



1941 - 2016

**KNOW CANCER**

# TATA MEMORIAL CENTRE

A Grant-in-Aid Institute of the  
Department of Atomic Energy, Govt. of India



*Affordable healthcare to all ..... at their doorsteps*

**ANNUAL REPORT 2016 - 2017**



Chief Guest Dr.R.Chidambaram (Principal Scientific Advisor to the Prime Minister) in the august presence of Mr.Ratan Tata (Head of the Tata Trusts and the former Chairman of Tata Sons) and Dr.R.A.Badwe (Director of Tata Memorial Centre) lighting the inaugural lamp of the TMH Platinum Jubilee Conference on 'New Ideas in Cancer - Challenging Dogmas' at the N.C.P.A, Mumbai on the 26<sup>th</sup> of February, 2016.



Nobel Laureate, Professor Amartya Sen with Dr. Sekhar Basu, Chairman of the Department of Atomic Energy - Govt. of India, Dr. Kailash Sharma, Director Academics - TMC and Dr. Rajendra Badwe Director - TMC, at the Conference on 'Healthcare: A Commodity or Basic Human Need?' in January 2017.



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# ANNUAL REPORT 2016-17

of

## TATA MEMORIAL CENTRE

(A Grant-in-Aid Institution of the  
Department of Atomic Energy,  
Government of India)

Tata Memorial Hospital, Mumbai.

Advanced Centre for Treatment,  
Research and Education in Cancer, Navi Mumbai.

Centre for Cancer Epidemiology, Navi Mumbai.

Homi Bhabha Cancer Hospital and Research Centre,  
Visakhapatnam.

Homi Bhabha Cancer Hospital,  
Sangrur.

Homi Bhabha Cancer Hospital and Research Centre,  
Mohali.

Mahamana Pandit Madan Mohan Malviya Cancer Centre,  
Varanasi.



## Mission and Vision of the Tata Memorial Centre

### Mission

The Tata Memorial Centre's mission is to provide comprehensive cancer care to one and all, through its motto of excellence in service, education and research.

### Vision

As the premier cancer centre in the country, we will provide leadership in guiding the national policy and strategy for cancer care by:

- Promoting outstanding services through evidence based practice of oncology
- Commitment of imparting education in cancer to students, trainees, professionals', employees and the public and,
- Emphasis on research that is affordable, innovative and relevant to the needs of the country.

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# 75th Year Platinum Jubilee Theme

“Affordable, healthcare to all ..... at their doorsteps”.



Cancer is a major health problem in India with the overall burden increasing due to improved life expectancy and a growing population. It is estimated that by the year 2030, 70% of the world's cancer burden will be borne by low and middle income countries like India. Currently, the annual incidence of cancer in India is estimated to be 1 million, with a high mortality to incidence ratio of 0.69. These numbers are expected to almost double by 2035 based on GLOBOCAN data of International Agency for Research on Cancer (IARC). The absolute numbers of patients with cancer is expected to rise primarily because of an improved lifespan, growing population and changing lifestyles. Clearly, the overall burden of cancer is growing in India.

Worldwide, inequities on socio-economic grounds are a major source of concern with significant implications on access and delivery of healthcare. This has been an important problem, even in highly developed countries like the United States and several countries of the European Union. This is an even bigger challenge in India with much higher levels of poverty, illiteracy and wide variations in the level of access to healthcare facilities. Also, healthcare costs are primarily out of pocket for most of India's population, with insurance penetration extremely low, in spite of several recent government-led health insurance schemes. Geographic, social, and economic inequities contribute towards maintaining these disparities even in a modern world which is shrinking into a global village.

Expanding healthcare access has been a crucial endeavor of the Government of India. Justice in healthcare delivery

is dependent on several criteria – universality of access, adequate access without increasing burden, fair distribution of the financial aspects of healthcare, increasing the pool of trained human resource in healthcare, and additional resources to support the socioeconomically vulnerable. With a large and expanding population, increasing inequities in wealth and socio economic capabilities, the challenges of achieving universal healthcare and access in India are evident. There are four dimensions of healthcare access that need to be considered – first, the physical and geographic accessibility of healthcare facilities for patients; second, the availability of requisite resources to treat patients; third, the quality of the healthcare delivery providers; and finally, affordability of treatment provided.

The Tata Memorial Centre has worked towards eliminating disparities in the quality of cancer care in the country right from its inception. With a stated mandate of treating at least 60% of patients at highly subsidized cost (many of them completely free), economic constraints for patients registered at the hospital have to a large extent been removed from an individual's ability to access the highest level of cancer care. In addition, active tapping of philanthropy enables numerous patients to be treated completely free of cost including resource and cost-intensive treatments like bone marrow transplantation. Incomplete treatment rates in curable cancers like childhood cancers have decreased drastically thanks to generous support from charitable organizations.

Recognizing the difficulties faced by patients (and their families) from outside the city and state to live in Mumbai for the duration of their treatment, the hospital has initiated several steps to provide accommodation at highly subsidized cost. In addition, moves are afoot to create even more options for patients and their families to stay in Mumbai during their treatment. Support from non-governmental organizations and corporate social responsibility have been instrumental in augmenting these facilities. Combined with the generous concessions for cancer patients and relatives for rail and air travel provided by the Government of India, these measures make the process of getting quality cancer care more feasible for poor patients from far flung areas in the country.

Tata Memorial Centre has taken several different approaches to make high-quality cancer care uniformly accessible to the Indian population. Several initiatives have been made towards offering the same levels of cancer care at the patient's doorstep. There are concrete plans for creating five new state of the art cancer hospitals in Varanasi (two), Vishakapatnam, Sangrur and Mullanpur – phased treatment facilities have already been started at Sangrur and Vishakapatnam. In addition, the B Borooah Cancer Institute in Guwahati has also recently come under the administrative purview of the Department of Atomic Energy, and thereby, TMC. These hospitals will have identical functioning as TMC and follow the same treatment protocols, thereby offering the same treatment to patients in four additional regions in the country.

The Tata Memorial Centre is responsible for training a large number of trained human resource to tackle cancer across the country. With a constantly increasing intake of trainees (residents and fellows) in surgical, radiation and medical oncology, along with broad specialties like pathology, radiology and anesthesiology, and paramedical courses like radiation physics, oncology nursing in addition to several other short and medium term training courses, it provides opportunities for both basic and advanced training in cancer care. Most of these professionals form the workforce of major cancer centres across India, again bringing the same work culture and ethic to these institutions. TMC's central role in expanding the human resource to tackle cancer across the country is a longstanding commitment.

Research has always been a major focus for the Tata Memorial Centre. Basic, translational and clinical research in cancer aims at addressing common cancers in India and providing cost effective treatment options. In the recent years, there have been important scientific breakthroughs in breast cancer treatment, cervical cancer screening and oral cancer surgery, all of which have had management implications far beyond the four walls of the institute. By virtue of being extremely cost effective, it has improved access to interventions which improve cancer outcomes and have been readily implementable across the country. Many of these advances have

been adopted by the Government of India through the ministry of health, several state governments and many specialized cancer centres in the country.

A major initiative in the past few years has been the creation of the National Cancer Grid (NCG), an initiative funded by the Government of India through the Department of Atomic Energy (DAE). The NCG is now a large network of 114 cancer centres, research institutes, patient advocacy groups, charitable organizations and professional societies with the stated mandate of having uniform standards of patient care, enhancing trained human resource to treat cancer and the initiation of multicentric collaborative research projects aimed at improving outcomes of cancer care in cancers which are common or unique to the country. Between these centres, it is estimated that over 600,000 new patients with cancer are treated annually, accounting for over 60% of India's entire cancer burden. A more detailed report of the NCG is available in another section of this annual report.

These initiatives from the Department of Atomic Energy through the Tata Memorial Centre and the National Cancer Grid have begun to transform cancer care in the country and make it affordable and accessible to all regardless of socio economic and geographical situation. The dream of providing high quality, affordable cancer care and making it accessible to every single citizen in India is rapidly becoming a reality.

# Governing Council



## Chairman

### Dr. Sekhar Basu

Chairman, Atomic Energy Commission & Secretary,  
Department of Atomic Energy, Government of India.

## Members, Ex-Officio

### Mr. S. Mervin Alexander

Joint Secretary (Admin & Accounts) Govt of India,  
Department of Atomic Energy, Research &  
Development Section.

### Dr. R.A. Badwe

Director, Tata Memorial Centre,  
Parel, Mumbai 400 012.

## Co-opted Members

### Mr. R.A. Rajeev

Joint Secretary (Finance),  
Department of Atomic Energy, Government of India.

### Dr. Snehlata Deshmukh

Ex-Vice Chancellor,  
University of Mumbai.

## Members

### Dr. N.K. Ganguly

Former Director General (ICMR) and Advisor  
Translational Health Science & Technology Institute,  
National Institute of Immunology, New Delhi 110 067.

### Shri. Jayant Kumar Banthia

Ex-Chief Secretary,  
Government of Maharashtra.

### Shri. R. Venkataramanan

Sir Dorabji Tata Trust,  
World Trade Centre-1, 26th Floor,  
Cuffee Parade, Mumbai 400 005.

### Mrs. R.F. Savaksha

Secretary & Chief Accountant,  
Sir Dorabji Tata Trust,  
24, Bombay House, Mumbai 400 001.

### Shri Lakshman Sethuraman,

Jamshetji Tata Trust,  
World Trade Centre-1, 26th Floor,  
Cuffee Parade, Mumbai 400 005

## Permanent Invitees

### Dr. A.K. D'cruz,

Director, Tata Memorial Hospital,  
Parel, Mumbai 400 012.

### Dr. S.V. Chiplunkar,

Director, Advanced Centre for Treatment Research and  
Education in Cancer (ACTREC),  
Kharghar, Navi Mumbai 410210.

### Dr. K.S. Sharma,

Director (Academics), Tata Memorial Centre,  
Parel, Mumbai 400 012.

### Dr. D. Raghunadharao,

Director, Homi Bhabha Cancer Hospital &  
Research Centre (HBCHRC),  
Aganampudi, Visakhapatnam.

## Secretary

### Dr. HKV Narayan,

Deputy Director, Advanced Centre for Treatment Research and  
Education in Cancer (ACTREC),  
Kharghar, Navi Mumbai 410 210.

## Message from Director - TMC



The platinum jubilee year marked an occasion to celebrate and also one for stock taking. Holding a peerless position since seventy five years of inception is no mean achievement, yet it's also a time to acknowledge the pressing need to envision, strategize and plan for the future so that in years to follow we can look back with pride and welcome the times ahead with progress and development.

Our maverick slogan for the platinum jubilee year well-projected our tireless commitment *KNOW CANCER*. Determined as we are, to know every cell, type, line and mutation of the disease, in order to control it. Three pivotal conferences were planned for the year, each focussing on different variants and dimensions of cancer control essentially for India and permeating into the world at large.

The first symposium, "Challenging Dogmas in Cancer and Finding New Solutions", was targeted towards steering our understanding of cancer and its treatment in different directions for improving outcomes. The meeting required acceptance of our limitations in understanding cancer biology and its application in conquest of cancer. The major challenges were in form of genetic basis of cancer, the ultimate reductionism leading us to smaller and smaller Abs or Ibs, with precision of targets but poor killer ability. Vaccines in oncology also faced hurdles with lack of evidence for reduction in invasive cancer and subsequent impact on mortality.

The next was an intensive conference curated to address the disturbing condition of healthcare as a commodity subject to market forces and appalling disparities. The vexing question of 'Is healthcare a basic human right or a commodity?' was deliberated in this landmark meeting with representation from over 32 countries and all Indian states. We had envisaged this project as a guide base for structuring a comprehensive and equitable healthcare system with Universal Health Coverage as the over-arching goal and sustainable, affordable, accessible and quality assured health polices as our riding principles towards achieving it. We had the privilege to host some of the greatest minds in economic policy, administrative control and medical experience to carve out the best solutions for improving access to affordable quality care. This was the most successful interaction with evolution of Mumbai Declaration, a charter which creates a road map for cancer control strategy. At the conference Health Minister Shri J. P Nadda announced that the pointers given by MD will be duly followed, both in word and spirit. True to his statement, the proposed directions of the Mumbai Declaration have featured in the recent National Health policy. Nobel laureate and economist Amartya Sen, the chief guest at the conference, also extolled the deliberations of the meeting. Commenting on the MD as an excellent direction for health reforms, he called it, *"the rare flagship in front of a national movement towards the universal healthcare"*. TMC's model of healthcare delivery was appreciated and accepted as the desired standard of affordable quality care, which needs to be replicated across India and the rest of the developing world

The third conference involving the oncology community was aimed at national cooperation on standards of care for seven common cancers in India. This was a consensus evolving interaction in oral, thoracic, breast, colorectal and gynaecological cancers. Inputs from over 300 oncologists across the country culminated into an EBM algorithm through a volume that carried the hallmark of ease of implementation and cost-effectiveness.

Given the growing number of cancer patients from the most populous state of India, Uttar Pradesh, and the lack of a specialized cancer hospital in that region, The Honourable Prime Minister Shri Narendra Modi announced the plans of opening a cancer hospital in Varanasi. TMC was handed the mandate for developing and running a 250 bedded comprehensive cancer centre in the campus of Benaras Hindu University, Benaras. The centre will offer state of art facilities to cancer patients in Uttar Pradesh, Bihar, Jharkhand, Uttarakhand, and adjoining countries like Nepal. Among its main objective is to augment cancer prevention and early detection in Uttar Pradesh and establish a base for providing Nuclear medicine services, especially in demographically challenged and economically compromised sections of Northern India.

According to a Globocan report, India has an incidence of 7,615 cases per lakh population in gall bladder cancer, with 6,416 deaths per lakh annually. In north and north-eastern parts, incidence is double in women than men. With the foundation of the planned centre we aim to set up a cancer registry and preventive oncology unit, also establish a research facility to study Gall bladder cancer, a unique cancer exclusively seen around Gangetic belt.

The most befitting finale to the grand year was the immortalization of TMC with a well-researched historical account of the institution's creation and growth collated in an in-house publication "Indelible Footprints in the Sands of Time". This is an engaging descriptive of TMC's conception by House of Tatas and its subsequent evolution under DAE. The elegant coffee-table milestone book replete with archival gems and outstanding research was unveiled by the Honourable Prime Minister of India, Shri Narendra Modi at his residence, in the presence of Dr. Sekhar Basu, Secretary DAE and Mr. Ratan Tata, Chairman Tata Trusts. The memorable event bore many distinctions. Primarily it converged under one roof, the three principal forces that created and shaped the institution into its destiny, the House of Tatas, Government of India and DAE. Secondly the release was a unique event, wherein the Prime Minister for the very first time through a video conference addressed the staff and students of TMC. The Prime Minister delivered an inspiring and impassioned speech duly emphasizing the importance and role of TMC in cancer control in India, lauding the efforts of collaborating partners like House of Tatas, DAE in shaping the institution and acknowledging the sterling services of all the past and present staff-members of TMC.

With great privilege and pride I cherish my belonging to this magnificent institution, and as it steadily progresses to attaining its centenary milestone, I sincerely urge all its members to maintain its commitment to humanity and excellence.



**Dr. Rajendra Badwe**

## Message from Director - TMH



2016 was an important milestone in the history of Tata Memorial Hospital. We celebrated our Platinum Jubilee – 75 years of dedicated service that has maintained the hospital as the undisputed leader in cancer care. This was largely possible due to the tireless efforts of each and every one of our staff past and present, who had never hesitated to work beyond the usual call of duty. The ethos and work culture of our staff was exemplary; a major factor responsible for the “brand” that Tata hospital had created for itself over the years.

One of the perennial problems at the hospital had been the shortage of manpower across all categories of staff despite the increasing footfalls at the hospital year on year. Our long standing request for an augmentation of staff was finally acceded to by the government. The last increase in manpower at the hospital was over a decade ago and understandably the system was stretched to the limit. This increase in manpower primarily in the nursing department will help us to further augment services at the hospital as well as ensure the delivery of safe care to our patients. Biochemistry and Haematology laboratory services at the hospital had been extended round the clock, giving clinicians the comfort to order tests as and when required in the interest of patient care. Timings of Radiotherapy department and of the Day Care services had also been increased benefitting a large number of patients. The Day Care services were now extended on weekends (Saturday & Sundays) as well, thus decreasing the wait times associated with this service; more than a 100, 000 Day Care sessions were offered last year. To help decongest the general outpatient department, restructuring plans were finalised that would help streamline patient flow and make life more comfortable for our patients. Internal counsellor training was conducted for selected individuals from the hospital to orient our staff towards best practices in patient care as mandated by the National Accreditation Board for Hospitals & Healthcare Providers. This was a step towards efforts at finally securing full accreditation of the hospital in addition to the already existing accreditation of laboratory and research divisions.

75 years has taken a toll on our iconic Main Building, the face that Tata Memorial Hospital has always been associated with. Structural audits suggested that the building had a limited life span of another couple of years. Plans are under way to build a new state-of-art hospital across the street in the original Haffkine premises where the State Govt. was gracious to grant us 5 acres of land. Hopefully, by the time I pen the next annual report we should be well on the way towards the construction of this new facility that would serve our patients in the years to come.

A stylized, handwritten signature in black ink, appearing to read 'Anil D'Cruz'.

**Dr. Anil D'Cruz**

## Message from Director - Academics, TMC



Tata Memorial Centre is a stand – alone post graduate and superspeciality centre and one of the constituent of Homi Bhabha National Institute (Deemed to be University) under Dept. of Atomic Energy, Govt. of India. Our institute has been recognized by Medical Council of India, New Delhi for undertaking MD, DM /M. Ch. programme in oncology and other subjects, namely, Anesthesiology, Radiology, Radiotherapy, Nuclear Medicine, Microbiology, Immuno-Hematology & Blood Transfusion Medicine, Pathology and Palliative Medicine. It also conducts postgraduate and doctoral programmes and encourages research in all sub-sets of cancer biology.

During 2016, we proposed to start a new superspeciality course – DM in Interventional Radiology to Medical Council of India and got it approved by Government of India. Tata Memorial Centre will be taking the first batch of 2 students from August 2017; first one in the country. We also propose to start a new superspeciality course – DM in Onco-Pathology and hopefully we will be taking first batch from August 2018 after the approval from Government of India. I am also proposing to start Masters in Hospital Administration and Masters in Onco-Physiotherapy after due approval from Homi Bhabha National Institute.

The centre continues to conduct six-month training programs for sponsored candidates from State Government Medical colleges, Central Government Hospital, Public Sector Undertaking Hospitals and Regional Cancer Centers across the country. Specialized training programmes in the field of oncology and related subjects are conducted for doctors from South East Asia Region and South African. These countries received appreciation of its applicability from WHO and UICC. Several specialists from developing countries participated as 'Observers' for hands-on training in various aspects of cancer management. The Centre also conducts Post-Doctoral Fellowship programs and Ph.D. program at Advanced Centre for Training, Research and Education in Cancer at Kharghar, Navi Mumbai in Life Sciences and Health Sciences. Specialists from Punjab Government Medical Colleges, Amritsar and Patiala, Sangrur have been trained. DM and M.Ch. residents have been deputed at the outpatient and day care services at Sangrur, Punjab. This year we have signed an MOU with Hammadan Medical Centre, Doha, Qatar to train their surgeons and students in Head & Neck Oncology at TMH. Considering the growing needs for professionals for management of clinical trial sites, a post graduate course in Clinical Research was initiated last year, and it received good response from science and pharma graduates. This year we will be admitting the third batch in M. Sc. Clinical Research. A summer school in Oncology for Under-Graduate and Post Graduate Students from medical colleges across the country was organized in collaboration with Kings Hospital, London, last year from 9<sup>th</sup> May to 20<sup>th</sup> May 2016 and 120 students (Including 16 students from North East Region) participated in this program. We have selected 5 students to undergo 1-month Internship at Kings College, London (Guys Hospital & St. Thomas Hospital) at no cost to them.

This year, under the Indo African Forum Summit – III, we have started training of African and Sub-Saharan oncologist, nurses and radiation technologist at TMH and this program will continue for further three years.

I cannot end my report without expressing appreciation of my staff in the department of Academics and PG Education. With collective efforts from the staff and my faculty members, TMC has become the national and international hub for training and education in the field of oncology and related subjects.



**Dr. Kailash Sharma**

## Message from Director, ACTREC



At ACTREC, TMC, our mandate is to provide seamless cancer care to our patients. Over the past few years, we have nurtured a team of outstanding scientists, clinicians, and clinician scientists who have contributed towards making ACTREC a comprehensive cancer centre in Navi Mumbai. Our efforts focus on fostering innovative basic and clinical research with the aim of translating laboratory discoveries into useful diagnostic and therapeutic tools for effective patient management.

In 2016, ACTREC commissioned the new linear accelerator with IGRT / IMRT capability for stereotactic radiotherapy, image guided radiotherapy, stereotactic radiosurgery, total body irradiation and total skin electron therapy. The new state-of-art PET-CT was commissioned at ACTREC, wherein the PET component was developed indigenously. The relocation of the Hematopathology lab and Cancer Cytogenetics lab to ACTREC have added new features to diagnostic services provided at ACTREC.

Subsequent to the Memorandum of Understanding signed between BARC and ACTREC for 'Development of New Cancer Chemotherapeutics', two drugs developed by scientists at BARC, Withaferin A and diseleno-dipropionic acid (DSePA) are undergoing preclinical testing at ACTREC for prophylaxis against graft versus host disease and radiation-induced pneumonitis in appropriate animal models.

On the Academic front, ACTREC fosters an environment that continues to attract young talent towards its Ph.D. program in Life Sciences. The rigorous coursework exposes students to varied aspects of cancer biology and latest technologies, and helps develop their research skills and analytical ability.

There is a common thread that runs through all the patients with cancer, namely the need for good supportive care. In our attempt to provide a holistic way to promote wellness while reducing the physical and emotional stress experienced by the patients and to improve the quality of their life, programs are conducted throughout the year with the help of NGOs and corporates working with us. These involve patient participation in cultural events, entertainment programs for pediatric patients, beautification of wards by display of colorful paintings, and Yoga therapy. Towards fulfilling our commitment to Society, members of the ACTREC staff actively participate in Cancer Awareness Programs to educate and motivate individuals to seek cancer prevention and screening services.

In the years to come, ACTREC is to have newer facilities including a Radiological Research Unit, Pediatric Hematolymphoid Cancer Centre, Women and Children Cancer Wing, Archives building and Hadron Beam Therapy that would give a new dimension to patient treatment. *Asha Niwas* – a new dormitory being constructed through the generous donation of a well-wisher, will provide on-campus accommodation for patients and their families so that their time and resources are optimally utilized for patient care.

I feel honored and privileged to work with a team of dedicated clinicians, scientists and staff at ACTREC who are delivering outstanding services towards improved patient management that will go a long way towards generating the best possible outcomes.

(Dr. Shubhada Chiplunkar)

## Message from Director, HBCHRC - Visakhapatnam



The year 2016 saw the Centre grow from strength to strength on all fronts - most notable being a sharp increase in patient numbers. A little baffling was the fact that 60% of the patients continue to be women! And, a sizeable number were from Orissa, Chhattisgarh and Jharkhand. The institution still functioned in *porta cabins* with bare minimum staff in each department.

We made substantial progress in surgeries, with 4<sup>th</sup> year specialty registrars being posted at Visakhapatnam. The gynecological cancer surgeries – ovary, endometrium, cervix, vulva and vagina increased substantially due to the patients receiving preoperative chemotherapies in the 2nd half of 2015. We could undertake patients not needing ventilator care – stomach, colon, GE junction, thyroid and breast with ease.

Our load of day care chemotherapies increased substantially – all solid tumours, lymphomas, and chronic leukemias received uninterrupted chemotherapy.

The diagnostic departments of radiology, pathology, biochemistry and molecular biology have had substantial increase in both the variety and number of tests done – tumour markers, immunohistochemistry and PCR being the most useful.

With the addition of immunohistochemistry to histopathology, we were now in an enviable position of making a complete diagnosis to prognosticate and guide adjuvant chemotherapy. Liquid based cytology, again a donation, had helped us provide accurate test results to guide follow up plan for the cervical cancer screening program.

The molecular oncology unit, apart from providing *bcr-abl* testing by quantitative real time RT PCR technique, had standardized assay for pathological variants of human papilloma virus, the gold standard for cervical screening.

A steady radiologist was of help with invasive procedures – sonographic and mammographic biopsies and cytology where needed.

The addition of an ECG machine on donation, tumour markers and protein electrophoresis as well as blood grouping and viral serology helped us complete the entire set of preoperative investigations for all our patients.

We have made substantial inroads into cervical cancer screening. Our gynaecological oncologist, Dr. Leela, conducted regular community screening camps. In association with an NGO, *Vikasatarangini*, in the Vizianagaram district, we systematically enrolled and screened rural, urban poor and the urban women with VIA. We have standardized the technique of liquid based cytology. It vastly improved the cytopathologic diagnosis while offering a chance to do HPV testing, the gold standard in cervical cancer screening. Our young Scientist, Dr. K Sailaja, developed and standardized the test conditions for in-house HPV detection, using PCR. Ours was the only centre that offered this test in the whole of the state.

We have integrated palliative care into daily practice – for symptomatic care. With help from an NGO, the *Sneha Sandhya Age Care Foundation*, we were in a position to easily transit to hospice care as well as home care. We have doubled

our quota of morphine for the year 2017. Unlike most other tertiary care centres in the country, our patients had continuity of care from active to palliative, and, finally, the end of life care. We also offered hospice and home care with equal facility and provide bereavement counselling to the family. Most gratifying was the integration of symptom control, pain and palliative care into the holistic management of each individual patient. All patients beyond cure, made a smooth transition to palliation either at home or in the hospice of St. Joseph's Hospital. Each family was tutored in pain and symptom control as well as terminal care. We provided bereavement counselling to families of deceased patients. Hence, unlike in most tertiary care centres, patients continued under our care till complete recovery or death.

Our training camps in volunteerism were hugely popular – from involvement in spreading awareness on cancer prevention & screening, healthy life style, blood and platelet donation, palliative care and fund raising.

The pharmacy, with an additional hand, now provided all drugs, disposables and consumables at the same prices as in TMC. However, wherever there was no supplier or distributor for a drug, we provided a ready substitute for a similar at substantially lower price.

The newly appointed store keeper now looked after both consumables and capital goods and assets. There was a substantial increase in donations in kind, for patient care.

Nursing staff had increased with addition of ad-hoc staff. There was a long pending need to provide housing for them as well as technical staff.

The IT staff function entirely in tune with the SOPs of TMC. However, they were still unable to fine tune or adapt the software to situations that were unique to the site. Most worrisome was the absence of a comprehensive annual maintenance contracts for any of the hardware. We are still as far cry from the paperless ideal for medical records.

There was dire need for a hospital cancer registry. Unless practices were laid down early, we would be unable to provide much needed demographic data. The PBCR was yet functioning at the local medical college. They need to be accommodated on our campus, with periodic training and supervision of data generated.

There was an urgent need for a couple of ambulances for transporting patients who need urgent medical attention into the city's specialist centres. There was also a need for a vehicle to transport doctors, nurses and technicians on duty for patient care, especially post-operative care.

The administrative staff had remained unchanged. Most were repeatedly trained in their respective fields in TMC. Stenographic or secretarial help was non-existent. There was an urgent need to provide better salaries or incentive for non-medical staff to continue working, as the present remuneration is less-than-daily wages salaries and very unattractive. There was a desperate need to include these posts into permanent staff cadres, lest we are forced to continue working with discontented personnel.

We have earned good will in the community. We have had a good run of donations towards patient care. We were in the good books of the local polity and the press. In order that we raise and meet their expectations and aspirations, we need to remain on mission mode with this project.



**Dr. D. Raghunadharao**

# National Cancer Grid, India

The National Cancer Grid (NCG), an initiative of the Department of Atomic Energy (DAE), Government of India, was constituted in 2012 with the broad vision of creating uniform standards of cancer care across India. Five years later, it has grown to a large network of 114 cancer centres, research institutes, patient advocacy groups, charitable organizations and professional societies. Incorporating virtually all stakeholders of cancer care in India, it has now become a strong, unified and powerful voice in the fight against cancer.

The mission statement of the National Cancer Grid is as follows:

The National Cancer Grid will create a network of cancer centres across India with the mandate of establishing uniform standards of patient care for prevention, diagnosis, and treatment of cancer, creating adequate trained human resources, and facilitating collaborative basic, translational and clinical research in cancer.

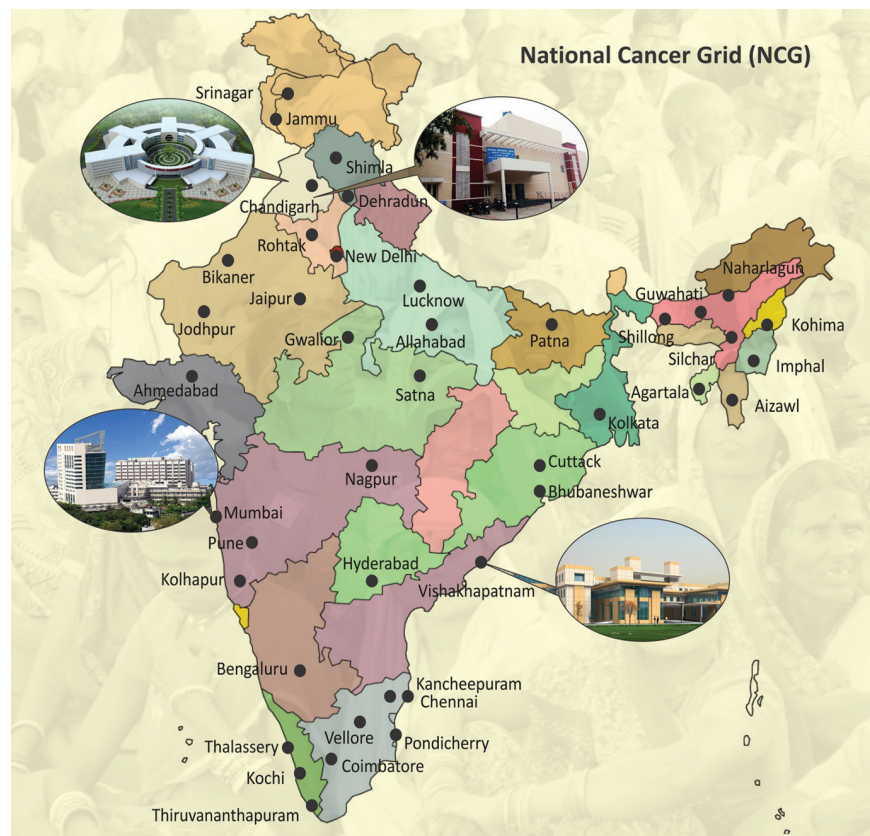
Funded primarily by the Government of India through the Department of Atomic Energy, the NCG has revolutionized cancer care in India by establishing the largest cancer network in the world. Uniform standards of patient care are likely by consensus on implementation of uniform cancer care to patients from all over the country at their doorsteps, by adopting evidence-based guidelines for treatment. The NCG guidelines on management of common cancers has been endorsed by all participating centres and is periodically modified as new evidence is generated. Adherence to these consensus guidelines is also being evaluated by conducting institutional peer reviews of the constituent centres. Currently a voluntary initiative, teams of experts drawn from other NCG centres conduct site visits after months of exchange of data and performance metrics, to

identify strengths and gaps, and opportunities for improvement which are then shared with centres as a peer review report.

Quality assurance programmes are underway in surgical pathology and being planned in radiation oncology. A web based platform has been created as an External Quality Assurance Service (EQAS) in surgical pathology (H&E and immunohistochemistry), similar to the College of American Pathologists' (CAP) programme. This service is provided free to member institutions and has been simplified to create a hassle-free experience for participating centres. Regular feedback with scores and suggestions for performance improvement are shared confidentially with member organizations. The success of this programme has spurred similar quality assurance project plans for

other diagnostic laboratories and radiation oncology.

Modern cancer treatment is increasingly complex and mandates that multidisciplinary teams are actively involved in treatment decisions. Two initiatives of the NCG ensure that gaps in quality of treatment decisions are narrowed. The first, the TMC-NCG-Navya solution is a second opinion service for patients across India and other countries across the world. Patients can upload copies of their investigation reports, radiology and pathology images, which are curated by a group of trained individuals, who then convert these into a structured format, including patient preferences and opinions. This structured data is shared using a mobile app with experts across the NCG along with evidence and experienced based treatment options, using cutting-



edge machine learning technology. NCG experts provide an expert opinion which is then transcribed and fed back to patients in easy to understand language.

The second initiative, the NCG Virtual Tumor Boards (VTB) work on leveraging the proven benefits of getting multidisciplinary teams to work on treatment decisions. Complex clinical situations in cancer are presented to peers with expertise and experience in cancer care using a web-based platform – anywhere upto 150 experts log on at a pre-specified time and discuss optimal treatment of patients from cancer centres across the country. In addition to assisting with treatment decisions for individual patients, the process reinforces the importance of multidisciplinary treatment decision making, and provides an excellent opportunity for participants to learn from collective experience and expertise of a large number of oncologists.

The NCG is a platform for exchange of specific expertise and skills and is likely to reduce the gap in outcomes between more and less experienced centres. It facilitates mentorship and proctoring of specific skills between centres, matching needs with institutions with the requisite expertise. In addition, the NCG has facilitated free unrestricted access to major cancer journals and books to all member centres thereby enabling specialists in these centres to be updated on the latest advances and research in cancer. E-access to over a hundred journals and books on cancer are provided to all NCG members, thereby providing a resource which would have been otherwise out of reach for the smaller centres. Inter-library loans and specific manuscript requests are also handled routinely by the NCG Virtual library.

Recognizing the difficulty of specific regions of the country like north-east India to travel to major cities to participate in continuing medical education programmes, the NCG regularly organizes the “travelling school of pathology”, a fresh initiative which takes training in surgical pathology to the doorsteps of these

regions. A team of expert pathologists and surgeons drawn from experienced NCG centres travel to several cities in the north east, conducting a series of workshops along with local faculty and train hundreds of pathologists and surgeons in best practices in cancer surgery and pathology reporting. Follow up workshops and contact meetings are planned to reinforce the learning from these workshops. Based on the success of the workshops in surgical pathology, similar workshops have also been conducted in oncology nursing. The travelling school of surgical pathology is likely to be replicated in other parts of the country as well.

The NCG also conducts highly specialized workshops on clinical cancer research methods, training researchers from across the country and abroad. In an intensive residential workshop assisted by 25 faculties, close to 50 participants convert one-page concept sheets on research ideas by junior faculty and trainees into full-fledged research protocols ready for submission to ethics committees and granting organizations over six days. In addition to the several projects being submitted and initiated, this also enables participants to mentor their colleagues and students in their respective institutions. The international Collaboration in Research methods Development in Oncology (CReDO) is supported by the National Cancer Institute (NCI), USA, King's College London, American Society of Clinical Oncology (ASCO), Indian Council of Medical Research (ICMR) and endorsed by the European Organisation for Research and Treatment of Cancer (EORTC), Medical Research Council (MRC), UK, Cancer Research UK (CR-UK) and the ACORD initiative, Australia.

The NCG facilitates and funds collaborative multicentric research in cancers common or unique to India. By fostering a culture of cooperation and close collaboration between centres, it creates a far more efficient system of conducting clinical trials. The focus of research is on finding cost effective, readily implementable interventions in all levels of cancer care in the country, thereby emphasizing its commitment to

provide affordable, equitable cancer care across the country. There is a strong commitment to data sharing, which is a mandatory requirement for funding by the NCG. So far, seven large multicentric clinical trials have been funded and supported by the NCG in different cancers.

Future plans of the NCG include a concerted and systematic effort at health promotion and cancer awareness, targeted at the general population. This is towards a longer term impact by improving awareness of cancer as a potentially curable disease if detected early, and healthier lifestyles. Augmentation and optimization of palliative care facilities in India is a priority area – a study to evaluate the gaps in provision of palliative care has already been undertaken by the NCG. Exploiting the volumes of individual cancer centres, an effort is being made to consider the feasibility of group negotiations for equipment, drugs and consumables. With a long-term plan to formulate a robust health technology assessment plan for cancer in India, initial steps are being taken to evaluate “value” of various modern cancer treatment. The NCG guidelines are also planned to be classified separately as “minimal”, “optimal” and “optional” to guide patients as well as public health policy makers.

The National Cancer Grid has grown over the past five years into a large and cohesive organization with significant impact on cancer care, training and education, research and policy in India. It serves as an exemplar for other disease groups to emulate and make a difference in overall healthcare delivery in India. With the continued spirit of collaboration and cooperation between the centres and the ongoing support from the DAE, it seems certain that its role will further expand and transform the way cancer is treated in the country.



**Dr. C. S. Pramesh**  
Convener NCG

## Second International Peer Review, 2016



*The international faculty led by Professor Arnie Purushottam with Director TMC, Dr. RA Badwe, Director ACTREC, Dr. SV Chiplunkar and Director Academics of TMC, Dr. KS Sharma.*

Tata Memorial Centre had its second international peer review in Feb-Mar 2016. The first review had been held in 2010, when 14 international experts reviewed the functioning, systems and processes of the institution in detail, initially by email (based on structured documents exchanged from various disease management groups, departments and laboratories), culminating in a three-day site visit at both Tata Memorial Hospital and ACTREC. The experts had been drawn from different relevant specialties including clinical, epidemiological and translational research backgrounds. The review was aimed to benchmark the available infrastructure in terms of

clinical effectiveness, adherence to evidence-based management guidelines, capacity building, educational programs and research capabilities of clinicians and scientists compared with global standards, keeping in mind the national needs. This helped identify areas of strength as well as those that could be augmented to ensure sustained benefits in patient care, education and training, research and administration.

The second international peer review was conducted to further evaluate the institution both with a view to review progress over the past five years but also the changes made based on the first report. The committee comprised

17 eminent experts from various specialties and backgrounds covering the entire spectrum of clinical care, education, basic, translational and clinical research, administration and policy, and brought with them a wealth of experience and expertise.

The team, led by Chairman Prof Arnie Purushotham, Director, King's Health Partners Comprehensive Cancer Centre, Section of Research Oncology, Guy's Hospital, London, included Prof Philippe Autier (Epidemiology), Dr Christopher Booth (Medical Oncology and Health Services Research), Prof Joy Burchell (Basic / Translational Cancer Biology), Prof Sanjeev Galande (Epigenetics and

Cancer Research), Dr Reena George (Palliative Care), Dr. Shaleen Kumar (Radiation Oncology), Prof Peter Naredi (Surgical Oncology), Prof Tony Ng (Basic Science / Translational research), Dr Binay Panda (Basic / Translational Sciences / Genome and Computational Biology), Dr T Rajkumar (Translational Research), Dr Tapan Saikia (Medical Oncology and BMT), Prof Richard Sullivan (Health Economics, Cancer Policy, Health Services Research), Prof Ian Tannock (Medical Oncology and Research), Mr R Venkataramanan (Public Health), Prof M Vijayakumar (Surgical Oncology) and Prof John Yarnold (Radiation Oncology).

The committee reviewed the documents sent by the various DMGs, departments for upto six months preceding a three-day site visit between 29<sup>th</sup> Feb and 2<sup>nd</sup> March 2016. The review process involved providing the committee members with departmental and multidisciplinary group's patient care pathways, waiting times for treatment, operational timelines, efforts in education and training and new research undertaken. These documents were critically reviewed by the committee prior, thereby enabling optimum use of the limited time available during the actual site visit. The committee divided their time between the hospital and ACTREC with half-hour slots with every DMG and department. During this interaction, the operational policies, the volume of work, mortality and morbidity data, educational programs, research activities and future vision were shared with the committee in freewheeling discussions.

The Peer Review report (2010) had lauded the efforts of the institution in the untiring and persevered commitment to cancer care and appreciated the undeterred quality of patient service struggling under the exponentially growing workload. Barring few isolated areas, the 2016 committee found that the recommendations of the 2010 panel had been implemented and patient care delivery was comparable to the top-performing cancer centres worldwide.

The panel hoped that research would not only continue from bench to bedside, but expanded to permeate into health services and cancer epidemiology. The 2016 peer review committee debriefed the leadership of the Tata Memorial Centre after the site visit and followed it up with a detailed report in April 2016. This review document has been subsequently shared with the staff of Tata Memorial Centre.

The peer review report commended the institution summarising that it was benchmarked with the leading global cancer centres and appreciated the conduct of the review itself as an essential requisite for any cancer centre aspiring for these high standards. The committee expressed their recognition of the openness, warmth and honesty with which the staff participated in the peer review and the way they engaged with the panel. They also felt that the methods and standards used in the peer review were well validated and provided the necessary breadth and depth. The committee felt that while the staff of TMC were coping admirably with the burgeoning patient load (which had

increased 40% since the last peer review), this was unsustainable and strongly recommended augmentation of staff at all cadres. They also felt that while the opening of three more cancer centres in other parts of the country would to some extent reduce this workload, there was a need to identify and implement system-level changes in cancer care across the country for which TMC should take a leadership role.

The committee recommended that TMC should have a clear overarching research strategy with a medium term research plan encompassing clinical, epidemiological, translational and basic cancer research. Specifically, the report recognized that the thematic groups at ACTREC had been set up only a few months preceding the peer review and suggested an in-depth review of the science of the research undertaken in two years' time. In education and training, the committee recognized the responsibility that TMC bore towards creating human resource to manage cancer in the country and suggested a "train the trainers" workshop as well as the adoption of new pedagogical methods in education. The report strongly suggested that once augmentation of the workforce occurred, protected time needed to be given to clinicians to focus on research and educational activities.

The committee were highly appreciative of the staff of the Tata Memorial Centre, stating that they *"should be rightly proud of the achievements and progress they have made over the last five years, which have been substantial, and their commitment and dedication to patients, research and education were evident throughout"*.



## Summary, Executive

The Tata Memorial Centre (TMC), a Grant-in-Aid institution of the Department of Atomic Energy, Government of India, comprised of seven centres - the main Tata Memorial Hospital (TMH) in Mumbai; the Advanced Centre for Treatment, Research and Education in Cancer (ACTREC) at Kharghar, Navi Mumbai; the Centre for Cancer Epidemiology (CCE) at Kharghar, Navi Mumbai; the Homi Bhabha Cancer Hospital (HBCH) at Sangrur, Punjab; the Homi Bhabha Cancer Hospital and Research Centre (HBCHRC) at Aganampudi, Visakhapatnam; the Homi Bhabha Cancer Hospital and Research Centre (HBCHRC) at Mohali, Punjab; and, the latest soon to be established, the Mahamana Pandit Madan Mohan Malviya Cancer Centre (MPMMMCC) at BHU, Varanasi. TMC continued to provide the highest standard of patient care through its services and research, and capacity building by imparting knowledge through various educational activities.

To continue the efforts of taking TMC into the top 5 cancer institute globally, the second international peer review was conducted in March 2016.

The TMC affiliation with the International Atomic Energy Agency (IAEA) Program of Action for Cancer Therapy (PACT) continued with different projects undertaken under this collaboration with WHO, Union for International Cancer Control (UICC) and the National Cancer Control Programme (NCCP).

Being the Asian hub for the International Agency for Research on Cancer (IARC), TMC continued to provide divergent training

opportunities for cancer registry personnel and established cancer registries in other Asian countries lacking such facilities.

The mutually benefitting sister institution relationship between TMC and The University of Texas MD Anderson Cancer Centre progressed further for the development and exchange, in programs related to cancer control, management and eradication.

There had been annual training fellowships and the exchange visits in cancer research and education between TMC and the Kings College London, UK.

The year 2016 saw the success of the recently launched TMC-Navya online second opinion services for patients and their relatives from cancer experts.

### **TATA MEMORIAL HOSPITAL (TMH), Mumbai - Maharashtra**

The Tata Memorial Hospital completed 75 years (1941 – 2016). To celebrate the Platinum jubilee anniversary, various conferences and seminars were conducted throughout the year. From a handful in 1941, the medical staff strength of the hospital rose to around 200 now, and patients from all over India and the neighboring countries flocked here for their cancer management. The Maharashtra State government tied up with the Tata Memorial Hospital to train rural doctors, nurses, general surgeons and physicians on cancer screening, chemotherapy administration, and treatment protocol in 24 of their districts; envisaged primarily to avoid unnecessary travel woes of the cancer patients within Maharashtra.

A new feature introduced for patients benefit was sending alerts through their cell phones. Appointment reminders, final report commissioning, critical value alerts, sample rejections etc. were conveyed through Short Message Services (sms). The smart card introduced a couple of years ago had become a huge success with majority of the patients opting for this cashless transactions.

For the benefit of patients and hospital staff, a new cell phone application, the TMH-Disha was developed and launched. It was a TMH Patient Navigation mobile phone application that helped locate the various service areas in the campus by providing visual directions.

From the TMH data that was fully analyzed and completed till the year 2013, the Hospital Cancer Registry revealed that in males, the highest cancer incidence was of the Buccal Mucosa, followed by Leukemia and Lung. In females, it was the Breast, followed by Cervix Uteri and the Ovary.

### **Services**

There was 3.85 % increase in the number of new patients as compared to last year. Of the total of 69,918 patient registrations in year 2016, forty thousand seven hundred and eighty four (40,784) were new patients; 5,660 registered for preventive oncology and 23,474 patients referred for investigations like mammography, pathology slide reviews etc. There had been an increasing trend for such second referrals. The total bed strength of the hospital remained at 629.

Patients from the state of Maharashtra numbered under 10,000 and those from Mumbai city about 5,500. The maximum

number of patients were from the Northeastern parts of India with West Bengal having the highest registrations after Maharashtra state with 4, 801 patients.

The eleven (11) Disease Management Groups (DMGs) for different anatomical cancer sites continued to provide evidence based diagnosis and offered individualized treatment in form of surgery, chemotherapy, radiation and palliative or in combination; this ensured better outcomes and improved the quality of life of patients.

Surgery formed the main stay in treatment for majority of the solid cancerous tumors. The department of **Surgical Oncology** with a team of 40 surgeons expanded its reach by providing their expertise to the established and upcoming cancer hospitals in Sangrur, Visakhapatnam, Aurangabad and Ratnagiri. The department entered into a MOU with Lifeline Express to offer Head & Neck surgical services on the world's first hospital on a train. The Lifeline Express or the Jeevan Rekha Express was the world's first hospital train funded by Impact India Foundation, as part of the International Initiative Against Avoidable Disablement.

The procurement of operating microscope with neurosurgery accessories, the intra-operative neuro-monitoring system and the digital stroboscope augmented the departmental services. A total of 10,798 major surgeries were performed; 8,465 in TMH and 2,333 in ACTREC. The number of minor surgeries performed only at TMH totaled 36, 474. Over 500 surgeries were performed at Sangrur and more than 150 each in Visakhapatnam and Aurangabad.

As part of the platinum jubilee celebrations, a live surgical demonstration workshop for advanced, minimally invasive and robotic surgeries was conducted over 4 days in November 2016; over 400 surgeons across India attended. The

departmental staff also edited and authored a book "Atlas of Operative Surgical Oncology 2016" to emphasize the operative techniques, the contraindications and the "what no to do" in surgery.

**Plastic surgery** performed over 600 free tissue transfers; being the largest for a single centre in Asia. A 5-day plastic surgery workshop was conducted to observe the Plastic Surgery Day on July 15<sup>th</sup>.

For surgical reconstructions and wound covers, and for post radiation skin ulcerations, grafts and tissues were required. The **Tissue Bank** procured them from living donors and included amnion, a biological dressing, tooth and bone. Over 1,000 patients benefited from these human grafts. About 10,000 such grafts were provided to various hospitals across India.

For surgery, it was essential that the patient be as pain free as possible. The department of **Anesthesiology**, including the divisions of Critical Care and Pain had a fulltime staff strength of 27 that catered to demands of 15 operating theatres and that at 10 other locations. A total of 21,110 patients were anaesthetized at TMH and ACTREC, and over 500 at Sangrur. The recovery room catered to 14, 691 patients and a total of 2,545 patients were admitted to post-surgical and medical ICU's of which 1,091 were ventilated. Twenty two thousand six hundred and eleven (22,611) patients were seen at the pre-anesthesia check-up clinic at TMH and ACTREC. The increased referrals for pain management were evidenced by the increased numbers of around 2, 500 for acute pain management and more than 10,000 for chronic pain management.

Radiation therapy formed another line of treatment for cancer; either for cure, control or palliation. The department of **Radiation Oncology** offered optimized and efficient treatment with the top of the line machines by 19 radiation oncologists and 16 medical physicists. The department was well-equipped

with the latest techniques and technology. External Beam Radiation was offered through its six Linear Accelerators and four Telecobalt units (for more than 6,500 patients). In addition, there was a Conventional and a CT- Simulator along with a Mould room. There was also the ease of image acquisition for 3-D Conformal and 4D treatments like Image Gated Radiotherapy, Image Guided Radiotherapy (IGRT) and, Intensity Modulated Radiotherapy (IMRT) and surgery (IMRS). These IGRT and IMRT techniques had been used on almost 2,000 patients. Newer softwares were able to perform image fusion from different imaging modalities like CT/MR/PET etc. The newer linear accelerators like Novalis, Trilogy etc. had facilities of image guidance using Cone-Beam and Mega Voltage CT.

Intra-cranial Stereotactic Radiotherapy and Radiosurgery was delivered using the "Brain-Lab" system comprising of micro-multileaf collimator (mMLC) and a dedicated planning system. Stereotactic RadioSurgery was performed on 3 patients. The Total Body Irradiation (TBI) for bone marrow transplant (BMT) was done using the in-house developed Bhabhatron II Cobalt 60 Unit. More than 20 patients were treated with Whole Body Irradiation. Significant cost reduction for institute was expected through indigenization of various aspects of radiation therapy equipment and accessories.

Interstitial and cavitatory Brachytherapy formed an integral part for treating many cancers using Iridium-192 and, had been used in over 3,500 patients.

Radiation therapy required a variety of high voltage equipment and it was imperative that they be maintained in proper working condition to emit appropriate radiation; safe radiation standards also needed to be adhered to. The department of **Medical Physics** complemented the Radiation Oncology department by performing machine

Calibrations, Quality Assurances, maintenance of these teletherapy and brachytherapy machines, formulating treatment planning & dosimetry, procurements of radioactive sources etc. The department had at its disposal many sophisticated equipment like treatment planning systems TPS (Eclipse, Oncentra, i-Plan), dosimeters & calibration instruments (DOSE1, Unidos), 3-D Water Phantom (Blue Phantom, 3-D scanner), 3D Dosimetry System (Octavius), TLD reader (Rexon), Film Dosimetry System (Omnipro), Gafchromic Film dosimetry system etc. to carry out these planning, calibrations, tests etc. The department also looked after the radiation safety aspects at all levels in the department as well as in the hospital. They advised departments like Radiodiagnosis, Interventional radiology, Nuclear medicine, Transfusion medicine, Tissue banking and the facilities at ACTREC for their requirements of radiation protection and safety, QA, source procurement and their disposal as per the Atomic Energy Regulatory Board (AERB) guidelines.

The use of drugs in treatment of cancer grew by leaps and bounds in this decade. The department of **Medical Oncology** had expanded its out-reach from just providing protocol based chemotherapy to drug development, drug quality testing, immunotherapy, targeted therapy and Bone Marrow Transplantations. The fulltime staff of 18 medical oncologists were also involved with the medical oncology molecular laboratory and the Pharmacological facility in ACTREC. Around 40,000 thousand new patients were treated and more than 2 lakh patients followed-up. Additionally, and noteworthy were the 3015 children who were treated with only < 5% rate of abandonment of treatment among them. There were separate Day-care wards for adults and children for chemotherapy that accounted for almost 1.5 lakh patients. Sixty eight (68) Bone Marrow Transplants were performed that included difficult cases, unrelated and

haploidentical transplants. To evaluate children with retinoblastoma a new digital retinal imaging system was procured.

All appropriate and adequate treatment of cancer was possible only after confirmation of cancer by tissue diagnosis. The department of **Pathology** offered diagnostic services to 57,460 histopathology cases; a 3.47 % increase that included cases of biopsies, big specimens and outside processed referral material. Six thousand two hundred sixty four (6, 264) Frozen Samples were examined along with 1,05,000 immunohistochemistry slides. The department maintained a National Tumor Tissue Repository to facilitate translational research. The department started the External Quality Assurance Scheme (EQAS) in histopathology in January 2016 with TMH as the nodal centre; the results were very encouraging.

In the **Molecular Pathology** section, 3,910 tests of solid tumors were performed; a 67.24 % increase. Various molecular techniques were used for the diagnosis, prognostication and prediction of solid tumors. For targeted lung cancer therapy, the lung gene panel comprising of *ROS1* gene rearrangement and *MET* gene amplification were introduced; a multigene panel (120 genes) spanning 9 chromosomes for neuroblastoma was also offered.

The **Cytopathology** section implemented synoptic report formats that ensured uniform and unambiguous reporting. This section was NABL accredited. The departmental workload consisted of 25,207 samples and 1,00,564 smears. The External Quality Assessment Scheme (EQAS) of diagnostic cytopathology service showed a 24% increase of participants (181 to 225) compared to the previous year

The **Hematopathology** section worked round the clock and processed more than 1,500 tests in a day to diagnose leukemia and lymphoma. Hematopathology initiated the Next

Generation sequencing facilities for research in 2016. The total numbers of routine hematological tests (coagulation and hemogram) were 5,56,234. The specialized tests like molecular tests, marrow aspiration morphology and Immunophenotyping totaled 21,121.

Chromosomal abnormalities had been linked with cancer. The **Cytogenetic** department performed molecular cytogenetics and conventional karyotyping that formed an integral part of diagnosis, prognostication and risk stratification in hematolymphoid malignancies and their management. The department was shifted to ACTREC in July 2016 and the laboratory performed 11,775 diagnostic tests in year 2016.

The department of **Clinical Biochemistry** was NABL accredited and performed 31,95,789 investigations. Tumor marker studies were performed on 1,61,592 samples and serum electrophoresis on 3, 361.

The department of **Microbiology** processed 1,90,802 samples that was a 5.9% increase from last year. The department tackled issues related to drug resistance and secondary pneumonias along with tuberculosis. The department supported issues related to environmental surveillance, water testing, waste management and control and prevention of nosocomial infections.

The evaluation of tumor location, its extent and spread elsewhere, was essential prior to treatment planning. The department of **Radiodiagnosis** was fully and adequately equipped with all modalities that included 2 Magnetic Resonance Imaging (MRI), 2 Computed Tomography (CT), 2 Digital Mammography, 1 Digital Subtraction Angiography (DSA), 1 CT-DSA combo machine, 1 Digital Fluororadiography, 1 Digital Orthopantomography (OPG) and 1 portable Direct Radiography. There were handful of Ultrasound and Color Doppler units with portability along with Conventional radiography

systems using Computed Radiographic imaging. The entire imaging department was computerized, filmless and almost paperless using Picture Archiving & Communication (PACS) along with the institutional Hospital and Radiology Information systems (HIS & RIS). The departmental work load increased by 11.5 % in 2016 with a total of 1,70,261 investigations being performed. In collaboration with the Atomic Energy Regulatory Board, the department developed a prototype to capture the radiation dose to patients from diagnostic imaging; plans were already a foot to link the same with the Aadhar Card number of the patients.

The **Nuclear Medicine & Molecular Imaging** department provided comprehensive diagnostic services and outpatient based isotope therapeutic services. The department with 5 medical staff managed 2 PET/CT and one SPECT/CT scanners and, performed 28,348 scans in the year. The year saw the introduction of 18 F DCFPYL PSMA scanning along with the use of 188 Rhenium HEDP for pain palliation and 188rhenium Lipiodol for Trans Arterial Radio Embolization (TARE).

Physical, mental and psychosomatic care formed an important aspect in cancer management and rehabilitation. To alleviate pain and improve the quality of life of patients, **Palliative Medicine** played a vital role in the life of cancer patients and their care-takers. End-of-Life management was also an integral aspect in cancer care. The home care visits provided to the patients and their relatives had become very popular. There were a total of 6,572 new referrals that included 295 pediatric patients. The follow up patients totaled 4,756 with 227 in the pediatric age group. The departmental staff visited 2,411 homes this year. The **Psychiatry** department performed psychological assessment of all cancer patients along with neurocognitive testing. Psychotherapeutic counselling was provided on individual and group basis and, psychoeducational

activities were arranged for the patients and their care-givers. Liaison was also set up with palliative medicine and the After Completion Therapy (ACT) clinic as part of management. A total number of 3,396 patients were evaluated that included 1,938 new referrals. Physical rehabilitation to restore function and making the patient independent was the prime function of the department of **Physiotherapy**. The department interacted with all DMG's to identify patients in need of such therapeutic exercises. The department procured the equipment called, Body composition Analyzer, Multiscan 5000 that could identify patients at risk of lymphedema, 9 months prior to its onset. This enabled the staff to identify risk patients and offer preventive measures. The LymphapressOptimal was also a new addition for the management of lymphedema by inducing intermittent pneumatic compression. The department attended to 14,341 patients this year. Return to appropriate physical activities, self-independence and maximizing ones' potential was another important aspect in cancer rehabilitation. The **Occupational Therapy** department collaborated with the Rehabilitation and Research Centre (RRC), Dr. E.B. Memorial Home Bandra and had provided orthoses, Jaw stretcher keys, Thermoplastic splints, etc. for patients. They also devised a novel forearm based devised orthosis, the Modified stretching wrist cock-up splint to maximize their forearm and wrist function. A total of 11,266 patients were attended upon with 782 at RRC, Bandra and, over 1,500 prosthesis and orthoses were provided to the patients. Talking, the vital communication link of humans; and swallowing, the essence for life, was addressed by the **Speech Therapy** department. The department worked together with the Head & Neck services for patients with oral and neck cancers who had lost or altered their speech and swallowing function. Radiation therapy patients were also evaluated to avoid the adverse effects of

radiation. The department was equipped with the latest Fiberoptic Endoscopic Evaluation of Swallowing (FEES) and the flexible Video-laryngostroboscope for voice evaluation and therapy. A total of 8,403 patients attended the department, of which 4,917 were new patients.

The jaw (mandible) played an important role in speech and swallowing. It was important to evaluate the mandible prior to and after radiotherapy to the head and neck regions; specially to look for tooth cavities and to look for the effects of radiation to the mandible. Reconstruction of the mandible also had to be performed, when its part or whole was removed during surgery. The **Dental & Prosthetic Surgery** unit was involved in maxillofacial prosthetic rehabilitation & dental care for head and neck, and other cancer patients. The dental out-patients section attended to 11,661 patients and 1,269 patients were treated with prosthetic rehabilitation. A total of 4,971 tooth extractions were also performed.

Bleeding and blood loss during surgery was a worrisome issue, as it could be fatal. The department of **Transfusion Medicine** continued to maintain high technical standards in providing a wide range of specialized blood components and special haemotherapy requirements of oncology patient. At more than 30 units per bed per year, it was rated at the highest adequacy among such providers nationwide. A total of 158 blood donation camps and 11 Platelet donor recruitment camps were organized by the department and the blood componentization was almost 100%. The department collected 22,251 units of blood and platelets.

Along with cancer management, one also had to look into the associated co-morbidities of the patients, especially where their heart and lungs were concerned. **The General Medicine** department advised on management of medical co-morbidities in patients undergoing surgery, radiotherapy and

chemotherapy. The Investigational services included 2D and 3D Echocardiography with Color Doppler for evaluation of cardiac structure and function as well as bedside echocardiography in critically ill patients. A total 11,108 echocardiography tests, 4,140 pulmonary function tests and 34,491 electrocardiograms were performed, and 14,216 consultations were provided during the year. Consultations were also offered in management of infections in the immune-compromised patients especially with HIV and critically ill oncology patients, including pulmonary complications, cardiovascular disease and metabolic disorders.

To endure the burden of treatment, nutrition of the patient had to be good. Besides managing gastrointestinal cancers and performing diagnostic and therapeutic endoscopies, the department of **Digestive Diseases and Clinical Nutrition** also provided clinical nutrition services to cancer patients and the hospital staff. A new diagnostic tool, the intraductal Endo Ultrasonography was introduced to stage precisely biliary cancers that impacted treatment decision. The department performed 6,888 endoscopies, evaluated 2,657 patients in their hepatic clinic and advised appropriate nutrition to 10,257 cancer patients.

Prevention was better than cure; an age-old adage. Infections, tobacco, alcohol had been mooted as catalysts for cancer. The department of **Preventive Oncology** educated the general public on the above issues and performed regular screening for oral, breast, uterine, lung and esophageal cancers. The department registered 5,660 new and 6,141 patients for follow-up screening services; 7,230 being women and 4,571 men. The department screened 1,144 women for oral, breast and cervical cancers under its community based cancer screening programs. One thousand seven

hundred sixty nine (1,769) tobacco users were counseled. About 6,035 men and women benefited through 28 Cancer Awareness programs conducted across Mumbai region. A 3-day workshop on tobacco control and cessation was held in August 2016.

## Research

Alongside service, research was encouraged with fervor. The ambience was to invigorate education through research. The institution had performed pioneering work in research and made breakthroughs in the management of cancers, especially of the breast and cervix. The research centre at ACTREC has laboratory and animal experimentation facilities. The department of Atomic Energy facilitated laboratory and clinical trials and, formed the **Department of Atomic Energy Clinical trial Centre (DAE-CTC)**. This centre along with the institutional **Clinical Research Secretariat (CRS)** encouraged and supported research through clinical trials towards the practice of evidence-based medicine, and training of researcher and clinicians.

To further the aim of good clinical practices, the CRS conducted conferences on Good Clinical Practices and Clinical Research Methodology. Courses were also held on medical writing, protocol writing and consent taking. The detailed Standard Operating Procedures (SOP) adhered to national policies and international guidelines.

Towards this aim, the CRS itself was physically expanded to accommodate more support staff including biostatisticians, and with all facilities. The area for data storage, compiling and analyses was increased; a central pharmacy for schedule Y and trial drugs with access control was in place. To overcome the inherent language issues of our multi-linguistic country, dedicated translators were also appointed.

The M. Sc. Clinical Research course was a popular one and 40 students were in various semester of training. Nineteen (19) students successfully completed the course and were in their internship program.

The statisticians were utilized for over 100 (one hundred) clinical projects including trials; analyses were offered to 86; sample size calculation to 7, randomized list generation to 6, sensitivity / specificity analyses to 2 and ROC curve analysis etc. to another 2 studies.

There were a total of 15 intramural trials and Rs. 86,19,754 was provided as financial support.

To maintain the highest ethical standards three Institutional Ethics Committees (IEC) were in place; two for TMH and one for ACTREC. All three were independent and, conferred once a month. The IEC were involved in the review of investigator initiated and industry sponsored trials; both intramural as well as multicentric ones.

Patient safety and anonymity was a priority; for the same, **Data Safety Monitoring Subcommittees (DSMSC)** were in place that ensured scientific and ethical aspects of all studies, projects, trials, student dissertations etc. There were one each at TMH and ACTREC. Around 200 projects were approved by the three ethics committees in the year 2016.

To commensurate the 75<sup>th</sup> year of TMH, the annual Evidence-Based Medicine conference was themed on "A Conference of New Ideas in Cancer-Challenging Dogmas" that included issues related to challenging the current Dogmas and the currently entrenched versus contrarian viewpoints. A total of 1,025 national and international delegates participated. The abstracts of this 3-day meet would be published in the European Journal of Cancer.

## Education

The Academics division of Tata Memorial Centre (TMC) affiliated to **Homi Bhabha National Institute (HBNI)**, Mumbai—a Deemed University, focused on Postgraduate training in Oncology and other broad specialties. TMC was also a recognized training center for cancer by several national and international organizations, including WHO, IAEA and INCTR. The education was offered through various postgraduate courses and, training through short term observerships and other such programs. About 180 Post graduate medical students were registered in 2016 for the Post Graduate courses in various disciplines.

TMC made in-roads in super specialization in oncology. Permission was granted by the Medical Council of India and the Government of India to start a new DM in Interventional Radiology course from the year 2017; the first in India. It was also proposed to introduce another new DM (Onco-Pathology) course in the curriculum soon.

Short term courses in the areas of Radiotherapy Technology, Medical Imaging Technology, Masters in Nursing, Infection Control, Palliative Care, Cyto-technologist and other Laboratory technologies were offered (181). There were 444 national and 32 international medical specialists who came as observers in various department of the institution. The institution offered 6-month training to 19 medical specialists in various branches of oncology and to 25 medical technicians in various modalities. The academic division organized a “Summer School in Oncology – 2016”, a training program of two weeks for Under-graduates and Post-Graduate Medical students in collaboration with Kings College, London. The Institution continued the exchange program with Seth G.S. Medical College & KEM Hospital, Children Wadia Hospital and Lokmanya Tilak Municipal General Hospital.

The medical and scientific staff members from each department and DMGs were nominated on editorial boards of several prestigious national and international journals, national and international committees, and participated in several research studies. They were also represented on various national and international committees to formulate treatment and diagnostic guidelines. In all, over 400 research papers were published by the TMC staff.

## Awards

TMC was conferred the 2016 Global Health Travel award its services in the field of Oncology for having maintained consistently outstanding performance in terms of initiatives that improved the way healthcare was delivered through areas such as leadership, innovations and service.



## ADVANCED CENTRE for TREATMENT, RESEARCH and EDUCATION in CANCER (ACTREC), Navi Mumbai - Maharashtra

The Advanced Centre for Treatment, Research and Education in Cancer (ACTREC), located in Navi Mumbai, is the R&D wing of the Tata Memorial Centre, Mumbai. ACTREC comprises of two sub-units: the Clinical Research Centre and 120-bed Research Hospital that focus on clinical and translational research and more importantly on the treatment of cancer patients; and the Cancer Research Institute that undertakes basic and applied research on cancer. Faculty at the Centre – both scientists and clinicians, are engaged in basic, applied, translational and clinical research projects that are designed for a better understanding of cancer that would lead to early

diagnosis and improved survival of cancer patients. Most of these projects involve collaborations within the Centre and also with national/international centres of repute from academia and industry, and are supported by institutional, intramural or extramural funding. During 2016, there were 188 on-going projects at ACTREC. A sum of Rs. 8.89 crore was received from governmental agencies such as DBT, DST, ICMR, etc., to meet the expenditure on 79 of these on-going projects. In addition, 15 new extramurally funded projects to the tune of Rs. 10.00 crore for a three year period were sanctioned by these funding agencies, of which Rs. 3.91 crore were received during the calendar year. Research carried out by faculty of the Centre resulted in 125 PubMed-indexed publications during 2016, of which 66 articles accrued from basic/applied research studies and 59 from clinical/ translational research or medical technology.

**The Clinical Research Centre (CRC) and Hospital** continued to be at the forefront of new developments at ACTREC. The current strength of the hospital is 120 beds including 88 ward beds, 10 intensive care unit and recovery beds, six bone marrow transplant beds and 16 day care beds. Continued increase in the number of patient referrals and registrations was noted in 2016. Diagnostic laboratories were granted continuation of NABL accreditation through ‘Desktop surveillance’ in June 2016. In September 2016, NABL accreditation was granted to the Hematopathology flow cytometry laboratory which relocated from TMH to ACTREC. ACTREC was empanelled with ‘A’ grade for the RGJAY scheme in October 2016.

**The department of Medical Oncology’s adult solid tumour** unit administers chemotherapy in neoadjuvant, adjuvant and palliative setting for solid tumours. In 2016, the unit dealt with around 9450 out-patient visits, and its five in-patient beds were always

occupied. **The Bone Marrow Transplant unit** performed 67 transplants, and handled almost 4500 out-patient visits. Adult patients with hematolymphoid neoplasms not undergoing transplant were also treated. In 2016, this unit handled ~700 in-patients and around 7500 out-patient visits. **The pediatric oncology unit** dealt with around 6000 out-patient visits in 2016 and its five in-patient beds were always occupied. **The department of Radiation Oncology** provided high quality radiotherapy services and generated evidence for the use of advanced radiotherapy technology. With the commissioning of a new linear accelerator with IGRT/IMRT capability, stereotactic body radiotherapy was provided particularly for liver and prostate cancer, and oligometastases. During 2016, respiratory motion management using deep-inspiratory breath hold was standardized for breast cancers and mediastinal lymphomas, and total skin electron therapy for cutaneous lymphomas was put into clinical use. Over 850 patients received external beam radiotherapy and 165 patients underwent over 380 brachytherapy procedures in 2016. **The department of Surgical Oncology** provides surgical services through its four operating theatres run five days a week, in-patient care, and conducts OPDs for newly registered cancer cases, pre- and post-operative care and follow-up. Almost 2300 major surgical procedures in pediatrics, head and neck, breast, gastro-intestinal, gynecology, urology and neurosurgery were performed in 2016. Intra-operative neurophysiologic monitoring and image guided surgeries were performed in patients with neurological tumors in eloquent areas. Minimally invasive laparoscopic gastrointestinal surgeries were carried out routinely. **The department of Anesthesiology, Critical Care and Pain** supported 2333 major OT and 547 radiotherapy OT procedures, 272 MRI, 384 interventional radiology procedures, 1492 new and follow up pre-anesthesia check-ups, 2067

recovery room admissions, 284 ICU admissions (including 116 ventilated), and 225 acute pain services. **The Radiodiagnosis department** at ACTREC conducts conventional radiology, ultrasonography including color Doppler, digital mammography, PET-CT, magnetic resonance imaging and several vascular/ non vascular procedures in interventional radiology. A new mammography machine was installed and made operational in February 2016. A new PET-CT scanner was installed and its CT component was made operational in May 2016. MRI under anesthesia for pediatric patients, and intervention radiology under anesthesia were started at ACTREC. **The department of Transfusion Medicine (DTM)** provides safe and adequate supply of blood/ blood components round the clock through blood donation, apheresis, blood donation camps, red cell serology; blood component preparation, testing, storage, and issue, as well as peripheral blood stem cell harvest, cryopreservation and storage, leukodepletion and gamma irradiation of blood. DTM organized 38 outdoor blood donation camps, collected 2347 blood units, and issued 3837 blood components in 2016. **The Nursing department** provides comprehensive nursing care to cancer patients undergoing various treatment modalities at ACTREC. Attention is also given to the implementation of patient safety goals, continuing education, and research. New initiatives in 2016 included day care patient assessment, and peripheral insertion of central catheter.

**The Pathology laboratory** at ACTREC provides diagnostic services for histopathology, frozen section, immunohistochemistry and cytology for patients treated at ACTREC and for referral cases from other hospitals. The lab is accredited by NABL for all services except cytology. In 2016, the lab processed 2900 histopathology specimens, 2300 frozen sections and 350 cytopathology specimens. The lab

performed around 3600 IHC tests on automated immunostainer. **The Hematopathology laboratory** is a state of the art referral diagnostic lab for hematolymphoid neoplasms, and a translational research lab. In April 2016, TMC's morphology and flow cytometry facility moved to ACTREC. Using morphology, cytochemical staining, flow cytometric immunophenotyping and molecular techniques, the lab undertakes diagnosis and predication/prognostication of hematolymphoid neoplasms. The lab carries out post-therapy response monitoring of acute leukemia, high sensitivity detection of circulating tumor cells of childhood small round cell tumors, and chimerism analysis for post-allogeneic stem cell transplant monitoring of patients. **The Cancer Cytogenetics laboratory** provides diagnostic services encompassing molecular cytogenetics and conventional karyotyping for diagnosis, prognostication, risk stratification and management in hematolymphoid malignancies. In July 2016, the lab shifted to ACTREC, and patient services restarted within a week. The lab is NABL compliant and, during 2016, performed 11775 diagnostic tests. **The Microbiology laboratory** provides patient related and hospital services encompassing bacteriology cultures, serological testing, clinical microbiology testing, viral antigen detection, sterility testing for Blood Bank services, mycology testing, environmental surveillance for OT, ICU, brachytherapy and BMT unit, and water testing. The Composite Lab is NABL accredited and provides routine hematology, routine biochemistry and immunoassay, and cytology (including FNAC) services at ACTREC. The lab also processes murine/ canine blood samples for research.

**The Clinical Pharmacology** group is actively engaged in the development of drugs and animal models of cancer/ related indications. Drugs in preclinical development include

Withaferin-A for prophylaxis against graft versus host disease (GvHD), and diseleno-dipropionic acid (DSePA) for radiation-induced pneumonitis (in collaboration with BARC). The group has developed and validated animal models of GvHD and radiation pneumonitis, and has made significant advances in pharmacokinetics (PK)-guided optimization of 13-cis-retinoic acid for neuroblastoma, meropenem for septic shock, and paclitaxel for breast cancer. **The Hypoxia and Clinical Genomics Group** focusses on the effects of acute hypoxia on tumor biology and clinical genomics. In 2016, experiments utilizing the newly installed hypoxia workstation provided evidence that acute hypoxic exposure results in modulation of gene expression in cancer cells. Another milestone was installation of the MiSeq NGS platform that will enable clinician researchers to design and conduct experiments on targeted sets of genes. Vital experiments on the clonal evolution of triple negative breast cancer are now nearing completion. **The Chromatin Biology group** has substantiated its seminal finding and made novel observations about (a) DNA damage, apoptosis and inflammation in bystander cells *in vitro* and *in vivo* that is caused by cell-free chromatin (cfCh) released from dying irradiated cells, (b) toxicity of chemotherapy caused primarily by cfCh released from dying cells - that is largely preventable, and (c) transformation of healthy bystander cells by cfCh emanating from dying cancer cells.

During 2016, scientists at the **Cancer Research Institute** continued to engage in a large number of on-going and newly-initiated basic and applied research projects under the newly formed thematic groups: Cancer Cell Biology; Cancer Genetics, Epigenetics and Genomics; Cell and Molecular Imaging; Protein Biochemistry, Biophysics and Structural Biology; Stem Cell Biology and Cell Signalling; Hemato-Oncology; Tumor Immunology.

**The Cancer Cell Biology group** stepped up its efforts towards gaining insights into the molecular basis of oral and cervical tumorigenesis in a bid to identify molecular targets. The role of proteins involved in vital cell survival/death pathways, and the association of HPV/ p16 with outcome in head & neck cancers are under study. Other study areas include understanding the mechanisms by which 14-3-3 proteins regulate cell cycle progression and epithelial mesenchymal transition (EMT), as also the biogenesis of the cell-cell adhesion junction - the desmosome, and the consequences of desmosome dysfunction to development, tumor progression and metastasis. Yet other aspects being studied are the functions of keratin, vimentin and their associated proteins in epithelial homeostasis and cancer, and attempt at using them as biomarkers of oral cancer. Other projects examine minimal residual disease in solid tumors to evaluate the efficacy of therapy and disease prognosis.

**The Cancer Genetics, Epigenetics & Genomics group** examines the biology of medulloblastoma, a common pediatric malignancy of the brain and has developed a microRNA based assay for molecular classification of medulloblastomas. The genetic basis of tobacco-related cancers involves the study of genomic alterations at the level of copy number across the genome, and identification of genes/ gene clusters in the altered genomic loci. Others in the group are examining alterations in epigenetic factors and site-specific post-translational modifications that alter chromatin organization and cell cycle progression, and contribute to malignant transformation. Yet another focus area is development of a next generation of effective targeted cancer therapies, with a specific emphasis on carcinomas of the breast, lung and the head & neck. Computational genomic approaches are being used to develop

computational tools such as HPVDetector and TMC-SNPdb as a resource for the community. The group is also involved in a series of studies that aim at understanding the molecular basis of inherited and somatic cancers, and development of translational algorithms through molecular biology and functional genomics.

**The Cell & Molecular Imaging group** aims to develop and utilize molecular imaging methodologies to obtain real-time visualization and quantitative measurement of cellular, physiological processes in live cells and small animal models, with the ultimate aim of experimental therapeutics for patient benefit. Using a basic cell biology approach with yeast, cell lines and cultured neurons as model systems and advanced microscopy techniques, attempts are also being made to understand the mechanisms governing the size and shape of the intracellular organelles - Golgi and nucleus. Non-invasive and minimally invasive applications of Raman spectroscopy in cancer are being actively pursued in a bid to differentiate between normal, pre-malignancy and malignancy, and also to identify early modifications such as cancer field effect and malignancy-related changes.

One of the focus areas of the **Protein Biochemistry, Biophysics & Structural Biology group** is to build protein interaction maps of proteases and associated chaperones involved in protein turnover, in a bid to identify targets that could be manipulated to destabilize the network. The group has developed functional screens to identify bottlenecks in cell growth, viability and invasive capacity of gankyrin-associated cancer cells. Yet another area involves screening of breast cancer-associated genetic mutations in the Indian population to identify the pathogenicity of mutations in BRCA1 gene. Characterization of BRCA1, BRCA2, BARD1, MAPK, FANCI and FANCD2 proteins is being attempted using X-ray diffraction and isothermal

titration calorimetry. Efforts are also on to understand the mechanisms underlying classical and non-classical programmed cell death by studying proteins of the apoptotic pathway - HtrAs, Pea-15, Hax-1, Bcl2-family, papillomavirus E2 and upstream caspases.

**The Stem Cell Biology & Cell Signaling group** investigates molecular signaling pathways that regulate stem cell renewal (Wnt, Notch, Sonic-hedgehog, TGF- $\beta$ , EGFR, etc), whose deregulation is associated with cancer. The group also aims to understand the molecular mechanisms governing radiation/ chemo- resistance in cancer, using glioblastoma and leukemia as model systems. *In vitro* cellular models from primary patient samples and *in vivo* pre-clinical orthotopic mouse models have been developed to identify signals and pathways associated with resistance. Other aspects under study include identifying transcriptional regulators of IGF-1R during acquirement of chemoresistance, understanding the differential potential of cell adhesion, migration and metastatic properties and probable lethal effect of p53 mutations and PIK3CA upregulation in chemoresistant cells, and understanding the role of Notch 3 in chemoresistance of ovarian cancer.

A prime focus of the **Hemato-Oncology group** is understanding leukemia biology to identify therapeutic targets during the blast crisis phase of chronic myeloid leukemia (CML). Proteomic analysis of cell lines representative of blast crisis phase has identified differentiators belonging to translational/ transcriptional machinery and proteins associated with key signaling pathways that could serve as therapeutic targets. Other projects in this group aim to understand the biology of acute leukemia and triple negative breast carcinoma. The miRNA-mRNA regulatory network in acute myeloid leukemia (AML) and the influence of gene mutations on it are under study.

**The Tumor Immunology group** continues to focus on understanding the reasons for immune dysfunction in oral cancer, leukemia and gall bladder cancer patients and development of immunotherapy for cancer. Molecular mechanisms underlying the killing of bisphosphonate-treated breast/ oral tumor cells and leukemic blasts by  $\gamma\delta$ T cells, and their cross-talk with osteoclasts are being investigated. Other aspects under study are the contribution of oral tumor-derived mesenchymal stem cells (MSC) toward immune evasion, and how acute myeloid leukemia MSC contribute to drug resistance in AML blasts, which is amenable to reversal with immunomodulators. Other projects in this group examine the effect of progesterone on TGF  $\beta$  gene expression in breast cancer cell lines, expression of IL32 isoforms in breast tumors, and analyze IL17 gene associated single nucleotide polymorphisms and gene expression in breast tumors.

### Academics

In keeping with its third mandate, ACTREC has a strong focus on Education. Its doctoral program is conducted under the aegis of the Homi Bhabha National Institute – a deemed university recognized by the University Grants Commission. Between January and December 2016, a total of 114 graduate students were working at ACTREC towards the Ph.D. degree in Life Sciences under the Homi Bhabha National Institute; these included 21 students of the new JRF 2016 batch that joined in August 2016. As a part of the Centre's short term and summer training program, 306 trainees worked under the supervision of the Centre's faculty during 2016 - 257 as short term trainees of which 103 worked for their Master's dissertation and 154 on collaborative projects/ for experience; 23 as Observers; 24 as summer trainees and two as research associates. In all, 18 local, national or international conferences, symposia, workshops, training programs, etc.

were organized at the Centre, beginning with the DBT-NER Hands on Training Workshop on 'Basic and Advanced Immunological Techniques' in January 2016, and ending with the 12<sup>th</sup> National Research Scholars Meet 2016 in December 2016. The Centre also hosted 23 national and international experts who delivered research seminars on varied topics in the life sciences and cancer. As its contribution towards society, the Centre also conducted cancer awareness programs for the general public, as well as cancer patient support/ entertainment programs during the year.

### CENTRE for CANCER EPIDEMIOLOGY (CCE), Navi Mumbai - Maharashtra

"Epidemiology is the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems." - Professor John M. Last.

The Centre for Cancer Epidemiology (CCE) was working fully from the year 2016 with the mandate to identify cancer burden, its causative factors and thence to provide preventing strategies and measures. Molecular epidemiology studies, which studied the interactions between genes and external factors were also undertaken.

The departmental staff looked for distribution of the disease within a population. Why were some individuals at higher risk than others? Were there associations between certain factors and increased risk of cancer; if so, casual or spurious?

**The Descriptive Epidemiological aspect** was to support cancer registries in India and the neighboring countries. **The Analytical Epidemiological** studies completed case control study on breast cancer and identified central obesity as one of the major factor towards its prevention.

The Population-based registry at various DAE sites revealed the highest cancer incidences as:

DAE Site	Population	Male Cancer	Female Cancer
Rawatbhata	1, 40, 128	Mouth / Lung	Breast / Cervix
Karwar	1, 56, 133	Lung / Mouth	Breast / Esophagus
Kakrapar	4, 64, 238	Tongue / Mouth	Breast / Cervix
Sindhuddurgh	8, 49, 651	Mouth / Tongue	Breast / Cervix
Ratnagiri	16, 12, 098	Mouth / Tongue	Breast / Cervix
Kalpakkam	40, 69, 603	Stomach / Lung	Breast / Cervix
Kudankulam	31, 31, 579	Stomach / Lung	Breast / Cervix
Tarapur	5, 57, 721	Mouth / Tongue	Breast / Cervix

The centre identified risk factors for gall bladder cancer, including a genetic risk locus. The first genome wide association study found a strong, replicated association at chromosome 7q21.12 which harboured ATP binding cassette subfamily B genes *ABCB1* and *ABCB4*. The menstrual pad to detect HPV infection was confirmed. Studies were on the way to identify risk if any, of development of brain tumor among cell phone users and role of indoor pollution in development of lung cancer. A cohort of around 200, 000 healthy individuals was established in rural areas of Barshi that formed a platform to study and identify dietary and other risk factors of cancer.

The completed 2013 study revealed that in the city of Chandigarh, lungs in men and breast in women had the highest incidence of cancer. Similarly, in Sangrur, it was esophagus for men and breast for women. In Mansa, again it was esophagus in men but cervix uteri in women.

The Ph. D in Epidemiology (Faculty of Health Sciences) was awarded to one student under HBNI university.

### **HOMI BHABHA CANCER HOSPITAL (HBCH), Sangrur - Punjab**

The hospital started late in the year 2015, and 2016 saw 4, 000 patients with 810 admissions for cancer treatment. The hospital being fully equipped with diagnostic imaging, performed 1, 855 CT scans, 1, 087 ultrasonographies, 475 conventional radiographies, 162 mammographies and 34 MR scans. There were a total of 41, 899 laboratory investigations that were carried out, of which, 1, 733 were of surgical pathology. Radiotherapy was offered to 695 and surgery to 542 patients. Regular technical training and degree courses were started for laboratories, operation theatres, anesthesia and radiology.

### **HOMI BHABHA CANCER HOSPITAL & RESEARCH CENTRE (HBCHRC), Visakhapatnam – Andhra Pradesh**

This cancer hospital (150 bed) and research centre at Aganampudi in Visakhapatnam was under construction and should be fully operational by 2018. From late 2015, it operated from temporary structures and offered many diagnostic services to the patients. Surgical procedures were performed in the Visakhapatnam Port Trust (VPT) hospital. With limited personnel and infrastructure, the

centre attended to more than 10, 000 patients and 166 surgeries were performed. Routine biochemistry (3,583), tumor marker (417) and molecular studies (200) were performed. The radiodiagnostic investigations of over 1, 000 included routine radiography, mammography and ultrasonography; image guided biopsies were also performed. Palliative care was offered to over 1, 500 patients. The commonest cancers detected were from the breast, the hematolymphoid system and of the head & neck region.

### **HOMI BHABHA CANCER HOSPITAL & RESEARCH CENTRE (HBCHRC), Mohali - Punjab**

The Phase I of the project was under way to start the cancer hospital and research centre by the end of year 2018. The Government of Punjab had sanctioned over Rs. 480 crore along with 50 acres of land for this project under DAE and TMC.

### **Mahamana Pandit Madan Mohan Malviya Cancer Centre (MPMMMCC), Varanasi – Uttar Pradesh**

At the behest of our Prime Minister, Shri Narendra Modi, a cancer hospital in Varanasi was planned. The plot of land was allocated in the campus of the renowned Banaras Hindu University in Varanasi, Uttar Pradesh.



# Tata Memorial Hospital



Affordable healthcare to all .... at their doorsteps

## Annual Events & Visiting Dignitaries

### Platinum Jubilee First Conference, 26<sup>th</sup> - 28<sup>th</sup> February 2016

The first conference to commensurate the 75th year jubilee of the hospital (1941 – 2016), “**A Conference of New Ideas in Cancer – Challenging Dogmas**” was held between 26th to 28th February, 2016 at the Tata Theatre, National Centre for Performing Arts in Mumbai.

**Dr. R. Chidambaram**, Principal Scientific Adviser to the Prime Minister was the chief guest for the opening ceremony on 26<sup>th</sup> February and inaugurated the conference in the august presence of **Mr. Ratan Tata**, head of Tata trusts and former chairman of Tata Sons.

The essence of the meet dissected the existing tenets in cancer management and debated on the ‘currently entrenched versus contrarian viewpoints’ in cancer research and treatment. The American Association of Cancer Research (**AACR**), the US National Cancer Institute (**NCI**) and the **Lancet Oncology**, the MD Anderson Cancer Center, Houston and the Princess Margaret Cancer Center, Toronto supported this conference that was attended by over 1,000 participants from across the world. Internationally renowned speakers broached on several issues related to cancer genomics; novel therapeutics and novel approaches; targeted therapies; precision medicine, tumor identity; architecture and microenvironment; novel technologies in cancer, cancer clinical trials and, large data sets and public health issues in cancer and its screening. There were two enthralling debates that deliberated the promises and benefits of targeted therapies and personalized

medicine in cancer. Dr. Amit Oza speaking for ‘targeted therapies’ illustrated early successes of such therapies in chronic leukemia, melanoma, etc. and Dr. Hope Rugo speaking for ‘precision medicine’, also espoused the potential advantages of tailoring the treatments according to patients’ molecular/genetic profile; both also spoke about the challenges of cost, toxicities, relative slow pace of drug approvals and the rather modest long-term gains for most solid cancers. Dr. Tito Fojo, presenting an alternative view to both topics, informed the audience that the American Cancer Society estimated 595,690 deaths in 2016; 43,000 odd more than what was seen in 2001, reflecting the effect of aging but also slow overall progress in cancer cures in these years. Dr. Fojo also showed that 91 drugs, the US NCI approved for cancer between 2002 to

2016, yielded an overall median gain of progression-free survival of only 2.6 months, with only 14 of these meeting the now increasingly recommended stricter measures, of meaningful benefit and at a relatively high cost and toxicities. Novel technologies in cancer theme was introduced by Dr. Michael Brada, who in his key note, raised the issue of embracing novel and exciting technologies in routine clinical practice on the basis of ‘me too’ mentality, seemingly misled political interventions and entrepreneurial drives but not always backed by data generated according to appropriate scientific rigor. Dr. Richard Sullivan showed that more than 80% of biomedical innovation was led by 8 countries in the highest income group with obvious economic disparities at a global level. Dr. Ian Tannock in his key note speech eloquently emphasized



*First Platinum Jubilee Conference on New Ideas in Cancer ‘Challenging Dogmas’ – at NCPA, Mumbai on 26<sup>th</sup> February, 2016. From left, Ms. Nishu Singh Goel, Dr. Rakesh Jalali, Dr. Praful Desai, Mr. Ratan Tata, Head of Tata Trusts and former Chairman of Tata Sons, Chief Guest Dr. R. Chidambaram, Principal Scientific Advisor to the Prime Minister, Mr. R.K. Krishna Kumar from Tata Trusts and Dr. R.A. Badwe, Director, TMC.*



Director TMC, Dr. RA Badwe with Dr Jan Vijg, Professor and Chairman, Dept of Genetics, Albert Einstein School of Medicine, New York who delivered the Platinum Jubilee oration in 2016.

the need for well-designed clinical trials in cancer to provide sound evidence to potentially change practice but pointed out with several examples, that randomized controlled clinical trials (RCT) are sometimes poorly designed, based on inadequate preclinical and clinical data, may use surrogate endpoints not necessarily reflecting patients' benefit, show a statistical significance with sub-optimal clinical relevance, underestimate toxicities, have biased

commercial interests and may be based on patients not commonly seen in clinical practice. Dr. David Collingridge and Dr. Tannock moderating the 'summing up' session concluded that future research should not be mere genomic fishing exercises but with a clear cut a priori hypothesis, keeping in mind complexities of intra-tumoral heterogeneity and not be burdened with unrealistic expectations on the scientific community and public at large.



Pandit Shivkumar Sharma, the famous Indian santoor player at the Platinum Jubilee function.

The existing dogma of screening mammography to reduce breast cancer mortality, not living up to the expectations with the attending issues of over-diagnosis of indolent and early cancers, but no reduction in advanced breast cancer was brought out by Dr. Michael Baum in his key note. Professor Baum cited the Cochrane report of 2009, where it had been estimated that for every breast cancer death avoided, 10 women are over-diagnosed, and are treated for 'breast cancer'.

Over 250 scientific abstracts on various aspects of cancer were submitted, of which, 41 were selected for oral presentations. All of them were published as supplements by the European Journal of Cancer.

The highlight of Platinum Jubilee conference was "**The Hospital Day Oration**" which was delivered by **Prof. Jan Vijg** (Professor, Department of Genetic, Albert Einstein College of Medicine in New York - USA and, Lola and Saul Kramer Chair in Molecular Genetics) on a tantalizing title "The cure that does not come: Stalling innovation in the 21<sup>st</sup> Century". He described the milestones in cancer treatment such as anesthesia, antisepsis, X-rays and chemotherapy, and, went on to list regulatory, governmental, administrative, R&D middle management, and cost of innovations as constraints in technology-driven medicine stalling innovations. He was the first to develop transgenic mouse models for the study of mutagenesis in vivo (1989) and used these models to study the possible relationship between damage to the genome and aging. His current research interests were focused on genome instability and the mechanisms through which this could cause human disease and aging. He authored books on Aging of the Genome, The Dual Role of DNA in Life and Death and the American Technological Challenge, Stagnation and Decline in the 21st Century.

Dr Rakesh Jalali, Organizing Secretary of the conference informed that the conference attracted tremendous enthusiasm around the globe with excellent feedback creating quite a buzz nationally and internationally. Several internationally acclaimed experts and attendees labeled it as a landmark conference with some of the messages leading even to potentially paradigm shifting approaches to various aspects on how we think about and treat cancer.

As part of Hospital Day function, an evening of Indian classical music Santoor recital by **Pandit Shiv Kumar Sharma** was organized along with a recital by Hindustani classical singer **Ms. Padmaja Phenani Joglekar**.

## 28<sup>th</sup> February, the 75<sup>th</sup> Year of Hospital Foundation Day

The annual Hospital foundation day was celebrated on 29<sup>th</sup> February, 2016. The musical evening was held at the Sri Shanmukhanada Fine Arts & Sangeetha Sabha hall in Mumbai. The invited 'Kalakar Orchestra' also included talented members of TMH staff. The thoroughly enjoyable musical evening was followed by dinner.

In this function, the services of the labour and other than labour staff who had completed 30 years of service were acknowledged and lauded. A "Best Workers Award" was also presented every year to staff from various categories. The deserving and meritorious employees selected as 'Best Workers' were facilitated by Dr. R. A. Badwe, Director, TMC; Dr. A. K. D'Cruz, Director, TMH; Dr. Kailash Sharma, Director, Academics; Dr. Sarita Khobrekhar, Medical Suptd.; Ms. Swapna Joshi, Nursing Suptd.; and other senior medical faculty members.



*Hindustani classical singer Ms. Padmaja Phenani Joglekar at the NCPA function in February 2016.*

*The ten (10) selected for the "Best Worker Award - 2016":*

Mr. Ravindra Keni	Preventive Oncology
Mrs. Pratima Advilkar	Nursing
Mr. Suresh Dhuri	Haematopathology
Mr. Shyam More	Pathology
Mrs. Bhanumati Jadhav	Radiation Oncology
Mr. Bhimsingh Parcha	RMC Ward
Mrs. Chetna Makwana	Female Ward
Mr. Kesharsingh Nensingh	RMC Department
Mr. Jagdish Solanki	Cobalt Department
Mr. Mangesh Pawar	Engineering Department



*Hospital Foundation Day celebration on 28<sup>th</sup> February, 2016. Felicitation of staff for rendering 30 years of service to Hospital. From left, Mr. AN Sathe, Senior Administrative Officer, TMH; Dr. RA Badwe, Director TMC; Ms. Rasheda Javed Ansari (felicitated); Dr. Kailash Sharma, Director Academic, TMC; Dr. AK D'cruz, Director TMH; Dr. S.D. Banavali, Head Medical Oncology and Dr. Sarita Khobrekhar, Medical Superintendent, TMH.*

## Concluding Platinum Jubilee Conference, 27<sup>th</sup> - 29<sup>th</sup> January 2017

The conclusion of the 75<sup>th</sup> year jubilee celebration was marked with a conference that had a unique purpose: To bring all stakeholders in healthcare on a common platform, discuss key issues that healthcare systems in India and worldwide are grappling with and arrive at implementable strategies to overcome some of these challenges. The theme for the conference was **“Healthcare: A Commodity or Basic Human Need?”** This broad theme was chosen to include within its ambit, the underlying issues of ‘Universal Health Coverage’ and ‘Health Equity’ and measures to promote these key determinants of population health.

The Conference was organized at the Homi Bhabha Auditorium of the Tata Institute of Fundamental Research (TIFR), Colaba - Mumbai from 27<sup>th</sup> to 29<sup>th</sup> January, 2017. There were 1307 registrations from delegates across the globe comprising doctors, healthcare administrators, policymakers, healthcare industry representatives (including pharmaceutical industry) and also students of medicine, pharmacy, business and healthcare management. The faculty members were a diverse and erudite set of individuals from all over the world, each of whom brought a unique capability to the meeting. There were 81 faculty members; 21 international and 60 national.

The conference was divided into 11 sessions with themes ranging

from national and institutional healthcare delivery models to financial aspects of healthcare delivery. Each session had 4-5 speakers followed by a panel discussion. Dr. Rajendra Badwe, Director, Tata Memorial Centre, delivered the Welcome Address and introduced the audience to ‘Mumbai Declaration’ – a charter of actionable ideas, distilled from the Conference deliberations, to be implemented by key stakeholders with the ultimate aim of promoting good quality universal healthcare in India. He also introduced the members of the Group that was tasked with drafting the Mumbai Declaration. The first Session was devoted to presentations of healthcare models from a selected set of countries (Brazil, Japan, Iran, Cuba, France, Thailand, Zambia) that were chosen for the diversity of their systems. The speakers presented not only the unique features of their respective healthcare delivery models but also the outcomes in terms of healthcare indices. This was followed by an engaging session on different models of healthcare institutions (such as private, public, hybrid, etc.) from India with indicators as to the sustainability of these models. The afternoon sessions on Day 1 deliberated on the themes of yardsticks for measuring the effectiveness of healthcare delivery and access to affordable care. In this context Dr. Nathan Cherny introduced the European Society of Medical Oncology (ESMO) Magnitude of Clinical Benefit Scale in cancer care and Mr. Yusuf Hamied elaborated on the experience of Cipla in improving worldwide access to HIV medications. The first day concluded with an enchanting performance by acclaimed Sitar player-Pandit Niladri Kumar and his troupe followed by dinner.

The second day touched upon some crucial subjects in healthcare such as healthcare costs, spending, financing, and economics of innovation. The TMC Platinum Jubilee Conference Oration was delivered by Nobel Laureate



*Dr. Sudeep Gupta, Deputy Director ACTREC, Dr. KS Sharma, Director Academics TMC, Dr. Sekhar Basu, Chairman, Department of Atomic Energy, Nobel Laureate Professor Amartya Sen, Director TMC, Dr. RA Badwe and Director ACTREC, Dr. SV Chiplunkar.*



*Pandit Niladri Kumar and his troupe at TIFR in January 2017.*

**Professor Amartya Sen** entitled ‘**Health for All: Why and How?**’ Some of the highlights of his Oration included tracing the historical imperative of universal healthcare, a call to increase national expenditure on public healthcare, setting systems in place to prevent exploitation of poor, improving sanitation and access to basic healthcare such as immunization and, maternal and child health, and request to increase the coverage of healthcare issues by media and citizens. The Oration was presided over by Dr. Sekhar Basu, Chairman, Department of Atomic Energy, and other dignitaries from Tata Memorial Centre.

The third day was centered around the pivotal contribution of non-government organizations in improving healthcare accessibility. This was followed by a session on the responsible reporting by the media and role of prominent public figures in promotion of good health in the community/country at large. Both sessions were attended by delegates from professional fields as well as representatives from the media in large numbers.



*Noble Laureate Professor Amartya Sen with Dr. RA Badwe, Director TMC and Dr. SV Chiplinkar, Director ACTREC.*

Between the two sessions on Day 3, the Chief Guest’s Address was delivered by **Shri JP Nadda**, Union Minister of Health and Family Welfare. Shri Nadda nicely outlined the vision of Indian Government with respect to health and the programs and policies being implemented to further this agenda. He graciously agreed to consider all the action points that would be outlined in

the Mumbai Declaration. The event was also graced by the State Minister of Health, **Dr. Deepak Sawant**. The dignitaries addressed the audience and shared their vision towards an effective and strong healthcare system in the country.

Day 3 also witnessed the unveiling of the Mumbai Declaration – a charter of recommendations for the Indian Healthcare system drafted by the designated members and was read out by Dr. Rajendra Badwe in presence of all the delegates, faculty and media representatives. The presence of Professor Amartya Sen added to the atmosphere and he remarked that Mumbai Declaration was the beginning of a long journey rather than the end.

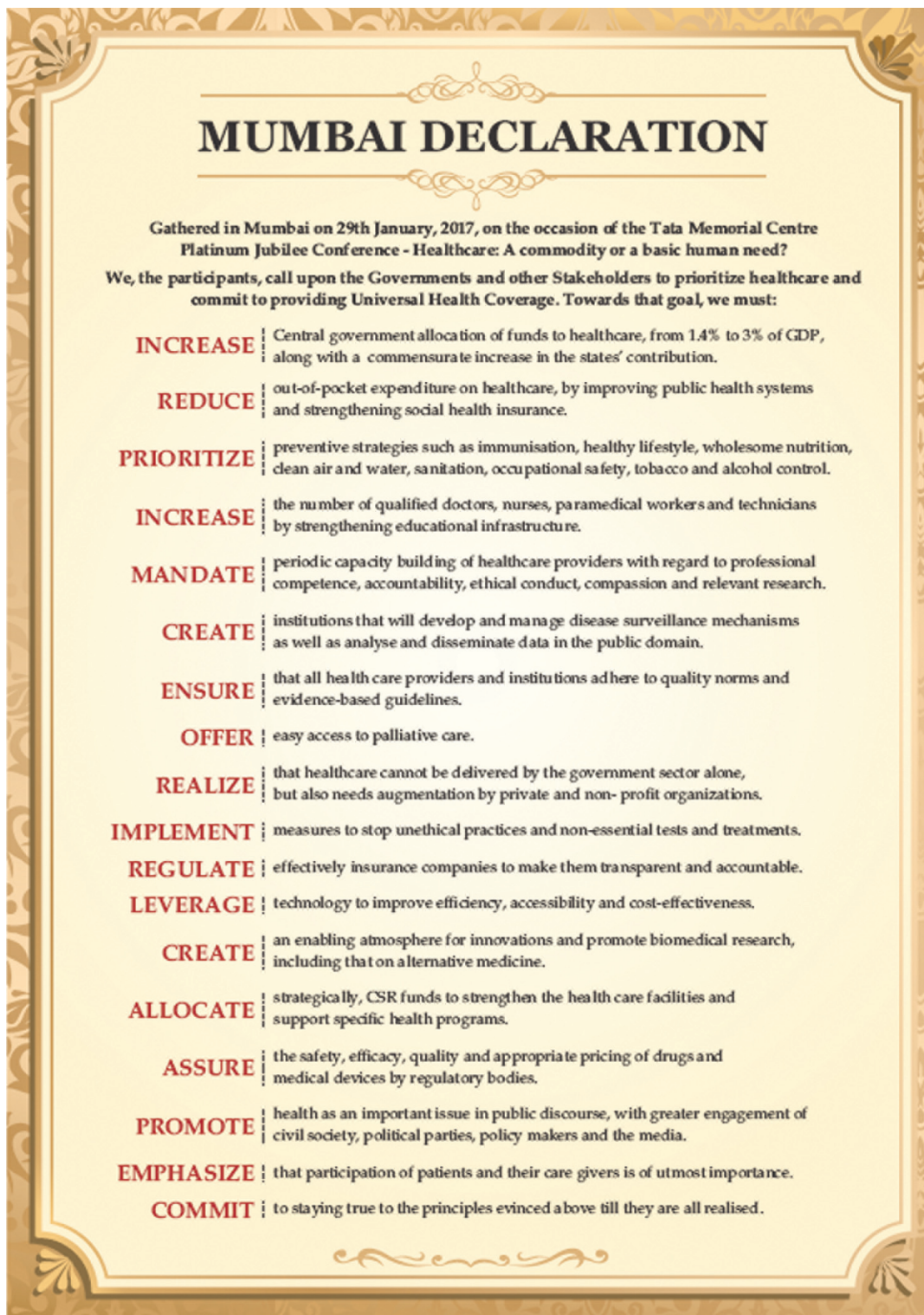
Dr. Sudeep Gupta, Deputy Director, ACTREC, Tata Memorial Centre delivered the valedictory address. The Conference received substantial press coverage both in print and electronic media. The event was a landmark initiative to identify the impediments to Universal Health Coverage and derive practical solutions to resolve them. The attendance of key opinion leaders in high numbers and call-to-action of ‘Mumbai Declaration’ stand testimony to the success of this event.



*Dr. Sudeep Gupta, Deputy Director-ACTREC, Dr. KS Sharma, Director Academics-TMC, Shri Deepak Sawant, Minister of Health & Family Welfare for the State of Maharashtra, Shri Jagat Prasad Nadda, Minister of Health & Family Welfare, Government of India, Dr. RA Badwe, Director-TMC, Dr. CS Pramesh and Dr. Pankaj Chaturvedi for the “Mumbai Declaration” charter during the conference in January 2017.*

## The “Mumbai Declaration” 29<sup>th</sup> January 2017

The members who formulated and drafted the ‘Mumbai Declaration’ were Dr. RA. Badwe, Dr. Richard Sullivan, Dr. Sanjay Pai, Dr. Mary Denise Leonard, Dr. Prakash Vaidya, Dr. Sarang Deo, Dr. Vish Vaidya, Dr. Sudeep Gupta, Dr. CS Pramesh, Dr. Pankaj Chaturvedi, Dr. Rakesh Jalali, Dr. Vikram Gota, Dr. Vinit Samant, Dr. Sandeep Sawakare, Mr. Pradeep Bhargava, Mr. Jayant Banthia and Ms. Nishu Singh Goel.



## Prime Minister Shri Narendra Modi, unveils book to commemorate 75 years of Tata Memorial Centre in presence of Shri Ratan N. Tata and Dr. Sekhar Basu

On 25<sup>th</sup> May, 2017, the Honorable Prime Minister Shri Narendra Modi, unveiled Tata Memorial Centre's (TMC) Platinum Jubilee book, *Indelible Footprints on the Sands of Time*, to commemorate the institution's 75<sup>th</sup> Anniversary, in the presence of Mr. Ratan Tata, Chairman, Tata Trusts, and Dr. Sekhar Basu, Secretary, Department of Atomic Energy (DAE), Government of India. The unveiling of the book took place at the Prime Minister's residence and was broadcast live via satellite to a 300 strong audience of excited staff, students, patients and TMC alumni at Tata Memorial Hospital, in Mumbai, who had assembled at the Rustom Choksi Auditorium in Tata Hospital, to witness this landmark event.

The Platinum Jubilee book splendidly highlights TMC's role as the torchbearer of affordable and specialized treatment, emerging as an enterprise that changed the face of healthcare in India. It highlights the hospital's remarkable journey from its humble beginnings of a 80 bedded establishment into becoming an iconic institution and attaining worldwide recognition. The journey of the hospital remains an inspirational lesson in effective institution building facilitated by research and education, augmented by the consistent efforts and determination of a varying brigade of individuals who emerged at different time intervals to contribute towards the lives of people combatting the deadly disease. The book elegantly captures TMC's growth trajectory and marks its steadfast commitment to setting quality standards of treatment, research and education in cancer care in India.

Commencing the event at the hospital, Dr Astrid Lobo vividly described the nuances of the book and Dr. Anil D'cruz paid tribute to all those who have been associated with the making of the



*The book release: At the residence of Honorable Prime Minister of India, Shri Narendra Modi with Ms. Nishu Singh Goel, Curator of the book, Shri Ratan Tata, Chairman Tata Trusts, and Dr. Sekhar Basu, Chairman Department of Atomic Energy, Government of India.*

institution. The spectacular event also featured a preview of the book in a captivating fifteen-minute audio-visual. Thereafter the video link was established with the Prime Minister's residence, 7 Lok Kalyan Marg and the event was up for live transmission by Doordarshan to the entire nation.

Dr. Rajendra Badwe, Director TMC introduced the ceremony and began its proceedings by welcoming the Honorable Prime Minister Shri Narendra Modi, Mr. Ratan Tata, Dr. Sekhar Basu and Ms. Nishu Singh Goel the curator of the book, who were present at the PM's residence.

Release of the book on the history of Tata Memorial Hospital on the occasion of its Platinum Jubilee by Hon'ble Prime Minister of India Shri. Narendra Modiji 'Indelible footprints on the sands of time' on 25<sup>th</sup> May, 2017, through video conferencing link between Prime Minister's Office, New Delhi and Tata Memorial Centre, Parel, Mumbai. The dignitaries included Ms. Nishu Singh Goel, Curator of book, Mr. Ratan Tata, Head of Tata Trust and

former Chairman of Tata Sons, Dr. Sekhar Basu, Chairman Atomic Energy Commission, and Dr. RA Badwe, Director TMC.

Speaking on the occasion, Mr. Ratan Tata described the hospital as the first special purpose hospital in the country which has progressed through the decades in terms of featuring on the international map for cancer research. He also expressed gratitude to the Department of Atomic Energy for consistently supporting the hospital by channeling funds for maintaining it as a state of art facility. Reflecting on the overwhelming menace of cancer as a disease that affects and devastates both rich and poor, he thanked the Prime Minister for his vision and support, which has made the scourge of cancer addressable in India.

The Honorable Prime Minister Shri Narendra Modi releasing the book, heartily congratulated TMC for achieving the platinum jubilee milestone. In his address to the enthralled audience consisting of TMC staff and students he remarked that



Dr. RA Badwe, Director TMC addressing the audience on the release of the book, 'Indelible footprints on the sands of time' by the Hon'ble Prime Minister of India Shri. Narendra Modi on 25<sup>th</sup> May, 2017. The dignitaries included Ms. Nishu Singh Goel, Curator of the book, Mr. Ratan Tata, Head of Tata Trusts, Dr. Sekhar Basu, Chairman Atomic Energy Commission.

very few institutions like TMC exist in India that have continuously, over many decades, been engaged in the service to the nation. He commended the ways in which the institute has worked for the treatment of millions of poor and called it as an inspiration for other hospitals in the country. Further, he described TMC as an exemplar of a successful public-private-partnership model.

The momentous happening was marked with both the dignitaries signing the Platinum Jubilee Milestone Book with personal messages. The

**Honorable Prime Minister Shri Narendra Modi's** in his message stated- 'TMC is a beacon of cancer care in India, an ideal to replicate not only across India but also in the emerging world'. While Mr. Ratan Tata's message read, 'TMC is an inspirational chapter in medical history of the country that needs to be memorized and repeated often'

The whole hospital was abuzz with excitement as the event was screened at different locations across the hospital. A giant LED screen was constructed at the Homi Bhabha Atrium for public viewing. The IT department

had also enabled the transmission through all the display units and TV screens at the hospital. Thousands of patients, caregivers and staff workers viewed the proceedings with great interest. In addition, the event was beamed live to ACTREC, HBB mini auditorium and Golden jubilee lecture hall, where large numbers had gathered to witness the event.

The Platinum Jubilee book "Indelible Footprints on the Sands of Time", is an in house publication and is available online through the TMC website.

### Visiting Dignitaries and Guests

- Dr. Deepak Sawant, Minister of Public Health & Family Welfare, **Govt. Of Maharashtra** on the occasion of World Cancer Day; 4<sup>th</sup> February, 2016
- Mr. Christian Ernst Boehringer, Chairman of the Shareholders committee-**Boehringer Ingelheim** on 10<sup>th</sup> March, 2016
- Sr. Executive of **Glaxo SmithKline Pharmaceuticals Ltd.** on 13<sup>th</sup> April, 2016
- Medical Officers from **Armed Forces Medical College, Pune** on 22<sup>nd</sup> April, 2016
- Mr. Guido Sander of the Global Diagnostic Leadership Team from **Roche Diagnostic India Pvt. Ltd** on 26<sup>th</sup> April, 2016
- Brig. Mohd. Abdul Hamid, Defence Advisor, **Bangladesh, High Commission, New Delhi** on 15<sup>th</sup> June, 2016
- Hon. Mr. Vinod Tawade (Education Minister) and Hon. Mr. Deepak Sawant (Health Minister) – **Govt. of Maharashtra** for the state level Grant Ceremony Programme Narotam Sekhsaria foundation, Salam Foundation on 21<sup>st</sup> September, 2016
- Medical Officers from **Armed Forces Medical College, Pune** on 21<sup>st</sup> September, 2016
- A team from **WHO Regional Office of South-East Asia & Ministry of Health** on 23<sup>rd</sup> November, 2016.



Shri. Jitendra Singh, Minister of State, Prime Minister's Office honouring Dr. Kailash Sharma, Director Academics, TMC with the award under category Excellency in Academics, initiated by India News Health Award 2016.



## Performance Statistics

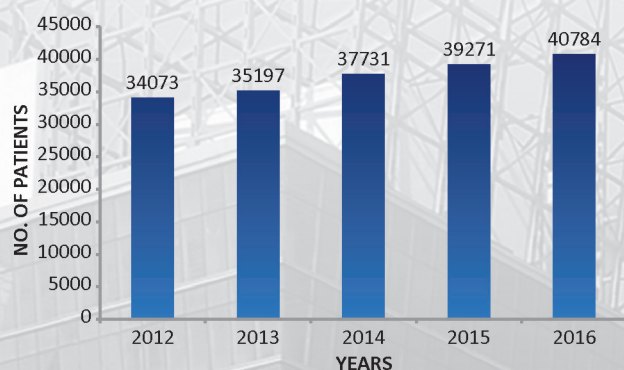
	2015	2016
Patient Chart Files - General	25195	27279
Patient Chart Files - Private	14076	13505
<b>Patient Chart Files - Total (A)</b>	<b>39271</b>	<b>40784</b>
<b>Referrals for Investigations / Second Opinion (B)</b>	<b>22439</b>	<b>23474</b>
<b>Preventive Oncology (C)</b>	<b>5488</b>	<b>5660</b>
<b>Total Registrations (A + B + C)</b>	<b>67198</b>	<b>69918</b>
<b>INPATIENT SERVICES</b>		
<b>Admissions</b>		
No. of Admissions	27068	28012
Average Length of stay (Days)	6.2	5.80
Bed Occupancy %	95.76	91.00
<b>SURGICAL ONCOLOGY</b>		
Major OT Procedures	8367	8465
Minor OT Procedures	35101	36474
<b>MEDICAL ONCOLOGY</b>		
<b>Day Care</b>		
Day Care - General	90438	109341
Day Care - Private	29558	30882
Bone Marrow Transplants at ACTREC	80	67
<b>DIGESTIVE DISEASES AND CLINICAL NUTRITION</b>		
<b>Endoscopies</b>	<b>6311</b>	<b>6888</b>
Nutrition Clinic	11677	10257
<b>ANESTHESIOLOGY, CRITICAL CARE &amp; PAIN</b>		
No. of ICU Admissions	3058	2225
Patients in Recovery Ward	9159	12624
Pain Clinic	4748	5246
<b>RADIATION ONCOLOGY</b>		
External Beam Therapy	6235	6528
Brachytherapy	3590	3816
Treatment Planning / Beam Modification	15281	16467
Special Radiotherapy Techniques (IGRT, IMRT, SRS, SRT, TSET etc.)	2609	1891

	2015	2016
<b>IMAGING SERVICES</b>		
<b>Radiology</b>		
Conventional Radiography	65590	70908
Ultrasonography / Colour Doppler	40466	40584
Mammography	12713	14654
C.T. Scan	28880	32664
M.R.I Scan	6367	8337
Interventional Radiology	3065	3114
<b>NUCLEAR MEDICINE</b>		
PET-CT	13943	15213
SPECT-CT	4592	5135
C.T. Scan	50	0
<b>GENERAL MEDICINE</b>		
ECG	32429	34491
Echo Cardiography	10816	11108
Pulmonary Function Tests	3792	4140
<b>LABORATORY DIAGNOSTICS</b>		
Pathology	161062	168724
Haemato Pathology	453170	556234
Biochemistry	2337437	3195789
Cytopathology	24328	25207
Molecular Pathology	2338	3910
Microbiology	179416	190802
<b>TRANSFUSION MEDICINE</b>		
Blood and Platelet Units Collected	24027	22251
Other Services	191829	183109
<b>Cytogenetics</b>	10888	11775
<b>OTHER CLINICAL SERVICES</b>		
Stoma Care	6049	6469
Occupational Therapy	11963	11266
Physiotherapy	11446	14341
Speech Therapy	5879	8403
Psychiatry and Clinical Psychology	3579	3396
<b>DENTAL SERVICES</b>		
Prosthetic Services	1279	1269
Other Services	10133	11661
<b>TISSUE BANK</b>		
Allografts Produced	7666	9366

	2015	2016
<b>PALLIATIVE MEDICINE</b>		
No. of Patients	10756	11328
Home Care Visits	2384	2411
<b>MEDICAL SOCIAL WORK</b>		
Guidance	25254	27212
Counselling	20367	29031
<b>EDUCATION</b>		
Residents & Others	263	180
Fellows	11	27
Medical Observers	463	476
Nursing Trainees	19	115
Paramedical Students	34	37
<b>RESEARCH PROFILE</b>		
Extramural Projects	05	09
Pharma sponsored	09	10
Intramural + Extramural Projects	10	10
Institutional Intramural	39	43
No fundings	103	88
P.G. Thesis (Dissertation)	87	89
<b>PUBLICATIONS</b>		
International	280	303
National	147	159
Book Chapters	41	13 (+2 Books)
<b>Conferences / Workshops / Seminars</b>	105	125

# Trends

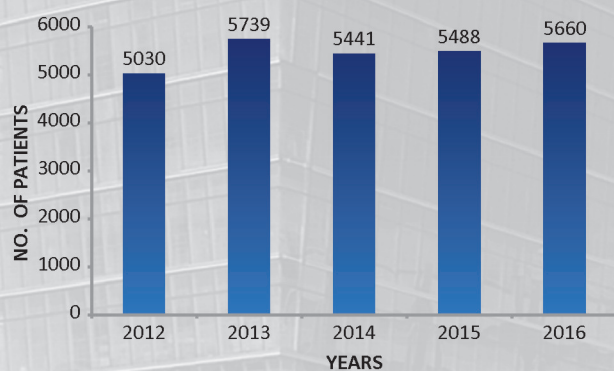
## CASE FILE REGISTRATIONS



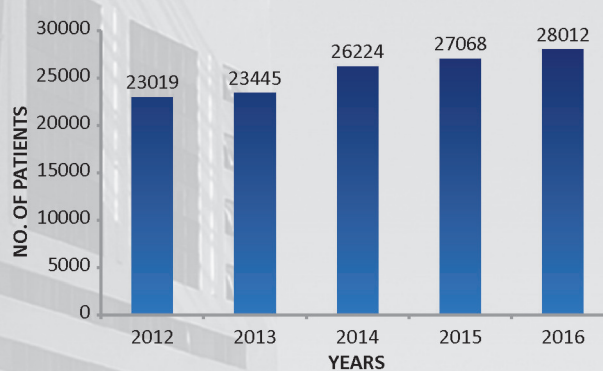
## REFERRAL FOR INVESTIGATIONS



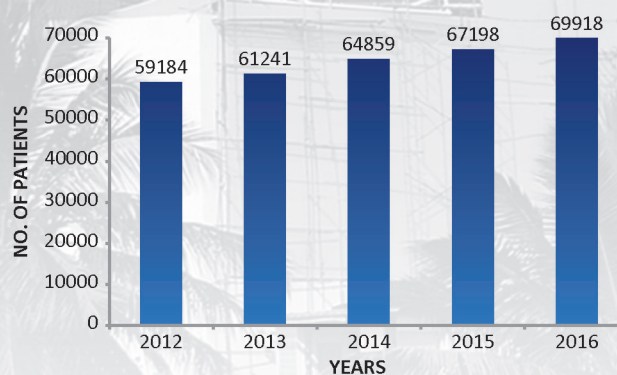
## PREVENTIVE ONCOLOGY



## NO OF ADMISSION



## TOTAL REGISTRATION



## Resource Augmentation



*Inauguration of the new Varian Medical Systems "Deformable Image Registration System" (DIRS).  
Dr. Sekhar Basu, Chairman Atomic Energy Commission with Dr. RA Badwe, Director TMC,  
Dr. AK D'cruz, Director TMH, Dr. SK Shrivastava, Head of Radiation Oncology and Dr. DD Deshpande,  
Head of Physics department.*



*Inauguration of the new Digital Subtraction Angiography system by Director TMH, Dr. AK D'cruz with  
Director TMC, Dr. RA Badwe, Dr. MH Thakur, Head of Radiodiagnosis and Director of Academics,  
Dr. KS Sharma.*



*Dr. Sekhar Basu, Chairman Atomic Energy Commission inaugurating the Advanced Radiotherapy facility at TMH in presence of Director, TMC Dr. RA Badwe, and Dr. S.K. Shrivastava, Head of Radiation Oncology.*



*Donation of Mobile Blood Clinic Van under CSR by Patel Integrated Logistics Ltd., a project of the Rotary Club of Mumbai, Bandra. Mr. Sudhir Widge, Mr. Rattan Mukhi, Dr. Sunil Rajyadhyaksha, Rtn. Syed Hussain, Director TMC, Dr. RA Badwe and Mr. Rajendra Agarwal.*



# Patient Support Services



Affordable healthcare to all ..... at their doorsteps

## Volunteer Patient Services

TMH had more than 34 Non-Government Organizations (NGOs) and about 150 volunteers who helped patients and their relatives during and after their treatment in financial, counselling and holistic matters. Many of them had provided food and clothing, toys etc. for the patients. Their activities were silent and mostly unheard of, except to the beneficiaries.

Words are not enough to express our gratitude to the known and the unknown who have helped the patients and the institution; it cannot be reciprocated in any manner and, we are thankful to all who have helped alleviate the misery of our cancer patients in any form. Though not wanting to enumerate them, we felt that the world must know that there is no

dearth of the saviours of humanity. Listed below are few benevolent and altruistic ones, of whom we know, as they often required assistance and guidance from the hospital management. The many missed out, are those who operated individually and on the quiet, whose identity remains unknown even to the management.

### List of Volunteers / Volunteer Organizations & their Activities

Aditya Kalyan (Mr)	Arranges magic shows and OPD activities
Ameeta Bhatia (Ms)	Counsels, emergency support, birthday celebrations on personal basis Annual event "Hope"
Asha Mehta (Ms)	B.P. checking and medicine compliance
BrajGauri Trust	Providing free Cloak Room facility for cancer patients at backside of GJ building from Monday to Friday Morning 8 AM to 5 PM Celebrating Rose day & select a patient for the 'Winner-in-life' awards in the month of September
CanKids	Emergency medical assistance Adoption of children for non-formal education at the "Chattal" clinics held in OPD & formal education at "CanShalla" (Special School for Cancer Children)
CPAA	Providing nutrition supplement for paediatric
Cuddles Foundation	Providing nutrition supplement for paediatric & full time dieticians support Providing Infection Control Products
Government of Assam	Giving voluntary service to cancer patients Providing shelter home
Gunwanti J. Kapoor Trust	Financial help to breast cancer patients through JASCAP Chemo education given to all OPD patients Providing guidance to all patients Providing adult dietician Providing research fellowship for molecular lab Providing LCEF powder to Head & Neck cancer patients Providing ration facility Provided accommodation reimbursement through ICS. Coordinating for the support group meeting Arranging platelets drive for paediatric and adult patients
Gurnani Sati Charitable Trust	Free tea & biscuits (Everyday morning breakfast)

ImPaCCT Foundation	Giving holistic support to paediatric patients
	Providing midday meal to paediatric patients
	Counselling to the patients
	For any paediatric patient with no proper documents, free treatment is given by the foundation
	Bereavement support – if any paediatric patient expires during the treatment, all services like ambulance, funeral arrangement etc. are provided
	Educational support to paediatric patients
Indian Cancer Society	Guiding for ration and other financial help
JACAF	Providing shelter home
	Awareness and detection camps
	Counselling
	Arrangement of blood and platelets for cancer patients
	Financial support to pediatric patients
JASCAP	JASCAP has published over 500 Booklets and fact sheets in English and other various languages; CD's and DVD's are available for cancer patients at a nominal cost
	Financial assistance to a poor patients through the Social Service department of TMH
	Emotional support and counselling on all fronts to cancer patients is provided by their Cancer Information Centre.
Konark Cancer Foundation	Providing guidance to all patients
Little More	Arranging entertainment program for patients & Birthday Celebration
	Educational support to paediatric patients
	Giving ration to needy patients
	Counselling
	Helping in organizing Diwali Celebration & Christmas Programme
Love & Care	Providing ration & distributes gifts
MADAT Trust	Helping needy patients & free wig
	Counselling patients
	Providing OLA Cab services for patients at 20 % Discount
Make A Wish Foundation	Fulfilling special wish of the paediatric patients
Mumbai Port Trust	Building & land in Sewri for rehabilitation of pediatric cancer patients
Narendra Nadkarni (Mr)	Medicine compliance and B.P. monitoring
Niyati S. James (Ms)	Counselling and arranges cash for emergencies
Payal Sangrajka (Ms)	Arranges emergency funds and distributes gifts
Pooja Bangia (Ms)	Arranges Art activities in wards
Sadbhavana Trust	Giving guidelines to patients for financial assistance
	Guidance for accommodation for cancer patients
	Giving voluntary service to cancer patients
Sanjivani Life Beyond Cancer	Counselling
	Financial Support
	Arranging Cancer Detection Camps, Documentary Films & Conference for the cancer survivors to share their experience with other patients
Save, Nandini & Nitin	School programs

Shraddha Foundation	Providing accommodation for cancer patients
	Financial help for needy patients
	Counselling patients
	Arranging entertainment programme twice a year
	Arranging awareness and detection camp all over Maharashtra, Gujarat and Orissa
Shilpi Mehta (Ms)	Arranges emergency funds
Society for Service for Voluntary Agencies (SOSVA)	Providing guidance to all patients
SSAUT	Giving voluntary service to cancer patients
St. Jude Trust	Counselling at Main Building Pediatric Outpatients department
	Guidance for ration and other financial help.
	Free accommodation for needy patients
Stock Holding India Ltd.	Free bus shuttle service between TMH and Dadar TT station
TajSats (Taj Hotels, Tata Group)	Free lunch daily to about 275 registered patients
Tarun Mitra Mandal	Providing guidance to all patients
	Financial help
	Fruit distribution in wards
Thjyagrajan P (Mr)	Fund support, small software application development & counselling
UGAM	Self Empowerment of the young survivors
	Helping children during cancer treatment
	Social awareness and re-bonding with society; national and international.
Vasanta Memorial Trust	Providing financial help to Breast & Leukemia cancer patients
	Arranging various programme for paediatric patients
	Financial support to paediatric patients
	Celebrating cancer survivor day
Vcare	Distribution of gifts to children at the time of discharge
	Gifts at Cancer Survivors Day
	Issuing products of Infection Control Kit from the V Care office
	Counselling patients in wards as well as OPD's
	Cancer Information Books
	Help supervise the toy room in pediatric ward
VCan Trust	Providing guidance to all patients
Women's Cancer Initiative	Provides financial support for curative treatments of breast cancer patients

**The management of the hospital acknowledges the humanitarian services offered by volunteers and organizations towards the welfare of our patients and their families.**

# Service



Affordable healthcare to all .... at their doorsteps

Convener: **Dr. Navin Khattry**  
(Medical Oncology)  
Secretary: **Dr. Sumeet Gujral**  
(Pathology)

## Adult Hemato-Lymphoid - DMG

### Cancer Cytogenetics

Dr. Pratibha Amre Kadam  
Dr. Dhanalakshmi Shetty  
Ms. Hemani Jain

### Clinical Pharmacology

Dr. Vikram Gota

### Hematopathology

Dr. Papagudi Subramanian  
Dr. Prashant Tembhare  
Dr. Nikhil Patkar

### Medical Oncology

Dr. Hari Menon  
Dr. Manju Sengar  
Dr. Bhausaheb Bagal

Dr. Hasmukh Jain

Dr. Deepa Philip  
Dr. Anant Gokaran  
Dr. Sachin Punatar

### Nuclear Medicine & Molecular Imaging

Dr. Venkatesh Rangarajan  
Dr. Archi Agarwal

### Pathology

Dr. Tanuja Shet  
Dr. Sridhar Epari

### Psychiatry

Dr. Jayita Deodhar

### Radiation Oncology

Dr. Siddhartha Laskar  
Dr. Nehal Khanna  
Dr. Jayant Sastri Goda

### Radiodiagnosis

Dr. Suyash Kulkarni  
Dr. Nitin Shetty  
Dr. Ashwin Polnaya  
Dr. Nilesh Sable

### Scientists (ACTREC)

Dr. Shubhada Chiplunkar  
Dr. Narendra Joshi  
Dr. Rukmini Govekar  
Dr. Syed Hasan

The Adult Hematolymphoid Disease Management Group (AHL-DMG) catered to the management of a variety of hematological malignancies in a comprehensive manner and, was the largest such group in the country.

It was involved in structured management of hematological malignancies that was evidence and protocol based, with emphasis to personalized therapy based on the cytogenetic and molecular profiling of the hematolymphoid malignancy.

Besides institution of quick management, the DMG also looked

towards the logistic, economic and sociopsychological issues that may be faced by the patients. Patients, in whom intensive therapy was perceived to make a difference in their outcomes, were identified and helped through our medical social workers, for financial and logistic support including their stay in Mumbai.

A financial support group meeting of doctors, social workers and volunteers was held weekly; their financial support feasibility was discussed on a case to case basis.

To consolidate efforts that the hospital had made towards catering to lymphoma / leukemia patients and their families, the DMG established a Lymphoma Leukemia Foundation wherein, donors had a platform for financial contribution. The corpus generated was used mainly for the initial treatment of the patient and at times, sustaining therapy until such time that other aid started to flow in. Approximately, INR 2, 08, 36, 000 / - was utilized for one hundred and fifty five (155) patients in 2016.

## Volume Indicator

Total registrations in AHL-DMG in the year 2016

	General	Private	Total
New Case	2583	1159 + 715 (Second Opinion)	4457
OPD Follow ups	33309	20460	53769

Number of patients treated at TMH according to diagnoses						
Diagnosis	Numbers	Treated at TMH	Treated at Local Place	Upfront Palliation	Expired before starting	Lost to Follow Up treatment
ALL	385	278	27	39	09	32
AML	425	171	64	77	25	88
APML	48	42	0	0	03	03
Acute Leukemia	31	05	02	19	01	04
CML	403	374	03	05	01	20
CMPD	23	15	02	03	0	03
HL	236	155	46	07	02	26
MDS	37	15	06	06	09	01
NHL	1050	685	171	33	17	144
Other Hematological Malignancy	37	24	05	02	0	06
Multiple Myeloma	287	173	82	05	01	26
<b>Total</b>	<b>2962</b>	<b>1937</b>	<b>408</b>	<b>196</b>	<b>68</b>	<b>353</b>

#### Number of patients registered but not treated at TMH

Second Opinion	715
Patients Referred to Other DMG	114
No Malignancy	97
Referred Back to Local Place	82
Palliation Before Diagnose	67
Expired Before Investigation	06
Expired on Investigation	20
LFU Before Diagnose	394
<b>Total</b>	<b>1495</b>

The AHL DMG also conducted the bone marrow transplant unit (BMT) and leukemia / lymphoma services at ACTREC.

#### New registrations and follow-ups of patient at ACTREC

ACTREC Registration 2016	
New Case	138
BMT Referrals	158
OPD Follow ups	7559
BMT OPD Follow up	4766
Autologous Transplant	34
Allogenic Transplants	34

The outpatient service runs four OPDs, two (02) each at TMH (Gen & Pvt.) and at ACTREC (BMT & Chemotherapy). The OPDs for Leukemia, Lymphomas and Myeloma were run separately. Considering the steadily increased numbers in the outpatients, the OPD timings had been sorted into two slots.

All the new and on treatment patients were seen between 9.30 am to 5.30 pm.; follow up patient between 2.30 pm to 5.30 pm. The new CML patients were followed up at TMH and once they achieved a stable response, subsequent follow up were done at ACTREC. Besides the routine BMT OPD at ACTREC a separate BMT OPD at TMH was operational on Thursdays to counsel potential patient for transplant.

## Research

Total Numbers of Clinical Trials	
Investigator Initiated	Sponsored Trials
18	08

#### Abbreviations

ALL	Acute Lymphocytic Leukemia
AML	Acute Myelogenous Leukemia
APML	Acute Promyelocytic Leukemia
BMT	Bvone Marrow Transplant
CML	Chronic Myelogenous Leukemia
CMPD	Chronic Myeloproliferative Disorders
HL	Hodgkins Lymphoma
LFU	Lost to Follow Up
MDS	Myelodysplastic Syndromes
NHL	Non Hodgkins Lymphoma
OPD	Out Patients Department

Convener: **Dr. Bharat Rekhi**  
(Pathology)  
Secretary: **Dr. Ashish Gulia**  
(Surgical Oncology)

## Bone & Soft Tissue - DMG

### Medical Oncology

Dr. Girish Chinnaswamy  
Dr. Jaya Ghosh  
Dr. Jyoti Bajpai  
Dr. Tushar Vora

### Nuclear Medicine & Molecular Imaging

Dr. Nilendu Purandare  
Dr. Venkatesh Rangarajan

### Palliative Medicine

Dr. Arunangshu Ghoshal

### Pathology

Dr. Mukta Ramadwar

### Physiotherapy

Dr. Anuradha Daptardar

### Radiation Oncology

Dr. Nehal Khanna  
Dr. Siddhartha Laskar

### Radiodiagnosis

Dr. Amit Janu  
Dr. Amrita Guha  
Dr. Ashwin Polnaya  
Dr. Kunal Gala  
Dr. Shashikant Juvekar  
Dr. Subhash Desai

### Surgical Oncology

Dr. Ajay Puri  
Dr. Prakash Nayak

The Bone and Soft tissue (BST) DMG group provided comprehensive patient care in an effective and an efficient manner by a holistic approach, using annually updated evidence-based guidelines for management of various bone and soft tissue tumors, including sarcomas. The OPD schedule was structured in a manner that ensured that initial evaluation was done on the day the patient attended the BST OPD; this avoided delay in the work-up and initiation of their treatment.

The BST-DMG met every Tuesday to decide upon an integrated management plan for all patients. It was attended by radiologists, pathologists,

surgeons, medical oncologists, radiation oncologists and occupational therapist, along with members from Nuclear Medicine, bio imaging and palliative care medicine.

A clinico-pathological joint meeting was conducted every Thursday to discuss diagnostically challenging cases; another Thursday meet discussed issues related to patient rehabilitation that formed a significant component in the holistic management of patient treated for musculoskeletal malignancies.

A monthly DMG meet was held on the first Friday of every month to discuss

new projects, student thesis and DMG related issues, for effective integrated functioning.

The Medical Oncologists were engaged in evolving newer strategies to optimize chemotherapy for high-grade osteosarcomas and, to form a Sarcoma consortium across the country. The Radiation Oncologists focused in improving local control for inoperable tumors using dose escalation strategies and, image guided and conformal techniques for reduction of acute and late radiation effects. Optimal use of brachytherapy was a major thrust area for radiation oncology.

## Volume Indicators

Total Registrations = **2601**; General = **1618**, Private = **534**, Referral = **449**

Radio Diagnosis	Pathology	Surgery Oncology	Radiation Oncology	Medical (Adult)	Occ (Th) Phy (Th)
Conventional Radiographs=10742 MRI = 1518 USG = 1287 CT Scan = 1071 IR = 173 CT-guided Biopsies = 243	Total = 4967 Biopsies=1304 Specimen = 696 Slides, Paraffin blocks = 1124 Cytopathology = 1843	Total = 1631 Major surgeries = 603 Minor procedures = 1028	Total = 411 RT Intent (Ext+Br): Rad = 338 Pall = 73 Ext Radiation Therapy = 397 Brachytherapy = 14 Conventional = 332 / 397(83%) 3D-CRT / IMRT = 73 / 397(18%)	Adult: Total Injections and Infusions = 10047 Adult (Planned) = 266 Adult Treated = 235	Occ (Th) Total = 2205 IPD(New) = 346 IPD(FU) = 720 OPD(New) = 216 OPD(FU) = 923 Phy (Th) Total = 1135 OPD = 699 IPD = 435

**IR:** Interventional Radiology included sclerotherapy, angioembolization, radiofrequency ablation and osteoplasty;

**Rad:** Radical. **Pall:** Palliative; **Occ (Th):** Occupational Therapy. **Phy (Th):** Physiotherapy

Palliative Medicine = 252.

## Outcome Indicators

Surgical Oncology	Radiation Oncology	Medical Oncology
Mortality (30 days) = 01 Morbidity: Vascular injury = 06 Neural Complications = 07 Infection requiring wound wash (Bone) = 23 Flap related complications (flap failure, flap necrosis) = 15 Wound dehiscence requiring debridement = 10	Mortality (30 days) = Nil Morbidity: Acute toxicity: Grade I = 13% Grade II = 4% Grade III = 9%	Total Mortality (30 days) = 02 Grade 3 / 4 Toxicity: Osteosarcoma = 36 / 89. 40% Ewing Sarcoma = 23 / 56 cases. 41% Soft Tissue sarcoma = 19 / 62 cases 31%

## Research

Total No. of Clinical Trials		Completed Trials		Ongoing Trials		Overall Patients Accrued	
Investigator Initiated	Sponsored trials	Investigator Initiated	Sponsored trials	Investigator Initiated	Sponsored trials	Investigator Initiated	Sponsored trials
12	03	06	Nil	06	01	1272	129

Br = Brachytherapy

IMRT = Intensity Modulation Radiotherapy

IPD = In Patients Department

RT = Radiation Therapy

Convener: **Dr. Tanuja Shet**  
(Pathology)  
Secretary: **Dr. Ashwini Budrukhar**  
(Radiation Oncology)

## Breast Oncology - DMG

### Medical Oncology

Dr. Sudeep Gupta  
Dr. Jaya Ghosh  
Dr. Jyoti Bajpai  
Dr. Seema Gulia

### Nuclear Medicine & Molecular Imaging

Dr. Venkatesh Rangarajan  
Dr. Sneha Shah

### Pathology

Dr. Sangeeta Desai  
Dr. Asawari Patil

### Physiotherapy

Dr. Anuradha Daptardar

### Radiation Oncology

Dr. Rajiv Sarin  
Dr. Rakesh Jalali  
Dr. Tabbasum Wadasadawala  
Dr. Santam Chakraborty

### Radiodiagnosis

Dr. Meenakshi Thakur  
Dr. Subhash Ramani (till June 2016)  
Dr. Seema Khembavi  
Dr. Palak Popat

### Scientists (ACTREC)

Dr. Ujjwala Warawdekar  
Dr. Narendra Joshi  
Dr. Abhijit De

### Surgical Oncology

Dr. Rajendra Badwe,  
Dr. Indraneel Mittra  
Dr. Prabha Yadav  
Dr. Vani Parmar  
Dr. Nita Nair  
Dr. Shalaka Joshi

### TMC Research Administrative Council (TRAC)

Ms. Rohini Hawaldar

The Breast Oncology DMG was one of the most heavily utilized outpatient and inpatient services at the Tata Memorial Hospital. The unit conducted three joint clinics in TMH and two at ACTREC every week. The DMG was always in the

forefront in patient care and, several steps to help patients like maximal financial assistance, counseling, survivor's clinic, annual survivors conference and lymphedema care were in place.

In 2016, the Navya online support formed a unique second opinion program that was started by the breast unit and had 620 consults in last two years.

## Volume Indicators

2016			
	TMH	ACTREC	TOTAL
Private Patients	1803	62	1865
General Patients	2261	284	2545
<b>Total</b>	<b>4064</b>	<b>346</b>	<b>4410</b>

Referral Card registration 2016	TMH	ACTREC	Total
	1107	104	1211

Surgical Data						
	TMH		ACTREC		TOTAL	
Type of surgery	2015	2016	2015	2016	2015	2016
Major Breast Surgery	1439	1517	704	686	2143	2203
Additional Surgical Procedures	288	447	94	118	382	565

## Outcome indicators

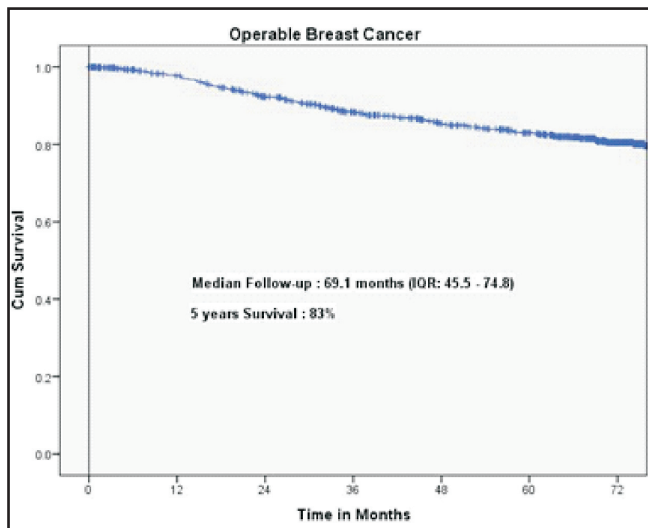
### 30-day mortality and complication rates:

- a) There was no reported 30-day mortality.
- b) Surgical morbidity; 14.2%

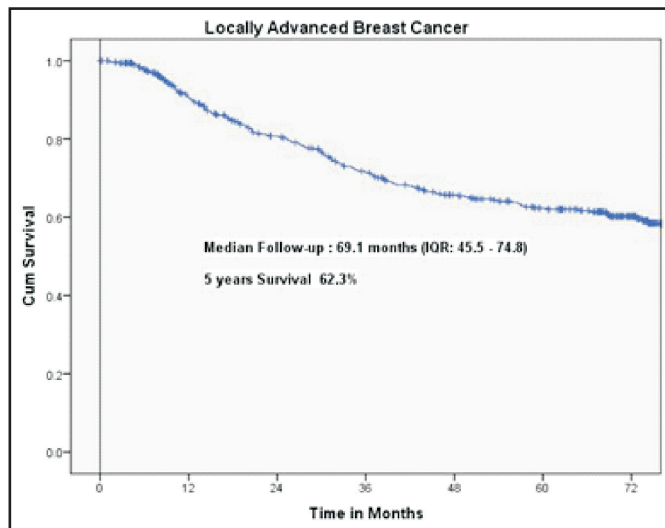
- c) Positive margin and re-excision rates; 2.7%
- d) Average hospital stay; 2.5 days
- e) Nodal yield with completion of axilla; median, 17
- f) Nodal yield with axillary sampling; median, 6

### 5-year disease free survival rates:

Outcomes similar to the range reported world over were noticed in last five years. For operable breast cancer it was 83% and for locally advanced breast cancer it was 62.3%.



*5-year survival in locally advanced breast cancer*



*5-year survival in operable breast cancer*

## Process Indicators

- Surgical compliance (Planned and completed surgery): 88%
- Radiation therapy (RT) to all BCT patients: 100 %
- RT to all post mastectomy patients with nodes > 3 and / or pT> 5 cm: 100%
- Adjuvant chemo planned for node positive patients: 100%
- Appropriate hormonal adjuvant tamoxifen / aromatase inhibitors to all hormone receptor positive tumors: 100%

## Research

Total			Completed			Ongoing			Patients Accrued
Investi- gator Initiated	Sponsored	Collabo- rative	Investi- gator Initiated	Sponsored	Collabo- rative	Investi- gator Initiated	Sponsored	Collabo rative	
68	21	15	16	07	00	52	14	14	2537

Convener: **Dr. Mukta Ramadwar**  
(Pathology)  
Secretary: **Dr. Reena Engineer**  
(Radiation Oncology)

## Gastrointestinal - DMG

### Anesthesia

Dr. Parmanand Jain

### Digestive & Clinical Nutrition

Dr. Shaesta Mehta  
Dr. Prachi Patil

### Epidemiology

Dr. Rajesh Dixit

### Medical Oncology

Dr. Vikas Ostwal  
Dr. Ananth Ramaswamy

### Nuclear medicine & Molecular Imaging

Dr. Rangarajan Venkatesh  
Dr. Nilendu Purandare  
Dr. Archi Agrawal

### Pathology

Dr. Kedar Deodhar  
Dr. Munita Bal

### Radiation Oncology

Dr. Shyam Srivastava,  
Dr. Supriya Chopra  
Dr. Shirley Lewis

### Radiodiagnosis

Dr. Supreeta Arya  
Dr. Suyash Kulkarni  
Dr. Nitin Shetty  
Dr. Ashwin Polnaya

### Scientists (ACTREC)

Dr. Shubhada Chiplunkar  
Dr. Sanjay Gupta  
Dr. Amit Dutt

### Surgical Oncology

Dr. Shailesh Shrikhande  
Dr. Mahesh Goel  
Dr. Avanish Saklani  
Dr. Ashwin Desouza  
Dr. Shraddha Patkar  
Dr. Manish Bhandare  
Dr. Vikram Chaudhari

Gastrointestinal disease management group delivered comprehensive care to patients with diverse gastrointestinal cancers through a multi-disciplinary approach. The surgical services were structured in three separate units; namely hepatobiliary, pancreatic and colorectal divisions. Other support services such as stoma clinic, familial cancer and genetics clinic, catheter clinic and psychiatric services were

availed of when required. A once-a-month medical social workers support group meet was started to address the patients' socioeconomic and logistic issues.

The focus was to improve upon the varied complex liver (including anterior approach) and pancreatic resections (including borderline resectable tumors and vascular resections). The scope of robotic services was expanded to

include hepatobiliary surgeries i.e: left lateral hepatectomy and radical cholecystectomy and, to further develop the laparoscopic / robotic pancreatic surgeries (distal pancreatectomy and Whipple resections).

The software programme, Medical Oncology Information System (MOIS) proved to be very useful in auditing the chemotherapy related data.

## Volume Indicators

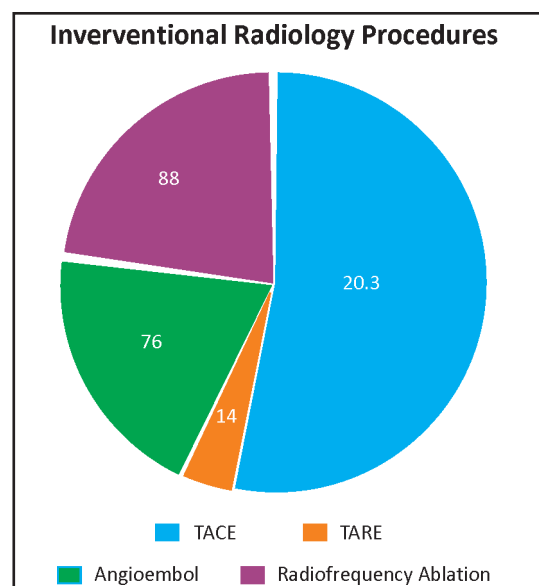
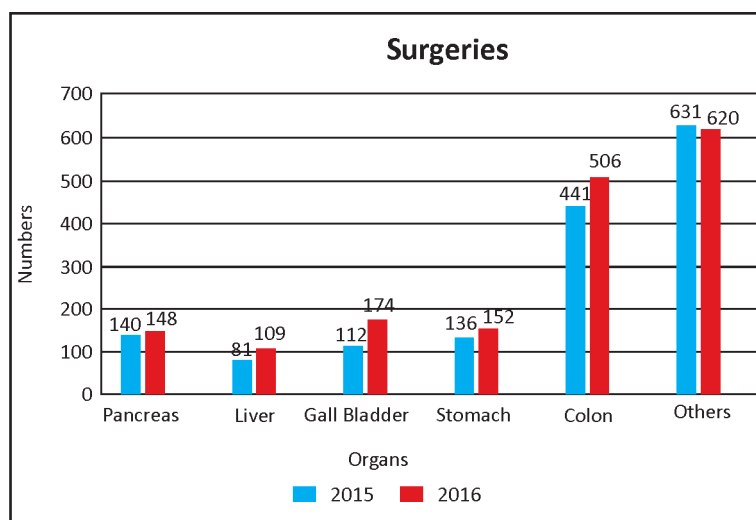
The DMG saw a total of 9108 cases in the year 2015, of which, 1948 required admission. A total of 1747 surgeries were performed.

Year	Reg.	Adm.	Surgery TMH			Surgery ACTREC	Mortality
			Elective	Emergency	Total		
2015	6567	1945	945	273	1218	346	30
2016	9108	1948	1023	349	1372	375	43

The General to Private patient ratio was **863 : 884**.

Chemotherapy for curative intent was administered to 1669 and as palliation to 3477 patients.

Radiotherapy as radical treatment was offered to 432 and as palliation to 215 patients.



## Outcome Indicators

### Surgery:

Overall Mortality: 43 (2.46%)

Mortalities in Elective Surgeries:  
18 / 1393 (1.29%)

Mortalities in Emergency surgery:  
25 / 354 (7.06%)

### Chemotherapy:

- Grade 1 toxicities: 2932 (54%)
- Grade 2 toxicities: 1321 (25%)
- Grade 3 toxicities: 0479 (09%)
- Grade 4 toxicities: 0095 (02%)

Not available in 10 % patients.

### Radiation Oncology:

Acute Radiotherapy Complication rates of patients undergoing radical treatments:

Grade 0 – 166 (26%)

Grade 1 – 172 (27%)

Grade 2 – 74 (12%)

Grade 3 – 18 (2%)

Grade 4 – 03

Grade 5 – 01

## Research

Total Number of Clinical Trials: 67 (Ongoing/Approved)+Completed			Completed Trials: 14			Ongoing / Approved Trials: 53			Overall Patients Accrued
Investi- gator Initiated	Industry Sponsored	Thesis	Investi- gator Initiated	Industry Sponsored	Thesis	Investi- gator Initiated	Industry Sponsored	Thesis	Ongoing Trials No of Patients to be accrued: <b>7037</b> No patients accrued: <b>4726;</b> <b>67.15 %</b>
38	12	17	06	03	05	32	09	12	<b>Completed Trials</b> No of Patients to be accrued: <b>1270</b> No patients accrued: <b>984;</b> <b>77.48 %</b>

Convener : **Dr. Amita Maheshwari**  
(Surgical Oncology)  
Secretary : **Dr. Sudeep Gupta**  
(Medical Oncology)

## Gynaecology - DMG

### Cytology

Ms. Swati Dighe

### Medical Oncology

Dr. Jaya Ghosh  
Dr. Jyoti Bajpai  
Dr. Seema Gulia

### Microbiology

Dr. Rohini Kelkar

### Nuclear Medicine &

### Molecular Imaging

Dr. Sneha Shah  
Dr. Venkatesh Rangarajan

### Occupational Therapy

Dr. Manjusha Vagal

### Pathology

Dr. Bharat Rekhi  
Dr. Kedar Deodhar  
Dr. Santosh Menon

### Preventive Oncology

Dr. Sharmila Pimple  
Dr. Gauravi Mishra

### Radiation Oncology

Dr. Umesh Mahantshetty  
Dr. Reena Engineer  
Dr. Supriya Chopra

### Radiodiagnosis

Dr. Meenakshi Thakur  
Dr. Nilesh Sable  
Dr. Palak Popat

### Scientists (ACTREC)

Dr. Shubhada Chiplunkar  
Dr. Murali Krishna Chilakapati  
Dr. Pritha Ray  
Dr. TanujaTeni

### Surgical Oncology

Dr. Rajendra Kerkar  
Dr. Thumkur Surappa Shylasree

The Gynaecology Disease Management Group (DMG) catered to female patients with reproductive tract cancers. All newly registered patients were examined on the first day and appropriate investigations / treatments were initiated. Joint Clinics were conducted on every Monday and Wednesday. The overall adherence to EBM guidelines was above 90%. In 2016, 21% of endometrial cancer and

28 % cervical cancer patients underwent robotic surgery.

The dedicated 'Gynaec Cancer Patient Support Group' looked into the daily availability of patient service coordinators in the OPD and for socio-financial assistance. The support group conducted special meetings every month with patients for their psycho-social rehabilitation.

## Volume Indicators

A total of 3493 new patients were registered under Gynaecologic Oncology DMG in the year 2016; of which, 2328 were in General and 1165 in Private categories (ratio 67:33). Additionally, 709 patients came only for a single visit opinion.

## Diagnostic Data

Diagnosis	Total	Private	General
Cancer Cervix	1441	336	1105
Cancer Endometrium	331	154	177
Cancer Ovary	1025	424	600
Cancer Vagina	39	13	26
Cancer Vulva	33	12	21
Cancer Vault	59	17	42
Others	312	109	203
No Malignancy	129	68	61
Unknown	126	32	93
<b>Total</b>	<b>3493</b>	<b>1165</b>	<b>2328</b>

The DMG performed a total of 739 major surgeries (650 at TMH & 89 at ACTREC) and 390 minor surgeries. The general: private ratio was 53:47.

### Major Surgeries

Disease sites	No of surgeries
Cervix	79
Ovary	409
Endometrium	111
Uterine Sarcomas	11
Vulva	18
Miscellaneous	111
<b>Total</b>	<b>739</b>

Thirty eight percent endometrial cancer (17% lap, 21% robotic) and 44% cervical cancer (16% lap, 28% robotic) patients underwent surgery by minimal access route.

Overall 903 cases received radiation. Radical radiotherapy was administered to 703 patients and palliative radiotherapy was delivered to 200 patients. A total of 2165 brachytherapy procedures were performed which included 1993 Intracavitary & 172 Interstitial brachytherapy. Chemotherapy was administered to 1146 patients with gynaecological malignancies.

### Outcome Indicators

#### Surgery:

Thirty-day surgical mortality was 0. 9% (6 / 739).

Major surgical morbidity rate was 8% (60 / 739); of which, 5.7% (37 / 739) were intra-operative and 3.5% (23 / 739) were post-operative.

#### Radiotherapy:

Of patients who received curative radiotherapy, acute grade II and grade III-IV GU-GI toxicity were observed in 14% and 3%, respectively.

#### Chemotherapy:

Of patients received Paclitaxel and carboplatin combination chemotherapy, grade III / IV myelosuppression and peripheral neuropathy were observed in 12% and 8% cases, respectively.

#### Research

DMG members have initiated many clinical trials. Some of them have potential to change practice.

Total Number of Clinical Trials (N = 43)		Completed Trials (N = 24)		Ongoing Trials (N = 19)		Overall Patients Accrued
Investigator Initiated	Sponsored Trials	Investigator Initiated	Sponsored Trials	Investigator Initiated	Sponsored Trials	Number of patients enrolled
38	05	20	04	18	01	~ 6865

Convener : **Dr. Prathamesh Pai**  
(Surgical Oncology)  
Secretary : **Dr. Kumar Prabhash**  
(Medical Oncology)

## Head & Neck - DMG

### Dental & Prosthetic

Dr. Kanchan Dholam  
Dr. Sandeep Gurav

### ENT Specialist (Honorary)

Dr. Chris DeSousa

### Nuclear Medicine & Molecular Imaging

Dr. Archi Agrawal  
Dr. Nilendhu Purandhare  
Dr. Venkatesh Rangarajan  
Dr. Sneha Shah

### Pathology

Dr. Asawari Patil  
Dr. Munital Bal  
Dr. Shubhada Kane

### Plastic & Reconstructive Surgery

Dr. Prabha Yadav  
Dr. Dushyant Jaiswal  
Dr. Vinay Sankhdhar

### Radiation Oncology

Dr. Ashwini Budrukhar  
Dr. Jaiprakash Agarwal  
Dr. Rajiv Sarin  
Dr. Sarbani Ghosh Laskar  
Dr. Santam Chakraborty  
Dr. Tejpal Gupta  
Dr. Vedang Murthy

### Radiodiagnosis

Dr. Abhishek Mahajan  
Dr. Suman Ankhati  
Dr. Supreeta Arya  
Dr. Shashikant Juvekar  
Dr. Suyash Kulkarni  
Dr. Nilesh Sable

### Scientists (ACTREC)

Dr. Shubhada Chiplunkar  
Dr. Murali Krishna Chilakapati  
Dr. Manoj Mahimkar  
Dr. Tanuja Teni  
Dr. Milind Vaidya  
Ms. Sharada Sawant

### Speech Therapy

Mr. Arun Balaji

### Surgical Oncology

Dr. Anil D'cruz  
Dr. Anuja Deshmukh  
Dr. Deepa Nair  
Dr. Devendra Chaukar  
Dr. Gouri Pantvaidya  
Dr. Pankaj Chaturvedi  
Dr. Sudhir Vasudevan  
Dr. Shivakumar Thiagarajan

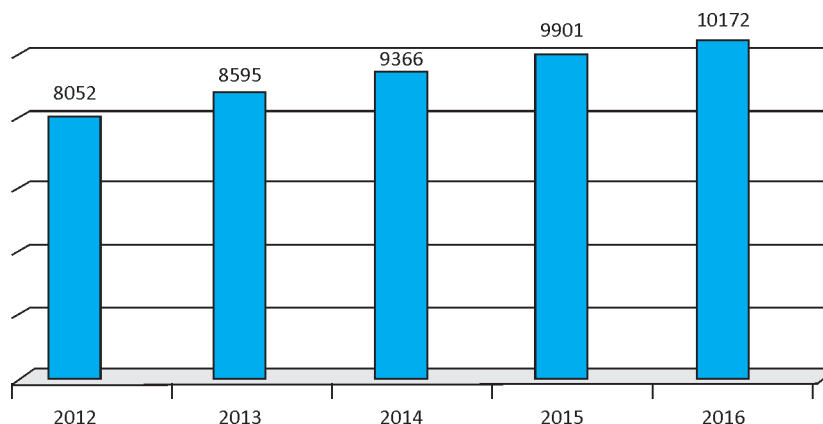
The Head & Neck (HN) DMG provided state-of-the-art healthcare with a multidisciplinary approach and ensured best possible outcomes. The HN DMG promoted scientific research, responsible medical care and disseminated knowledge through its members. The group was actively involved in raising the standards of care not only in TMC, but across the country. The members were instrumental in promoting a healthy environment through public education and anti-tobacco advocacy.

HN cancers constituted ~ 25% of the annual registrations at TMC. The DMG comprised of major oncology specialists (surgical, radiation and medical

oncology), effectively supported by other ancillary and rehabilitative services and, provided effective, evidence based care for HN cancer patients.

## Volume Indicators

### Registration Data : 2.73% increase



Modality	Procedures	No of patients
Surgery	Minor	6830
	Major	2258
Radiotherapy	Radical (Definitive + Adjuvant)	1092
	Palliative	157
Chemotherapy	Radical (NACT + CTRT)	1191
	Palliative	776
Pathology	Histopathology	13606
	Fine Needle Aspiration Cytology	3406
	Exfoliative cytology	57
	Total no. of all samples received in pathology	17509
Radiology	CT Scan	6546
	MRI	2223
Dental / Prosthetic	Consultation	11661
	Prosthesis	1338
	Food Grinder Apparatus	2945
	Extractions	4971
	Prophylaxis (Total two sitting)	1171
	Implant	67
Speech / Rehabilitation	New Patients	4917
	No of sittings	8403
	Laryngectomy Rehabilitation	187
	Audiometry	3559

## Surgery

	(Unit A)	(Unit B)	(Unit C)	ACTREC	HN surgery
Total cases	562	620	707	369	2258
<b>Site: Oral</b>	339	325	467	350	1481
Larynx / hypo	35	35	46	02	118
Thyroid	124	112	110	07	353
Salivary gland	20	31	24	02	77
Maxilla	16	14	11	0	41
Skull base	08	61	12	0	81
<b>Trans Oral Robotic Surgery</b>	<b>04</b>	<b>06</b>	<b>06</b>	<b>0</b>	<b>16</b>
<b>Miscellaneous</b>	<b>16</b>	<b>10</b>	<b>31</b>	<b>07</b>	<b>68</b>

	(Unit A)	(Unit B)	(Unit C)	ACTREC	HN surgery
<b>Reconstruction</b>					
Yes	281	260	334	279	1154
Free flaps	153	138	139	21	451 (39%)
Pedicled Flaps	85	77	114	253	529 (45.8)
Local	43	45	81	05	174
<b>Category</b>					
Private	239 (42.5%)	269 (43.3%)	194 (27.4%)	27 (7.3%)	729 (32.2%)
General	323	351	513	342	1529
Morbidity	175	176	153	80	584
Major	62	72	60	53	247
Minor	113	104	93	27	337
Infection	36	42	21	33	132
No of Operation Theaters (OT)	430	422	433.5	340	1285.5
OT utilization	1.30	1.46	1.63	1.09	1.75
Mortality	02	04	0	02	08 (0.3%)
Laser resections	50	133	32	0	215
Minor OT procedures	2131	2279	2420	0	6830
Wide excision	64	179	17	0	260

### Radiotherapy

Treatment	No of Patients
Radical: Definitive	614 (49)
Adjuvant	490 (39)
Re Radiotherapy	40 (3)
Brachytherapy	43 (3)
Palliative	157 (12.5)
ACTREC	157

### Chemotherapy

Treatment	No of patients
Neoadjuvant Chemotherapy (NACT)	486
Chemo Radio Therapy (CTRT)	705
Palliative Chemo Therapy	776
<b>Total</b>	<b>1967</b>

## Outcome Indicators

### 30-Day mortality & complication rates:

Modality	Morbidity / Mortality	No of patients ( %)
Surgery at TMH (n=2, 258)	Morbidity	584 (25.86%)
	Mortality	08 (03%)
Radiotherapy	Completed	96
	Dermatitis (Grade 0-2)	97
	(Grade 3)	03
	Mucositis (Grade 0-2)	97
	(Grade3)	03
	NGT placement (%)	30.5
	Weight loss (Avg. in Kg)	02
	Hospitalization (%)	04
	Not completed (%)	04
	Mortality (%)	01
<b>Chemotherapy</b>		
NACT (n=486)	Completed NACT	471 (97%)
	Toxicity	03 (0.6 %)
	30-day mortality	0 (0%)
CTRT (n=705)	Completed CTRT	635 (90.1%)
	Toxicity	45 (6.36%)
	Mortality	03 (0.425%)
Palliative (n=776)	Completed	Cetuximab 30 pts (75%)
		OMCT & Intravenous 445 pts -90.4%)
		Second Line 120 pts (77.4%)
	Toxicity	
	Mortality	01 patient (0.207%)

### 5-year survival rates:

#### Surgical Oncology

- Oral Cavity (2010-2011): Mean Overall Survival: 63.5 mnth (0 to 68 mnth); 91.7%
- Parotid (2010-2011) 5-year Overall survival: 73%
- Larynx: 5-year Overall survival; 72%

#### Medical Oncology

##### NACT;

- Oral

The 2-year survival in patients receiving NACT in oral cancers was 42%

- Hypopharynx

The 2-year survival in patients receiving NACT in pharyngeal cancers (laryngopharynx) was 60%

- Maxilla

The 2-year survival in patients receiving NACT in maxilla was 41%.

- Sinonasal

The 2-year survival in patients receiving NACT in sinonasal tumors was 78.5%.

- Stridor

In all patients receiving immediate chemotherapy, clinical stridor resolved within 48 hours. The radiological response rate was 62.5%. The median reduction in size of tumor was 37%

- Surgical margins

The unfavorable margin status (either positive or close margin) was seen in 5.1% of upfront operated patients while it was 3.3% in patients operated after NACT. It was interesting to note that perineural invasion was seen in quite a high proportion of our upfront operated patients (23.3%) while this was not the case in the NACT patients (7.4%) ( $p = 0.000$ ).

- Geriatric

In patients receiving NACT for technically unresectable disease the corresponding figures were 82.06% and 9.0 months (95%CI 5.9-12.1 months).

## Palliative Chemotherapy;

- **First line treatment outcomes**

The median OS in metronomic chemotherapy was 249 days (222.48–275.52 days), in intravenous chemotherapy was 152 days (134.19–247.81 days) and in paclitaxel & cetuximab was 314 days (95%CI 227.6 - 400.4 days).

- **Second line treatment outcomes**

The median estimated PFS and OS were 110 days (95%CI 61-175 days) and 156 days (95%CI 126-185 days) respectively.

## Radiation Oncology

### 1. Early stage Oral cavity treated with surface mould Brachytherapy: n=31

Median FU: 52 months

3-& 5-year Local control (LC): 5 year LRC- skin-92%

5-year LRC-intraoral: 76%

3-& 5-year DFS: 2 and 5 year DFS; 69%

3-& 5-year OS: 2 and 5 year OAS; 86% and 81% respectively

### 2. Oral cavity: Stage III / IV

5 year controls	Adjuvant RT (n = 600)	Adjuvant CTRT (n = 300)
Locoregionally controlled	64%	69.3%
Disease free Survival	54%	56.7%
Overall Survival	50%	51.7%

#### PROCESS INDICATOR

Stage of treatment	Adherence at our centre (%)
Pre-treatment	99.3
Definitive treatment	90.9
Adjuvant treatment	89.7

## Research

	Total Number of Clinical Trials		Completed Trials		Ongoing Trials		Overall
	Investigator Initiated	Sponsored Trials	Investigator Initiated	Sponsored Trials	Investigator Initiated	Sponsored Trials	Patients Accrued
TMH	22	02	12	0	31	02	1958
ACTREC	13	0	7	0	33	0	
Total	35	02	19	0	61	02	
<b>Total</b>	<b>37</b>		<b>19</b>		<b>63</b>		<b>1958</b>

# Neuro-Oncology - DMG

Convener : **Dr. Tejpal Gupta**  
(Radiation Oncology)  
Secretary : **Dr. Epari Sridhar**  
(Pathology)

## Medical Oncology

Dr. Girish Chinnaswamy  
Dr. Maya Prasad  
Dr. Tushar Vora  
Dr. Vijay Patil

## Nuclear medicine & Molecular Imaging

Dr. Ameya Puranik  
Dr. Nilendu Purandare  
Dr. Venkatesh Rangarajan

## Pathology

Dr. Ayushi Sahay  
Dr. Shubhada Kane

## Psychiatry

Dr. Joyita Deodhar

## Radiation Oncology

Dr. Goda Jayant Sastri  
Dr. Rakesh Jalali

## Radiodiagnosis

Dr. Abhishek Mahajan  
Dr. Amit Janu  
Dr. Amrita Guha  
Dr. Ashita Rastogi  
Dr. Ashwin Polnaya  
Dr. Subhash Ramani (till June 2016),  
Dr. Supreeta Arya

## Scientists (ACTREC)

Dr. Neelam Shirsat

## Surgical Oncology

Dr. Aliasgar Moiyadi  
Dr. Prakash Shetty  
Dr. Venkatesh Madhugiri

The Neuro-Oncology DMG held two dedicated multi-disciplinary joint clinics every week for consensus on therapeutic decision-making. The members also met monthly to discuss DMG-related issues and activities including presentation of clinical trial protocols, study results, and status updates. There was a monthly meeting that audited the neurosurgical morbidity and mortality cases. An academic meet was held to discuss novel issues and landmark papers.

The Neuro-Oncology DMG had been at the forefront in introducing molecular markers of diagnostic, prognostic, predictive, and therapeutic relevance for testing in clinical practice, to enhance the quality of patient care.

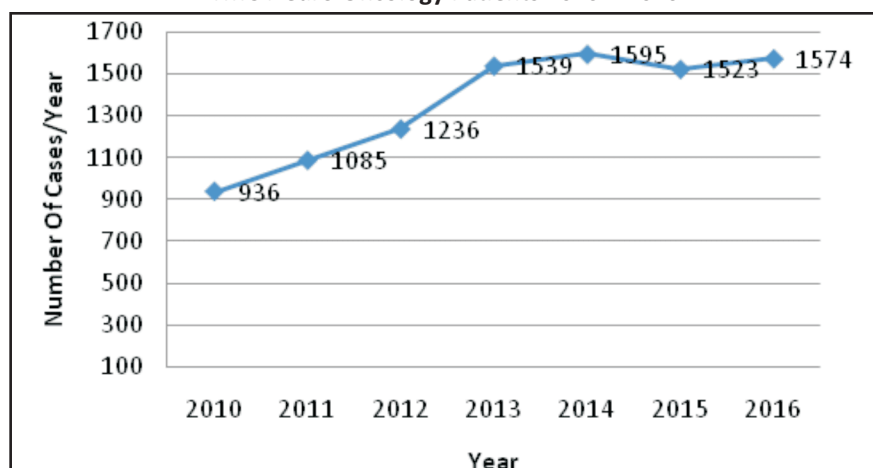
In keeping with the theme 'Access to Quality Care', underprivileged and non-affording patients were provided cutting-edge services through philanthropic funding generated by via Brain Tumor Foundation (BTF) and Brain Tumor Poor Patients' Welfare Fund.

Patient information brochures were provided to all patients by the BTF staff. Feedback from the patients and their caregivers was collected during the patient support group meetings.

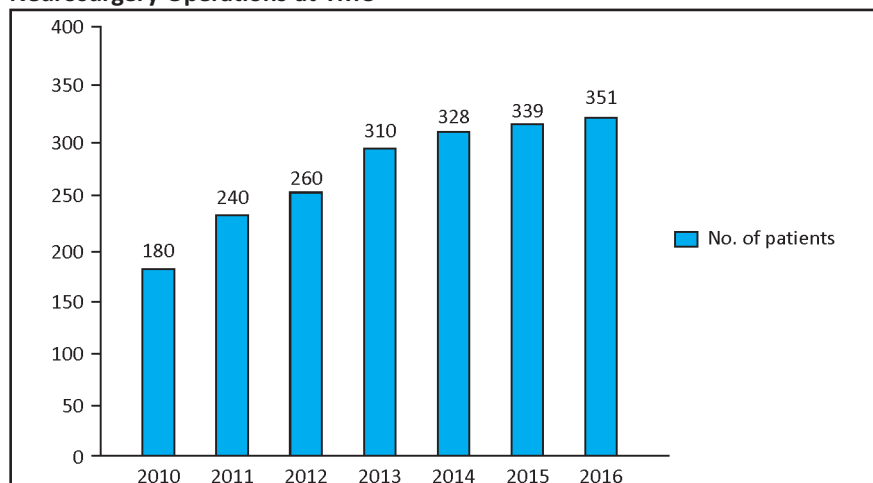
## Volume Indicators

The General to Private Patient Ratio was 59 : 41.

TMC Neuro Oncology Patients 2010 – 2016



Neurosurgery Operations at TMC



Surgical Details		TMH	ACTREC	TOTAL
Demographics	Males	75 (65.2%)	144 (61%)	219 (62.39%)
	Females	40 (34.8%)	92(39%)	132 (37.61%)
	Adult	89 (77.4%)	204(86.4%)	293 (83.47%)
	Paediatric	26 (22.6%)	32 (13.6)	58 (16.53%)
Total no of surgeries	Primary procedures	351		
	Additional procedures	14 (12.17%)	24 (10.16%)	38 (10.82%)
	Re-exploration	5 (4.34%)	10 (4.23%)	15 (4.27%)
Primary Surgical procedures	Craniotomy (supratentorial)	63 (54.8%)	169 (71.61%)	232 (66.09%)
	Posterior fossa	07 (6.1%)	24 (10.16%)	31 (8.83%)
	Retro-mastoid	03 (2.6%)	14 (5.93%)	17 (4.84%)
	Trans-sphenoidal	22 (19.1%)	0 (0.0%)	22 (6.26%)
	Others	20 (17.4%)	29 (12.30%)	49 (13.98%)
Nature of Surgery	Elective	82 (71.3%)	229 (97.0%)	311 (88.60%)
	Emergency	33 (28.7%)	7 (3.0%)	40 (11.4%)

#### Radiation Oncology

Technique of RT	TMH	ACTREC	Total
Conventional Radiation Therapy	74	02	76
3D-Conformal Radiation Therapy	163	66	229
Intensity Modulation Radioterapy / Image Guided RT	151	58	209
Stereotactic Radiosurgery	04	Nil	04
<b>Total</b>	<b>392</b>	<b>126</b>	<b>518</b>
Referred outside for radiation therapy	244	00	244
<b>Grand Total</b>	<b>636</b>	<b>126</b>	<b>762</b>

#### Medical Oncology

Approximately 90 paediatric brain tumour patients received chemotherapy.

#### Chemotherapy in Adult Brain Tumours:

Regimen	Number of cycles
Bevacizumab based regimen	95
Packer regimen	38
Salvage temozolomide	41
Adjuvant temozolomide	1008
CET	05
CCNU / PCV	24
Others	32

Regimen	Toxicity 3-4 CTCAE	Mortality due to toxicity
Adjuvant temozolomide	15%	Total 4 patients of all regimens. (1.33%)
CCNU	33.3%	
Bevacizumab	11.1%	

#### 30-DAY MORBIDITY AND MORTALITY FOR ELECTIVE CASES

	MORBIDITY (Minor)	MORBIDITY (Major)	MORTALITY
TMH	19 (23.2%)	08 (9.8%)	02 (2.4%)
ACTREC	46 (20.1%)	21 (9.2%)	05 (2.2%)

The highlight of the year had been the introduction of intra-operative electrophysiological monitoring service for operating tumors in eloquent areas of brain. It helped to reduce morbidity related to the procedure and better tumor resection. In addition, advanced neurosurgical adjuncts like navigation, frameless stereotaxy, intra-operative 3D ultrasound and ALA guided surgeries were also offered. Besides, the service

had started providing expanded endonasal procedures to various skull base tumors in collaboration with the Skull Base team.

The DMG members were also involved in collaborative projects with the Indian Institute of Technology (IIT-Mumbai) for a project on proteomics, as well as with the Department of Remote sensing and Robotics, BARC, Mumbai to develop an indigenous robotic stereotactic system.

The IIT collaboration had led to important leads on the proteomics aspects of brain tumours which were being pursued in future projects. The robotics project had been adopted by the BARC as a departmental project under the “Make in India” programme of the PMO and was being validated across multiple centres across the country.

## Research

Total number of clinical trials currently in 2016			Completed trials in 2016			Ongoing trials before 2016			Overall Patients Accrued in 2016
Investigator Initiated	Retro-spective Audit trials	Sponsored trials	Investigator Initiated	Retro-spective Audit trials	Sponsored trials	Investigator Initiated	Retro-spective Audit trials	Sponsored trials	494 (32.62%) of 1514 patients
25	00	00	00	05	00	18	05	00	

Convener: **Dr. (Surg. Cdr) Gaurav Narula**  
(Medical Oncology)  
Secretary: **Dr. Papagudi Subramanian**  
(Hematopathology)

## Pediatric Hematolymphoid - DMG

### Anesthesia

Dr. Vijaya Patil

### Cancer Cyto genetics

Dr. Pratibha Amare Kadam

### Clinical Pharmacology

Dr. Vikram Gota

### Hematopathology

Dr. Nikhil Patkar

Dr. Sumeet Gujral

Dr. Sridhar Epari

Dr. Prashant Tembhare

### Medical Oncology

Dr. Shripad Banavali

Dr. Brijesh Arora

Dr. Navin Khattry

### Microbiology

Dr. Rohini Kelkar

### Nuclear Medicine &

### Molecular Imaging

Dr. Venkatesh Rangarajan

Dr. Sneha Shah

### Pathology

Dr. Tanuja Seth

### Psychiatry

Dr. Jayita Deodhar

### Radiation Oncology

Dr. Siddharth Laskar

Dr. Nehal Khanna

### Radiodiagnosis

Dr. Seema Medhi

### Scientists (ACTREC)

Dr. Shubhada Chiplunkar

### Surgical Oncology

Dr. Sajid Qureshi

### Transfusion Medicine

Dr. Anita Tendulkar

This DMG provided comprehensive medical management, counselling and palliative care to children below 15 years of age suffering from hematolymphoid malignancies. The DMG was one of the largest pediatric leukemia programs in the world for a single center.

Due to the highly curative nature of most these malignancies affecting children, the DMG had developed an extensive support system to provide

financial aid, accommodation, nutrition, continued education of children, sporting and fun activities, outings and cultural programs as part of its service program.

The children's Mindspring educational program got a boost through additional funding from a CSR partner. In the year 2016, the educational and vocational courses were diversified and, that doubled the number of children participants.

In addition to multilingual booklets, a video had been made for patient information and education on hygiene, infection prevention, nutrition etc. The video was played continuously and regularly in the waiting areas and in the monthly parent support group meeting.

The DMG provided guidance to many other centers and referred patients closer to their homes or workplace of parents after comprehensively working them up and making detailed treatment plans.

## Volume Indicators

Disease	Disease Burden In 2016			
	General	Private	TOTAL	(%)
Acute Lymphocytic Leukemia (ALL)	461	86	547	61.7
Acute Myeloid Leukemia (AML)	113	15	128	14.4
Chronic Myeloid Leukemia (CML)	13	01	14	1.6
Non Hodgkins Lymphoma (NHL)	81	12	93	10.5
Hodgkins Lymphoma (HL)	67	14	81	9.1
Langerhan Cell Histiocytosis (LCH)	06	03	09	1.0
Juvenile Myelo Monocytic Leukemia (JMML)	15	0	15	1.7
Myelo Proliferative Disorders (MPD)	02	0	02	0.25
<b>Total</b>	<b>770</b>	<b>102</b>	<b>872</b>	<b>100</b>

## Survival

The Overall Survival (OS) rates of close to 70% reflected the highly curable rates of pediatric hemato-lymphoid malignancies in general. These rates were achieved despite significant challenges of presentation with advanced disease, malnutrition and resistant infections encountered. The streamlined patient management guidelines and tracking, along with adoption of risk-stratified approaches and sophisticated disease monitoring including Flow Cytometry and PET-CT based response assessment, there was improved OS and Disease Free Survival (DFS).

The Overall Survival Rates for Patients (disease-wise) initiating treatment in 2010-2011:

Disease (n)	5-yr OS (SE) %	Mean Survival in Months (95% CI)	Median Survival in Months (95% CI)
ALL (380)	63.5 (3.0)	47.6 (44.3-50.9)	Not Reached
AML (76)	47.1 (8.8)	34.7 (25.6-43.7)	35
CML (16)	85.7 (9.4)	59.1 (47.7-70.5)	Not Reached
HL (71)	91 (4.5)	64.2 (60.5-67.9)	Not Reached
NHL (83)	87.7 (3.9)	60.4 (48.9-53.9)	Not Reached

## Mortality in 2016

Disease	Total Registered	Total Expired	Mortality In 2016					
			Before Rx		Within 45 Days		After 45 Days	
			No.	(%)	No.	(%)	No.	(%)
ALL	535	40	13	2.4	18	3.4	09	1.7
AML	115	20	06	5.2	06	5.2	08	07
CML	19	01	01	5.3	0	0	0	0
NHL	95	08	01	01	02	02	05	5.3
HL	96	04	0	0	01	01	03	03
LCH	8	02	01	12.5	0	0	01	12.5
JMML	02	01	0	0	01	50	0	0
<b>Total</b>	<b>875</b>	<b>78</b>	<b>24</b>	<b>2.7</b>	<b>28</b>	<b>3.2</b>	<b>26</b>	<b>03</b>

## Compliance with Clinical Guidelines

Patients on treatment were more than 96% compliant with treatment due to the social support and patient tracking systems in place. Patients not reporting within 7 days of due date were contacted by the concerned social worker. A tracking software had been designed to flag such patients in the year 2016.

The completion of entire therapy at expected time for malignancy and stage was 90%.

Disease	Total No.	2016									
		Treated at TMH		Treated under TMH guidance elsewhere		Second Opinion		Treatment Refusal & Abandonment (TR&A)		Palliative & Expired	
		No.	(%)	No	(%)	No.	(%)	No.	(%)	No.	(%)
ALL	547	391	71.48	36	0.06	47	8.5	13	2.8	60	15.3
AML	128	66	51.56	05	3.9	14	10.93	09	7.0	34	51.5
CML	13	12	100.0	0	0	0	0	0	0	01	8.3
NHL	93	66	70.96	08	12.1	03	3.22	01	1.1	15	22.7
HL	81	57	70.37	08	9.8	10	12.34	02	2.5	04	7.0
LCH	09	06	77.77	01	0	01	11.11	0	0	01	11.1
JMML	15	06	40	0	0.00	01	6.66	01	0.67	07	46.6
<b>Total</b>	<b>757</b>	<b>410</b>	<b>54.16</b>	<b>57</b>	<b>0.07</b>	<b>76</b>	<b>10.03</b>	<b>26</b>	<b>0.03</b>	<b>121</b>	<b>15.9</b>

## Research

Total Number of Clinical Trials		Completed Trials		Ongoing Trials		Overall Patients Accrued
Investigator Initiated	Sponsored Trials	Investigator Initiated	Sponsored Trials	Investigator Initiated	Sponsored Trials	Number of patients enrolled
09	02	01	00	02	00	512

# Pediatric Solid Tumor - DMG

Convener : **Dr. Seema Kembhavi**  
(Radiodiagnosis)  
Secretary : **Dr. Tushar Vora**  
(Medical Oncology)

## Medical Oncology

Dr. Girish Chinnaswamy  
Dr. Maya Prasad  
Dr. Tushar Vora

## Nuclear Medicine & Molecular Imaging

Dr. Sneha Shah  
Dr. Venkatesh Rangarajan

## Ophthalmologist (Honorary)

Dr. Nandan Shetye

## Palliative Medicine

Dr. Mary Ann Muckaden  
Dr. Naveen Salins

## Pathology

Dr. Bharat Rekhi,  
Dr. Mukta Ramadwar

## Radiation Oncology

Dr. Nehal Khanna,  
Dr. Siddharth Laskar

## Radiodiagnosis

Dr. Akshay Baheti  
Dr. Kunal Gala  
Dr. Rahul Chivate  
Dr. Suyash Kulkarni

## Surgical Oncology

Dr. Sajid Qureshi

The Pediatric Solid Tumor DMG strived to provide timely and appropriate treatment for this challenged group of children; and, saw to it that there was a smile on all their faces despite the adversities associated with their disease and its management.

The Retinoblastoma Clinic got a boost with funding from CSR and the Tata trust as evidenced by the eye globe salvage rate of 80%.

Other NGOs contributed to the economic, sociopsychological, vocational and education needs of the children and their guardians. Compassionate bereavement support was also offered in unfortunate cases. Patient and their guardian support group was formed that met once a month to share their experiences and prop up the morale.

## Volume Indicator

Diagnosis	Total (2016)	Total (2015)
Neuroblastoma	98	89
Renal Tumor	59 (WT 55)	63
Germ Cell Tumor	48	56
Liver tumors	25 (HB 19)	34
Retinoblastoma	52	56
Soft Tissue Sarcoma	115	140
Misc	95	53
No malignancy	29	24
No investigation	15	25
<b>Total</b>	<b>536</b>	<b>541</b>

WT = Wilms Tumor; HB = Hepatoblastoma

## Surgical Data

	TMH	ACTREC	Total (2016)
Major	127	36	163
Minor	13	23	36
Vascular access	67	0	67
<b>Total</b>	<b>207</b>	<b>59</b>	<b>266</b>

## Radiotherapy data

Treatment		No of Patients
RT Intent (Ext. RT)	Radical	122 / 169 (72%)
	Palliative	26 / 169 (15%)
	Ketlar	35 / 169 (21%)
Ext RT		158 / 180 (88%)
Brachytherapy		11 / 180 (06%)
Conventional		81 / 169 (48%)
3D-CRT / IMRT		88 / 169 (52%)
Referred outside for RT		156

## After Completion of Therapy (ACT) Clinic for long-term survivors of childhood cancers (2016)

Follow-up	794
New registration	60
<b>Total</b>	<b>854</b>

## Morbidity / Mortality

Treatment	Morbidity	Mortality
Surgery	30-day: 19.09% (38 / 199)	1.0% (2 / 199)
Chemotherapy	Need for admission for Febrile neutropenia 7.2% (32 / 443)	1.8% (8 / 443)
Radiotherapy (n=169)	Acute toxicity Grade I: 30% Grade II: 05% Grade III: 04%	0 %

## Survival Rates

Cancer	Event-free survival (%) TMC	Overall survival (%)TMC	From Published data (%)
Wilms	84	89	90 (OS)
Germ cell tumors (extracranial)	81	93	Best – 95 OS
Retinoblastoma	79	81	95 OS
Soft tissue sarcomas (non-rhabdomyosarcoma)	61	77	89 OS
Neuroblastoma			
(Low / Intermediate)	68	75	54 – 100 (4 year EFS)
Neuroblastoma (High risk)	22	40	30 – 50 ( 3 year EFS)
Extraskelatal Ewing's Sarcoma	68	77	69 – 77 and 58 – 67 EFS and OS
Hepatoblastoma	70	88	100, 83, 56 and 46 – stage wise OS

## Compliance

Compared with 4.6 % drop out from treatment (for any reasons) last year, the year 2016 saw a dropout rate of only 2.7 % (15 of 536).

The average time taken to initiate treatment from day one was 14 days in

almost 90 % of the children. About 80 % of the children got operated within the expected dates after induction chemotherapy. 90% of the patients completed entire therapy at expected time in accordance with the tumor type and its stage.

## Research

Total Number of Clinical Trials		Completed Trials		Ongoing Trials		Overall Patients Accrued
Investigator Initiated	Sponsored Trials	Investigator Initiated	Sponsored Trials	Investigator Initiated	Sponsored Trials	Number of patients enrolled
19	0	11	0	08	0	2198

Convener : **Dr. Sarbani Ghosh Laskar**  
(Radiation Oncology)  
Secretary : **Dr. Nilendu Purandare**  
(Nuclear Medicine &  
Molecular Imaging)

## Thoracic Oncology - DMG

### Medical Oncology

Dr. Kumar Prabhash  
Dr. Vanita Noronha  
Dr. Amit Joshi  
Dr. Vijay Patil

### Nuclear Medicine & Molecular Imaging

Dr. Venkatesh Rangarajan

### Palliative Medicine

Dr. Jayita Deodhar

### Pathology

Dr. Shubhada Kane  
Dr. Rajeev Kaushal  
Dr. Neha Mittal

### Pulmonary Medicine

Dr. Sandeep Tandon

### Physiotherapy

Ms. Anuradha Daptardar

### Radiation Oncology

Dr. Jai Prakash Agarwal  
Dr. Sarbani Ghosh Laskar

### Radiodiagnosis

Dr. Subhash Ramani (till June 2016)  
Dr. Abhishek Mahajan  
Dr. Amit Kumar Janu

### Surgical Oncology

Dr. Shanmughan Pramesh  
Dr. George Karimundackal  
Dr. Sabita Jiwnani

The multidisciplinary Thoracic Oncology Disease Management Group (DMG) comprised of surgeons, medical and radiation oncologists, pulmonary physician, pathologists, radiologists, palliative care physicians and physiotherapists. The team was strengthened by inputs from cardiovascular surgeons, endocrine

specialists, basic scientists and technology experts.

## Volume & Outcome Indicators

The DMG is amongst the highest volume thoracic centres in the world. A total of 3946 new patients were

registered in the DMG in 2016. Lung cancers were the majority, 2432 (61.6%) followed by esophageal cancer 1111 (28%), showing a rise of about 2% compared to 2015.

Total=678	Esophagus	Lung	Metasta- sectomy	Mediastinal mass	Chest wall	Port	Others	Mediasti- noscopy
Total number operated	178	113	106	20	42	42	129	26
Mortality	07 (4%)	04 (3.5%)	02 (1.8%)	0	—	—	—	—
Major morbidity	31 (17.4%)	10 (8.8%)	03 (2.8%)	01 (5%)	0	—	—	—
Minimally invasive	41 (23%)	30 (27%)	31 (29%)	06 (30%)	—	—	—	—
Video Assisted Thoracoscopy	38 (93%)	18 (60%)	31 (100%)	05 (83%)	—	—	—	—
Robotic	03 (7%)	12 (40%)	0	01 (17%)	—	—	—	—
Open	115 (64%)	83 (73.4%)	66 (62%)	14 (70%)	—	—	—	—
Inoperable	22 (13%)	0	09 (9%)	0	—	—	—	—

Overall mortality (excluding other / emergency procedures) = 14 (2.1%)

**Minor procedures (including bronchoscopy) = 2558**

**Bronchoscopy = 1587**

### **Newer initiatives in the DMG**

- Endobronchial Ultrasound (EBUS) and EBUS guided trans-bronchial needle aspiration (TBNA)
- Availability of 68GaGalium DOTA Peptide for neuro-endocrine tumors

### **Research**

The thoracic DMG conducts several investigator-initiated and sponsored research studies.

Members from the DMG have published more than 35 articles in peer reviewed journals in 2016.

Convener: **Dr. Ganesh Bakshi**  
(Surgical Oncology)  
Secretary: **Dr. Amit Joshi**  
(Medical Oncology)

## Uro-Oncology - DMG

### Epidemiology

Dr. Rajesh Dixit

### Medical Oncology

Dr. Kumar Prabhash

Dr. Vanita Noronha

### Medical Records

Dr. Bala Ganesh

### Nuclear Medicine &

### Molecular Imaging

Dr. Venkatesh Rangarajan

Dr. Archi Agarwal

### Pathology

Dr. Sangeeta Desai

Dr. Santosh Menon

### Radiation Oncology

Dr. Vedang Murthy

Dr. Rahul Krishnatry

### Radiodiagnosis

Dr. Meenakshi Thakur

Dr. Shashikant Juvekar

Dr. Suyash Kulkarni

Dr. Nilesh Sable

Dr. Palak Popat

### Scientists (ACTREC)

Dr. Shubhada Chiplunkar

Dr. Ashok Verma

### Surgical Oncology

Dr. Gagan Prakash

Dr. Mahendra Pal

The Uro-oncology DMG conducted outpatient clinic every Tuesday and Thursday and, new patients including emergency ones were seen daily; all patients were worked up as per the EBM guidelines / European Urology 2016 guidelines. After completion of the diagnostic workup, the patient was discussed in the joint clinic and treatment planned.

The Surgical branch of the DMG had 6 major and 2 minor theatres a week (including ACTREC); annually around 4000 cases were operated.

DMG academic meetings were scheduled on the second and fourth Thursday every month, where, important scientific literature was discussed in form of symposia, debates, journal club and lectures. The administrative meeting of DMG was held once a month to discuss the various issues related to patient care, guidelines update and research related topics.

In year 2016, around 126 robotic urological surgeries were performed and the DMG stressed on organ preserving surgeries. The introduction of Stereotactic Body Radiation Therapy (SBRT) significantly reduced treatment time by 5-7 days, with minimal toxicity and lowered burden on therapy machines. The surgical branch adopted separate divisions to evaluate patients depending on whether they were: new, with all investigations completed and prior to management, follow-up within few weeks of therapy and, follow-up after 1-year and 3 - 5-year of therapy. Long term survivors were also seen separately; that way, the evaluation process of the patients became faster. The appointments for cystoscopy were sent via Short Message Service (sms) on mobile phones with the help of software developed for the same by the IT dept., TMH; saving patients' time and prevented inconvenience of long waiting hours. About 177 cystoscopies were performed per month.

In 2016, the DMG saw 2199 new patients of which, 1290 were subjected to further treatment by the DMG; the rest were referred back or to other DMGs.

### Volume Indicators

Total of 2787 new patients were seen at the Uro-oncology DMG.

Patients	Numbers
New registration	2199
Follow ups	14212
RH cards	588

The ratio of general to private category of patients was 1268:931 = 58:42

Additionally, there were 63 emergency surgeries and 222 references in the operation theatre. The minor surgical procedures totalled 3670.

Radiation therapy radical treatment was offered to 189 and, as palliation to 207 patients.

<b>Total number of major surgeries</b>	<b>TMH + ACTREC</b>	<b>538 + 185 = 723</b>
Total minor surgical procedures		
	Cystoscopy, DJ, BCG, Debridement, dressings, wound wash	3670
<b>Total Number of Major cases</b>	<b>TMH + ACTREC</b>	<b>538 + 185 = 723</b>
Renal Tumors	107	
Bladder Tumors	324	
Prostate Cancers	134	
Penile Cancers	115	
Testicular tumors	79	
Laparoscopic Urology	31	
Robotic Urology	57	

### 30-Day Mortality and Complication Rates

#### Surgical Oncology

Complication rates: (As per Clavien Dindo system)

Grade 1 – 6.1%

Grade 2 – 0.7%

Grade 3 – 0.7%

Grade 4 – 0.3%

Grade 5 – 0.3%

Outcome indicator- 2 patients died within 24 hours of surgery

#### Medical Oncology

30-day morbidity:

Ca Site	% of patients
Cancer Testis	30.4%
Renal Cell Carcinoma	26.4%
Prostate	27.1%

30-day mortality for Ca Testis was 3%.

#### Survival Rates

The survival rates for all urological cancers was extremely good, most of them being highly curable neoplasms and were comparable with the figures reported from other reputed uro-oncology centers.

### Surgical Oncology

The overall five-year survival rate:

Organ	Overall Survival		Disease Free Survival	
	Early disease (T1,T2,M0)	Advanced disease (T3,T4,M0)	Early disease	Advanced disease
Cystectomy	77%	55%	72%	46%
Nephrectomy	90%	46%	84%	55%
Testicular	93%	85%	91%	82%

#### Medical Oncology

Organ	Survival (in months)	
Metastatic Penile cancer patients receiving palliative chemotherapy	Median OS	10.6
Metastatic Renal Cell Cancer patients receiving TKIs in first line	Median OS	22.6
Metastatic Renal Cell Cancer patients receiving TKIs in Second line	Median OS	6.2

2-year OS for seminoma: **94.9%**

2-year OS for Non Seminal Germ Cell Tumor: **95.4%**

18-month OS Metastatic castration resistant Prostate cancer patients receiving palliative chemotherapy: **57.3**

### Process Indicator

The DMG maintained an over 95% compliance with evidence based guidelines in respect with patient treatment. However, in 5% of patients, pragmatic decisions were taken in the Joint Clinic to offer therapy that would provide optimal benefit and with minimal harm to the patients; allowing for various patient related factors predominantly patient's background, home-support, financial and patient refusing the standard care.

## Research

A total of 479 DMG patients (22%) had enrolled for research studies in uro-oncology.

	Investigator Initiated	Sponsored
Total Number of Clinical Trials	19	02
Completed	0	01
Ongoing / Approved but not initiated	19	01

# DMG Support Services



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## DMG Support Services

### Dental and Prosthetic Services

**Dr. Kanchan Dholam, Head**  
Dr. Sandeep Gurav

The dental and prosthetic department evaluated the dental and mandibular status of head and neck cancer patients; especially of maxillofacial and radiotherapy cases.

#### Service

Eleven thousand six hundred sixty one (11661) patients were seen as out-patients. Of these, 1269 patients were treated with prosthetic rehabilitation following ablative surgery and included: maxillary prosthesis - 293, guide plane prosthesis - 544, tongue prosthesis - 9, palatal augmentation - 9, occlusal guard - 284, complete and partial dentures -

49 and implant retained intra oral prosthesis - 69. Of the 242 patients, 67 were treated with surgical insertion of NOMURA funded titanium dental implants for fabrication of implant retained oral rehabilitation.

One thousand one hundred sixty five (1165) patients were treated with prophylaxis & 2945 with fluoride gel applications. A total of 4971 extractions were carried out.

#### Research

The pilot study of phase 1 of the in vivo studies on cell responses / rapid osseointegration of endosseous titanium dental implant with electrospun PCL- gelatine ossteoinductive scaffold in rabbit bone model {WIHC Animal study Project (A / C 3596)}, was completed. Dr. Dholam

was involved in the collaborative research project with IIT Mumbai titled "Development of improved indigenous dental implants: Phase1: In vivo studies on cell responses / rapid osseointegration of endosseous titanium dental implant with electrospun PCL- gelatine ossteoinductive scaffold in rabbit bone model" with seed funding from Western Indian Healthcare Consortium.

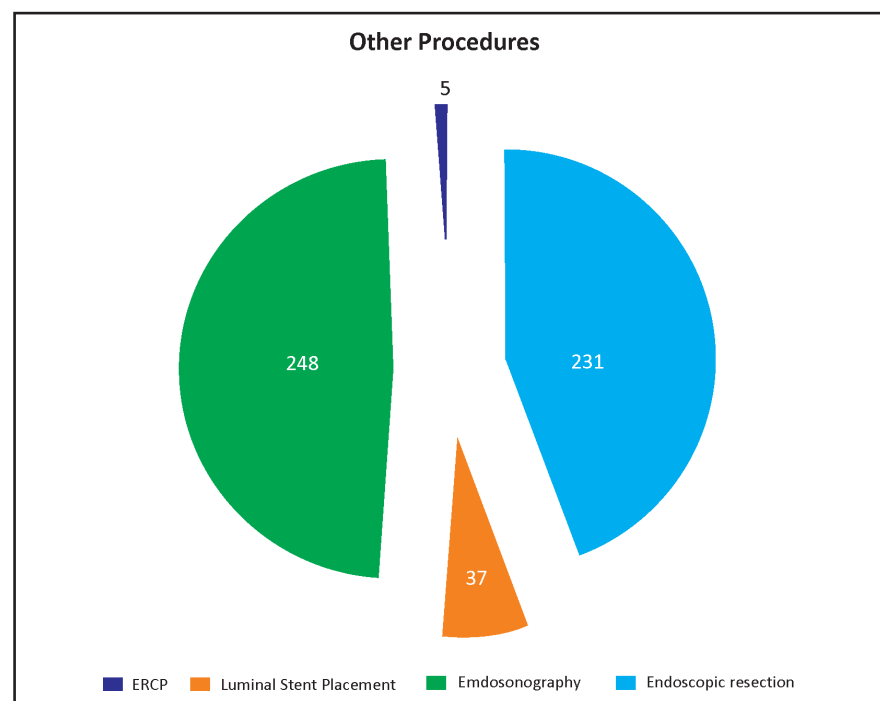
#### Education

The department organized and conducted training and informal teaching sessions for observers from dental faculty, surgical and radiation oncology in Maxillofacial Prosthetics. A total 16 students attended as observers in the department.

### Digestive Diseases and Clinical Nutrition

**Dr. Shaesta Mehta, Head**  
Dr. Prachi Patil

The department of Digestive Diseases and Clinical Nutrition catered to the management of patients with Gastrointestinal (GI) cancers and other gastrointestinal disorders. The department provided holistic care for GI cancer patients that included diagnostic and therapeutic endoscopy, evaluation and endoscopic management of premalignant and malignant lesions of the GI tract, management of familial digestive cancers and clinical nutrition including disease specific enteral and parenteral nutrition therapy.



## Service

The department was involved in the work-up and management of patients with digestive cancers arising for the intestines and hepato-pancreaticobiliary system. In addition, post treatment rehabilitation care and clinical nutrition services were offered to all DMGs and hospital staff members. A new diagnostic tool, the Intraductal Endoscopic Ultrasound (EUS) was added for precise staging of biliary cancers and improved treatment decisions for patients. The EUS guided biliary drainage procedures led to reduction in the use of percutaneous drainage

procedures that reduced morbidity, hospital stay and healthcare cost. In 2016, the department performed 6888 endoscopies of which, 1847 were therapeutic.

The dedicated hepatology clinic served 2657 patients, while the nutrition section provided nutritional support to nearly 10257 cancer patients.

## Research

A total of 13 ongoing projects included research in endoscopy, phase 2 / 3 clinical trials and epidemiological studies with some of them under the India-Oxford (INDOX) Collaboration

Group. Of these, 15 were investigator generated and 4 were sponsored.

## Education

Besides the DM gastroenterology doctorate, the department conducted a 6-month basic endoscopy training program and a one-year Fellowship in advanced endoscopy. For experience in digestive oncology, a 3-month training was offered to other hospital residents. Training in clinical nutrition and dietetics was provided to other university residents as a 6 to 24-week training in oncology related clinical nutrition.

## Occupational Therapy

**Dr. Manjusha Vagal,**  
**Officer in Charge**

The Occupational Therapy department played an important role in onco-rehabilitation and, the therapists were crucial health care members of the rehabilitation team for holistic approach towards cancer patients. Their goal was to assist each individual to be as independent as possible, to maximise personal productivity, well-being and quality of life.

## Service

With 4493 new and 6773 follow-up patients, the year 2016 saw a total of 11266 (8720 out- & 2546 in-) patients who were counselled by the department. Lymphoress was used in 185 patients and the Rehabilitation & Research Centre (RRC) attended to 782 patients.

The department provided 3 temporary prosthesis, 16 thermoplastic splints,

159 orthoses, 40 prostheses and, carried out 47 repair work related to orthoses and prostheses. The Rehabilitation and Research Centre (RRC), Dr. Ernest Borges Memorial Home (EBMH) Bandra prepared and supplied, 1300 Jaw stretcher keys and 34 Lymphedema kits to hospital dispensary. A total of 99 new and 683 follow-up patients received Occupational Therapy services at RRC, EBMH, Bandra. The department had a turnover of INR 13, 63, 314 / - through sale of various above mentioned articles through RRC, E.B.M.H. Bandra.

## Research

The department designed and devised a novel forearm based dual stretching hand orthoses "Modified stretching wrist cock-up splint" for prevention and correction of manus valgus deformity following excision of radius in paediatric patients.

The department successfully completed retrospective study on cervical cancer

in August 2016 titled "Vaginal stenosis following treatment of cervical cancers and the effectiveness of rehabilitation interventions: A retrospective study".

## Education

Throughout the year, the department was involved in educating observers from other institutional faculties like occupational therapy, palliative medicine, dental, physiotherapy and nursing.

The department conducted its 4<sup>th</sup> Educational Program in honour of late Mrs. A. P. Tole on 7<sup>th</sup> December 2016. The theme of this educational event was "Updates on Occupational Therapy Practice". The department held its first web conference with the Occupational Therapy Department, Govt. Medical College Nagpur. A total of three scientific sessions were held, viz., inter-institute case presentations, poster competition and special lecture series (five lectures).

## Physiotherapy

**Dr. Anuradha Daptardar,**  
Officer in charge

The Physiotherapy Department was committed to restore patients to their highest level of independent physical function through individualized therapeutic exercise program and a wide range of state-of-the-art techniques. The common services included: rehabilitation of shoulder and neck dysfunction; management of trismus; post-operative respiratory care following major surgeries; mobilization and ambulation in orthopedic oncology; pain relief; treatment of sub mucous fibrosis; and diagnosis and management of cancer-related fatigue in head & neck and lung cancers. Newer services included the preoperative pulmonary rehabilitation and pediatric pulmonary rehabilitation program for children and their care-givers.

In 2016, the Body Composition Analyzer - Multiscan 5000 (predicted lymphedema approximately 9 months before its onset and enabled identifying the risk patients and to take necessary precautions) and of LymphapressOptimal (advanced intermittent pneumatic compression therapy in lymphedema management) were procured; a certified lymphedema therapist provided lymphedema treatment in accordance with the International Consensus of Lymphedema. The department also offered post-operative group therapy rehabilitation program for breast cancer patients.



### Service

The department interacted with the various DMGs that ensured full rehabilitation for better outcomes and increased patient satisfaction. Additional staff recruitment enabled the department to work from 8.00 am to 6.00 pm and, thereby catered to an increased number of patients in 2016.

Besides the routine work of physical rehabilitation, the department also specifically addressed the needs of the pediatric population (367), those with lymphedema (512), postoperative breast cases (1338), cancer related fatigue (531) and pulmonary rehabilitation (1625). In all, the year 2016 saw the department treating more than 14000 patients.

### Research

The ongoing studies and trials included; Exercise for the management of cancer related fatigue in advanced lung cancer planned for systemic palliative therapy: A randomized controlled trial; and, a randomized controlled trial evaluated the role of exercise in women undergoing treatment for breast cancer.

### Education

A 6-month training program in Onco-Physiotherapy had commenced from 15<sup>th</sup> September 2016. An annual workshop on "Rehabilitation in Breast Cancer" was conducted on 13<sup>th</sup> and 14<sup>th</sup> August 2016.

## Pulmonary Medicine

**Dr. Sandeep Tandon,**  
Head

The Pulmonary Unit, a part of the Thoracic DMG, assessed patients referred for respiratory evaluation and management. It also worked in collaboration with the Rehabilitation Services and ensured an optimum preoperative pulmonary evaluation, respiratory optimization and exercise schedule that reduced pulmonary morbidity. With good pulmonary

function impacting faster and safer recovery before, during and after surgery or chemotherapy or radiotherapy, there had been progressive increase in referrals for respiratory consultations.

### Service

In the year 2016, more than 5600 patients across all DMGs and cross referrals were evaluated by the pulmonary medical unit.

## Research

The unit increased its contribution to the Thoracic DMG's clinical research activities through clinically relevant joint research projects.

### Education

The Pulmonary Medical unit created an increased awareness for the need to diagnose and treat respiratory co-morbidities, either pre-existent or iatrogenic (post-therapy) in cancer patients.

## Speech Therapy

**Dr. Gurmit Bachher,**  
Head (till February 2016)

**Mr. Arun Balaji KD,**  
Officer in Charge (from March 2016)

The Speech Therapy services offered comprehensive speech and swallowing therapy to cancer patients, especially those related to the head and neck region. The year 2016 had seen modernization through advanced equipment and facilitated evidence-based voice and swallowing rehabilitation.

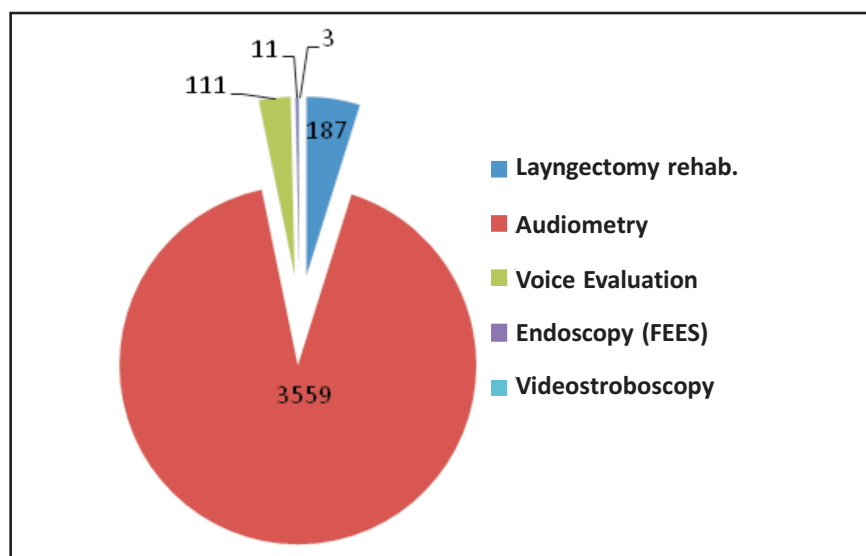
### Service

There were a total of 8403 patients who attended the speech therapy department of which, 4917 were new cases.

Water swallowing tests were performed routinely as a clinical swallowing evaluation protocol along with preventative swallowing exercises program.

Fiberoptic Endoscopic Evaluation of Swallowing (FEES) was started in the year 2016 and was considered a gold standard for objective evaluation of pharyngeal dysphagia.

The department also offered the flexible videolaryngostroboscopy, the latest imaging modality for comprehensive voice evaluation and therapy.



## Research

The utility of FEES on swallowing-related quality of life in patients with head and neck cancers had been proposed for translation and validation.

### Education

The department held regular courses on swallowing and voice rehabilitation.



# Departments



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**Dr. Jigeeshu Divatia,**  
Head

## Anaesthesiology, Critical Care & Pain

Dr. Kailash Sharma,  
Director Academics, TMC  
Dr. Parmanand Jain,  
Head of Pain Division  
Dr. Atul Kulkarni,  
Head of Critical Care Division  
Dr. Vijaya Patil  
Dr. Raghubir Gehdoo  
Dr. Aparna Chatterjee  
Dr. Sheila Myatra  
Dr. Madhavi Shetmahajan  
Dr. Nayana Amin  
Dr. Vandana Agarwal  
Dr. Sumitra Bakshi  
Dr. Priya Ranganathan  
Dr. Reshma Ambulkar  
Dr. Madhavi Desai  
Dr. Raghu Thota  
Dr. Bhakti Trivedi  
Dr. Shilpushp Bhosale  
Dr. Amol Kothekar  
Dr. Malini Joshi



Dr. Jeson Doctor  
Dr. Swapnil Parab  
Dr. Sohanlal Solanki

Dr. Sudivya Sharma  
Dr. Sheetal Gaikwad  
Dr. Sukhada Savarkar  
Mrs. Manisha S. Kadam

Besides exclusive paediatric, thoracic, hepatobiliary and pancreatic anaesthetic services; and, the Critical Care and Pain specialty, a formal physiotherapy referral and pulmonary rehabilitation class for patients was initiated in the beginning of 2016.

### Service

In 2016, 21110 patients were given anesthesia and 22611 patients were seen in the Pre-Anesthesia clinic. The Pain Clinic was attended by 13137 patients. The Critical Care division that managed all Intensive Care and the Recovery Units, had 14849 admissions (2225 in ICU and 12624 in recovery).

A donation of transesophageal ultrasound prob facilitated bedside sonography.

The department continued to provide its services to the sister institution Homi Bhabha Cancer Hospital (HBCH) in Sangrur.

### Research

The department had more than 40 completed and continued clinical studies. Many books were authored and edited by the staff members.

### Education

The department conducted the annual Anaesthesia Review Course (ARC) for post-graduate students, a three-day course attended by more than 300 students.

# Cancer Cytogenetics Department

**Dr. Dhanlaxmi Shetty,**  
Officer in Charge



Mrs. Sharayu Kabre  
Ms. Hemani Jain

The Cancer Cytogenetics laboratory had the mandate to provide diagnostic services that encompassed molecular cytogenetics and conventional karyotyping and, formed an integral part of diagnosis, prognostication and risk stratification in hematolymphoid malignancies and their management.

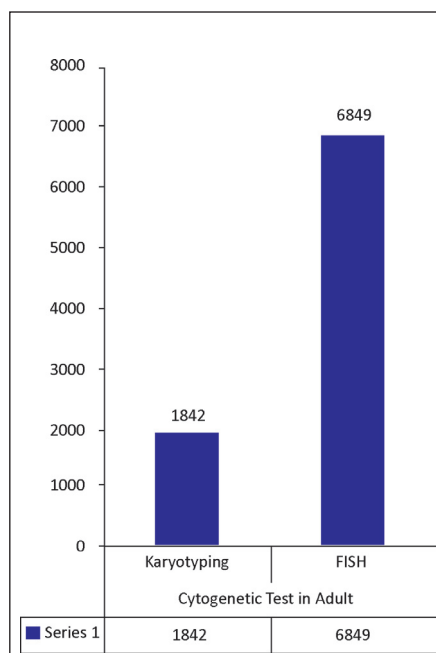
In July 2016, the laboratory was shifted to the ACTREC campus and the patient services were resumed within a week. All clerical staff from OPDs, minor OT, RF counter and wards were trained in sample transportation and requisitioning for Cancer Cytogenetics department. The laboratory was NABL compliant and the CAP proficiency program was continued at its new location.

## Service

The cancer cytogenetics department focused on diagnostic services in hemato-lymphoid malignancies that included Molecular Cytogenetics i.e. FISH (Fluorescence In Situ Hybridization) in CML, ALL, AML, MDS, lymphoma & multiple myeloma.

Conventional karyotyping was performed in all CML, AML, MDS cases, and with Ploidy analysis in all acute lymphatic leukemia cases.

In 2016, the laboratory performed 11,775 diagnostic tests. The total adult hemato-lymphoid cases were 8,691



**Fig.1a: Adult Hemato-lymphoid cases**

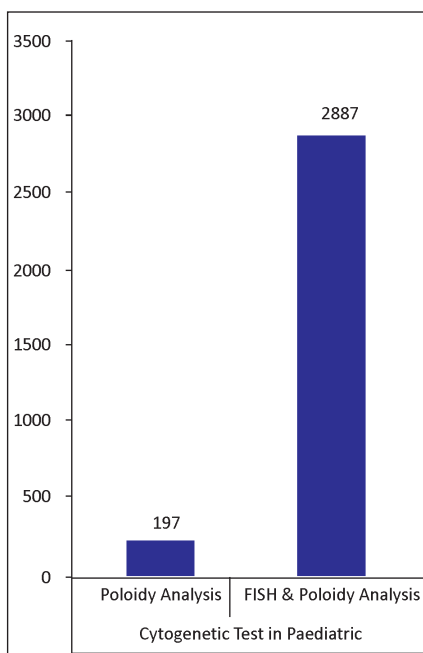
(Fig.1a) and pediatric hemato-lymphoid cases were 3,084 (Fig. 1b). There was an overall increase of 7.5% cases in the service program for myeloid and lymphoid malignancies.

## Research

The laboratory had six publications to its credit in the year 2016.

## Education

The department conducted a workshop on "Managing Quality in Clinical Laboratories" on 5th-6th March 2016 at Tata Memorial Hospital, Mumbai.



**Fig.1b: Pediatric Hemato-lymphoid cases**

Mrs. Mrudula Pusalkar

The Digital library, a user-demand, innovative and excellence-driven service, catered to the needs of medical and paramedical staff under the umbrage of Tata Memorial Centre and across the country. The library resources were continuously updated to satisfy research and clinical needs and, managed their collections that were in conjunction with the tenets of the institution.

### Service

In 2016, the library added 51 books and 11 eBooks to its collection and subscribed to about 182 journals (print and electronic) and four e-databases. The total number of eBooks available were over 110. The library facilitated procurement of books for Sangrur hospital (HBCH). The library indexed about 382 TMH publications and continued to index articles on oncology from other Indian journals.

The library received about 1226 request for articles and supported 880 full texts articles with a compliance rate of 72%. Full texts of 766 articles were supported in pdf. formats, 74 as photocopies, 20 in printouts and 20 as scanned copies.

During 2016, the Library website was fully revised and restructured and resource discoverability was improved as part of the TMC's website redevelopment program. It had a single search window to all its resources and



services and an easy to use interface for the visitor. The user friendly and interactive website was released during the end of the year. The website had special features like-single search facility across all resources, auto search in PubMed for journals subscribed by TMH, listing of staff publications, announcements, subject pathways, etc.

Accesses to Library-managed e-resources observed a total of 85,472 download from major publishers. The total downloads from Science Direct was about 66000 during the year. Amongst the subscribed full text e-databases, Clinical Keys (usage - 6480) and UPTODATE were most accessed during the year. The remote access facility ignited three years ago was highly used by the TMC members. The resources were remotely accessed 173173 times during the year.

### Research

The library infrastructure was updated and replaced with its management system and Documantra (KMS) replaced with a customized KOHA library

management system for library collections, and with DSpace for managing the non-textual material. Both the systems were implemented and functional by November 2016.

Trial accesses were facilitated for new e-journals and e -databases, including the Antiplagiarism software - iThenticate, for evaluation of utility and usefulness prior to its subscription.

### Education

The library information literacy tutorials gained popularity and it continued to conduct information literacy tutorials as scheduled and on demand formats. It conducted about 8 tutorials covering topics like searching effectively, systematic literature review, citation management, abstract writing and assigning keywords, copyrights and plagiarism. About 85 students and staff were trained.

Library staff answered complex reference questions, provided informal instruction (in addition to tutorials), and conducted literature searches. The library staff also provided assistance for publications.

## General Medicine

Dr. Aruna Alahari Dhir,  
Head

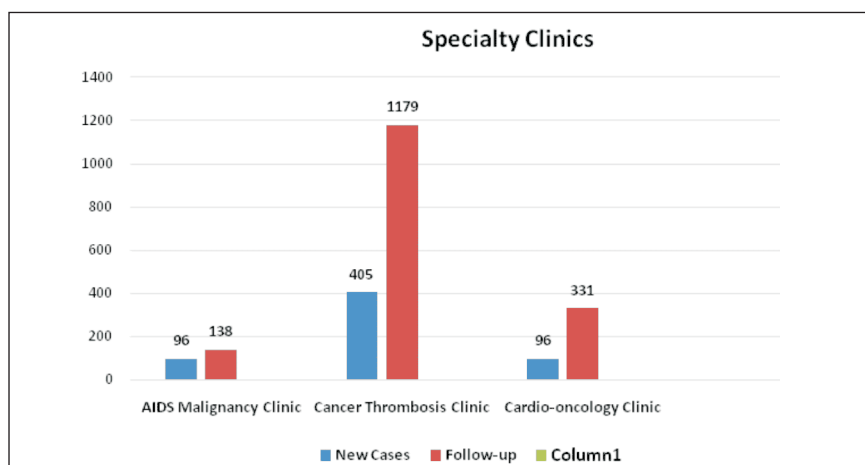
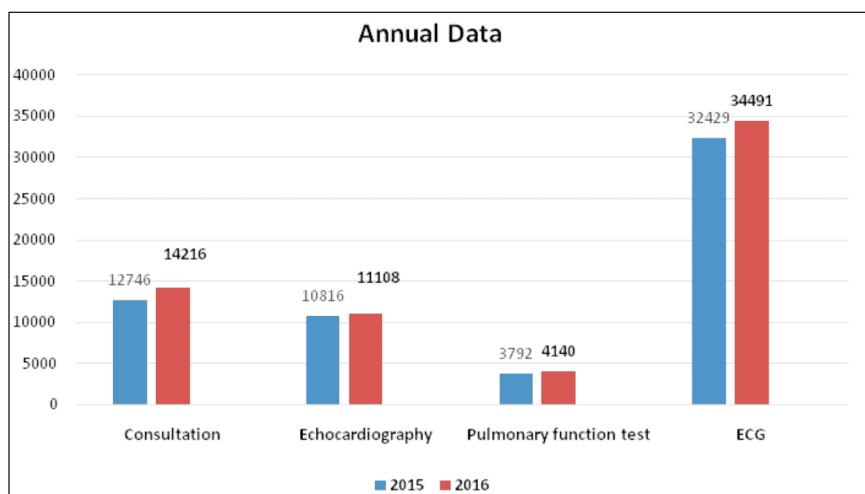


Dr. Sheela Sawant  
Dr. Anuprita Daddi  
Mrs. Manjiri Mirwankar

The Department of General Medicine played a vital role in the hospital, as a vast number of patients presenting to the hospital invariably required general medical consultation. The department provided both, outpatient and inpatient consultation services for the management of medical comorbidities in patients undergoing surgery, radiotherapy and chemotherapy. The staff members also provided valuable inputs for ICU management of patients, including bedside portable echocardiography; and in the wards, towards the management of emergencies and medical events in the peri-treatment course.

### Service

The department procured a state-of-the-art 4D Echo and a portable echocardiography machine to augment their service resource in 2016. Cardiopulmonary stress tests were also offered besides the 2D echo and ECG services. Telephonic advice was offered to those who could not physically attend the clinics.



Apart from management of common medical issues like diabetes, hypertension, ischemic heart disease, asthma, COPD etc., the department was also involved in the treatment of some chemotherapy and radiation induced toxicities; management of infections in the immuno-compromised patients especially HIV; management of some acute complications in critically ill oncology patients, including infections, pulmonary complications, cardiovascular disease and metabolic disorders. The cancer thrombosis working group conducted quarterly meetings.

## Research

Research was focused on early detection of cardiotoxicity in patients on treatment for cancer and in cancer survivors.

An IEC approved study on Metabolic syndrome in childhood cancer survivors was ongoing.

## Education

Post graduate students from Jodhpur Medical College were trained in cardiopulmonary exercise testing. This department was one of the few centers' in India that conducted such test for pre-operative risk stratification in high risk patients.

The faculty was involved in training for the hospital infection control course for all medical and paramedical staff.

## Information Technology Department

**Mr. Mahesh Mangrulkar,**  
Head



Mr. Vivek Marathe  
Mr. Sanjay Sinha  
Mrs. Charulata Nimje  
Mr. Pravin Kalsekar  
Mrs. Sandhya Joshi  
Mr. Manoj Chavan

The Information Technology department ensured smooth functioning and integration of different software modules related to various clinical, administrative, patient and out of state sister institutions' oriented modules. In 2016, older modules were modified and new ones added as per the needs of the end users. Of note, were the development of TMH Patient Navigation Mobile phone application on all platforms and the estimation of patient radiation dose from diagnostic imaging. The process to interface patient case file number with their Aadhar card was in the final stages.

The department had added more informative and beneficial Smart Message Service (sms) for the benefit

of the patients and staff. The institution being paperless, stretched the department to its maximum but ensured prompt services, and took remedial action whenever required. All activities of the hospital were computerized and new functionalities were added on a continuous basis.

The department provided comprehensive coverage of all hospital functions with integration of external systems like PACS Systems, Lab Auto analyzers, Bar Code, Smart Card, Kiosk, Computer on Wheels etc.

The department also looked after the TMC web site and those of the upcoming sister institutions in Visakhapatnam, Sangrur etc.

Data analysis was regularly done for Clinical Information System, Patient Administration, billing & receipting system, Diagnostic Information system, Radiology Information system, Operation Theatre module etc. that provided data for Clinical Research.

Training was given to Nurses on Computer concepts, Hospital Information System, Microsoft office and IT related topics. Laboratory staff was trained to use Diagnostic Information system effectively.



The department of Medical Photography had grown from a 'microfilming' Department to a full scale medical graphics one and also catered to the graphic requirements of the Regional Cancer Centers across the country.

The department was fully equipped with state-of-the-art digital technologies such as Digital Cameras, Full HD medical purpose surgical recording system, Live broadcasting facility using latest broadcasting system and High resolution scanner for MRI and CT scan images.

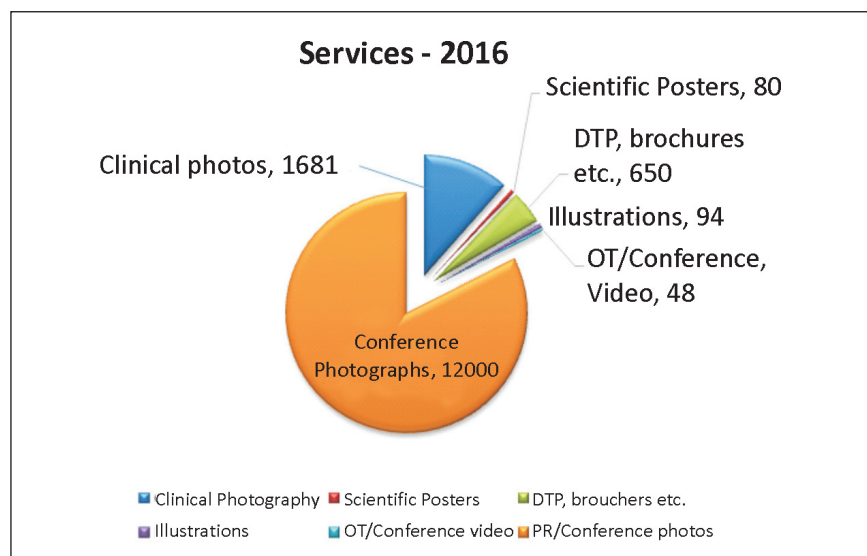
The medical artist, the medical photographer & the technicians formed an important part of the healthcare team and were responsible for accurate recording of disease images (pre and post therapy) that helped clinicians plan their treatment more accurately with the visual clue that the images provided. These accurate documentations of recorded videos and images were used for measurement & analysis; and, also as accompanying material for medical of scientific reports, articles or research

publications as well as for education purposes.

With the specialized digital camcorder, surgical procedures were recorded. A variety of specialist photo imaging techniques were employed for the complex and challenging situations such as macro photography of a lesion to achieve 1:1 magnification ratio, thermal Imaging, endoscopy to photograph

internal organs and, photography outside the visual spectrum i.e. infrared technique.

The department extended support to the entire hospital during the course of conducting their conferences and CME programs in form of brochure designing, poster making, medical illustrations, audio visual support and, Public Relation (PR) photography and archival of these images.



# Medical Oncology

**Dr. Shripad Banavali,**  
Head



Dr. Kumar Prabhash  
Dr. Brijesh Arora  
Dr. Navin Khattry  
Dr. Vanita Noronha  
Dr. Anuradha Chougule

Dr. Jyoti Bajpai  
Dr. Bhausahab Bagal  
Dr. Girish Chinnaswamy  
Dr. Gaurav Narula  
Dr. Maya Prasad

Dr. Seem Gulia  
Dr. Vikas Ostwal  
Dr. Vijay Patil  
Dr. Deepa Philip  
Dr. Anant Ramaswamy  
Dr. Sachin Punatar

The department of Medical Oncology with a medical staff of 18 planned the protocols and provided chemotherapy to cancer patients. This could be pre-operative, conjugant with surgery, post-surgery, upfront or palliative. Facilities to administer chemotherapy could be Day-care based or as in-patients. Chemotherapy was also prescribed for those who had geographic boundary limitations. There were separate chemotherapy wards for children and adults. The departmental staffs were essential members of all institutional DMG's.

With the advent of personalized medicine and better understanding of tumor biology, the treatment armamentarium of a medical oncologist had now expanded from just

administering chemotherapies, to incorporating use of targeted therapies and immune-therapies including checkpoint inhibitors, monoclonal antibodies and cellular therapies.

The department was actively involved in research and development of effective chemotherapeutic drugs. The bone marrow transplantation work was now carried out at ACTREC. The department liaised with various NGO's and helped patients overcome their socioeconomic issues.

## Service

Medical Oncology was one of the fastest growing and the busiest department of TMC treating 36, 756 new patients and around 2, 40, 000 out-patients in 2016.

Besides the 6, 740 patients admitted in wards for management, the day care section for chemotherapy had almost 1, 40, 000 admissions.

The division of pediatric oncology treated a record of 3, 015 patients. Because of a holistic approach taken by the pediatric division by providing financial, accommodation, nutritional, transfusion as well as educational support, the treatment abandonment rate in children was consistently < 5% for the past years.

The Bone Marrow Transplant (BMT) unit that performed 68 transplants, was one of the very few BMT units in the country that performed difficult to do, unrelated & haploidentical transplants on a regular basis.

## Research

Departmental members were Principal Investigators of 45 & co-investigators of 11 Scientific Projects approved by the various IECs in 2016. They also were part of 81 scientific publications published in 2016 in various indexed journals. Apart from being on Editorial Boards of various journals, the department members were Chief Editors of all the three prestigious cancer journals of India; the Indian Journal of Cancer, the Indian Journal of Medical and Pediatric Oncology and the Pediatric Hematology Oncology Journal. Department members were also representatives on various other national committees like DCGI, NCCP, DBT and DST.

The pediatric department was spearheaded a very large (> 4, 000 children), multi-centric, risk-stratified, randomized trial in childhood acute lymphoblastic leukemia (ALL) that was based on the use of clinical & cytogenetic data as well as estimation of minimal residual disease. Along with IIT, Mumbai & NIH, USA, the department was associated with the development of CAR-T cells for the treatment of ALL.

Precision medicine was an important development in patient care. Recently,

the Medical Oncology Molecular laboratory had developed a highly sensitive SNaPshot PCR based multiplex genotyping assay for evaluating 19 driver somatic mutations for routine diagnostic practice in non-small cell lung cancer. It standardized the technique of Liquid Biopsies that would further help to understand the tumor biology & for betterment of patient care. The Laboratory also developed lung cancer panel and extended panel of actionable mutations using NGS platform. Molecular profiling helped the effective use of targeted therapies and also to understand the tumor biology especially in hematological malignancies, lung & breast cancers. This also ensured that the department could complete the first Indian randomized study with molecularly selected lung cancer patients.

Generics were regularly used for the patients at the center. There was testing of the quality of some of the generic drugs in the Pharmacological facility at ACTREC and, it was planned to expand the scope of this, so as to test most of the generic drugs as part of routine care to ensure that quality of generics used was good. Phase I Unit at ACTREC, which was developed in collaboration with Pharmacology department, had started testing crushed tablets use in

patients. It had also planned a series of drug-interaction study protocols. Drug repositioning and development of low-dose cost-effective metronomic therapies was an important area of focus for the department.

## Education

The department took 14 DM (Medical Oncology) and 2 DM (Pediatric Oncology) candidates along with one student for Fellowship in Bone Marrow Transplantation annually. Additionally, there were multiple students from other DM programs (CMC Vellore; RCC Trivandrum; KEM Mumbai) & Fellowship programs (Apollo Chennai; LTMMGH Mumbai); as well as observers from across the country; and from African & SARCC countries who came for training in the department. The department was also the leader in pediatric nutrition capacity building for India. Department members were appointed on various selection, DM examination & PhD committees of various renowned Institutions across the country. The Faculty members were also invited to Institutions / Meetings across the country for disseminating knowledge through invited talks as well as panel discussions. Department consultants were members of various IAP & ICMR committees on formulating treatment guidelines for the country.

# Medical Physics

**Dr. Deepak Deshpande,**  
Head

Mr. Rajesh Kinhikar  
Mr. Ritu Upreti  
Mrs. Vijaya Someshan  
Mr. Yogesh Ghadi  
Mrs. Kalpana Patil

## **ACTREC**

Ms. Swamidas Jamema  
Mrs. Phurailatpam Reena Devi  
Mrs. Siji Paul



The Department of Medical Physics worked in close association with Department of Radiation Oncology for radiotherapy of cancer patients. The department was actively involved in dosimetry, data acquisition of various telecobalt machines, Linear Accelerators and brachytherapy machines. The planning & execution of sophisticated techniques like 3D Conformal treatment with Multi-leaf collimator (MLC), Stereotactic (SRT/SRS) and Intensity Modulated Radiotherapy (IMRT), Image Guided Radiotherapy (IGRT) treatments were some of the advanced & skilled jobs carried out by department staff. The department had kept international standards of dosimetry by participating in International IAEA/WHO/BARC dose inter-comparison and many other clinical trial protocols like RTOG / ESTRO etc.

Two (2) new linear accelerators (True Beam with Flattening Filter Free beam and Unique) with complete IGRT capabilities were procured. Detail QA and beam data measurements were carried out during the commissioning of these equipment.

The department also advised other departments like Diagnostic Radiology, Transfusion Medicine, Tissue Bank, Bio-imaging and ACTREC (CRI) for their requirements on radiation protection, QA, source procurement and disposal as per AERB guidelines.

The Medical physicists were responsible for treatment planning of patient treated by external and brachytherapies. They also calculate treatment time of therapy on machines and ensure that accurate dose was given to the patient.

## **Service**

The department had planned 6149 cases of external therapy using 2044 TPS plans for complex techniques like 3DCRT, IMR etc. and 790 cases of brachytherapy (3234 applications) in 2016. The physicists used the Radiation Oncology Information System (ROIS) for checking all calculations and took care of Quality Assurance of various machines periodically.

## **Research**

The department was part of the Co-ordination team for exporting Co-60 source to Mongolia for Bhabhatron Machine donated by Prime Minister Narendra Modi. The department worked on two projects; Dosimetric characteristics of Flattening Filter Free (FFF) beams from True Beam linear accelerator and Hi-Art II Tomotherapy and, the other on Dose Accumulation using deformable image registration for Adaptive Radiotherapy (ART). The department had been granted an IAEA project on small field dosimetry that was envisaged to be part of international guidelines for the same.

## **Education**

The staff were constantly updating their knowledge through publications and attending National and International conferences. They also educated and trained physicists, doctors, nurses, technologists and many visiting national and international (IAEA) trainees in radiation physics. The department conducted 2-year Diploma of Radiotherapy Technologist' that was recognized by the Maharashtra State Board of Technical Education (MSBTE).



Dr. Sanjay Biswas  
Dr. Vivek Bhat (ACTREC)

The hallmark of Microbiology services had been to provide rapid, accurate, reliable and affordable diagnosis of infectious diseases to all the patients referred to the department.

The diagnosis of viral infections in patients with Hematolymphoid malignancies undergoing bone marrow transplantation had been strengthened with the introduction of antigen detection tests for enteric viruses (viz. rotavirus, adenovirus, norovirus, astrovirus). The microbiology facilities at ACTREC were augmented to support the requirements of hematolymphoid malignancies and other areas of oncology.

The department supported environmental surveillance, water testing, waste management and the prevention and control of healthcare associated infections.

## Service

The total numbers of samples processed were 190802. The number of tests performed by the department showed an overall increase of 5.9% in the calendar year.

The individual sections showed a rising trend namely, increase of 3.2% in Bacteriology, 7.0% in Serology, 2.4% in Mycobacteriology, 20.5% in Mycology, 5.29% in Clinical Microbiology and 16.4% in Molecular Microbiology.

## Research

The focus was on the validation of an in-house molecular test for the early diagnosis of fungal infections and rapid tools for the early diagnosis of sepsis in critically ill patients. In vitro studies on characterization of drug resistant pathogens like *Klebsiella pneumoniae* were ongoing.

The faculty published articles in national and international journals.

## Education

The ongoing educational programs included the Certificate Course in Hospital Infection Control and, the training of nurses, dialysis technicians and other technologists in laboratory biosafety and Infection control.

# Nuclear Medicine & Molecular Imaging

Dr. Venkatesh Rangarajan,  
Head

Dr. Nilendu Purandare  
Dr. Sneha Shah  
Dr. Archi Agrawal  
Dr. Ameya Puranik  
Mrs. Bhakti Shetye  
Ms. Priya Montiero  
Mr. Ashish Jha



The Nuclear Medicine Department provided comprehensive diagnostic services and outpatient based isotope therapeutic services.

## Service

The department had two PET/CT scanners and one SPECT/CT scanner and, was the pioneer of hybrid imaging in oncology in the country. In 2016, twenty thousand three hundred fortyeight (20348) scans were performed. 18F fluorodeoxy glucose, 18F sodium Fluoride, 18F Thymidine, 18F Misonidazole, 18F Flororethyl tyrosine, 68Gallium DOTA TATE, 68Ga – PSMA whole body scans were performed. In 2016, 18F DCFPYL PSMA was added. SPECT and planar studies were done using a dozen radiopharmaceuticals prepared at the departments' Radio pharmacy laboratory. Therapeutic services were provided with 153Samarium and low dose Radioiodine. 90Y labelled microspheres were used for Transarterial radioembolisation. The

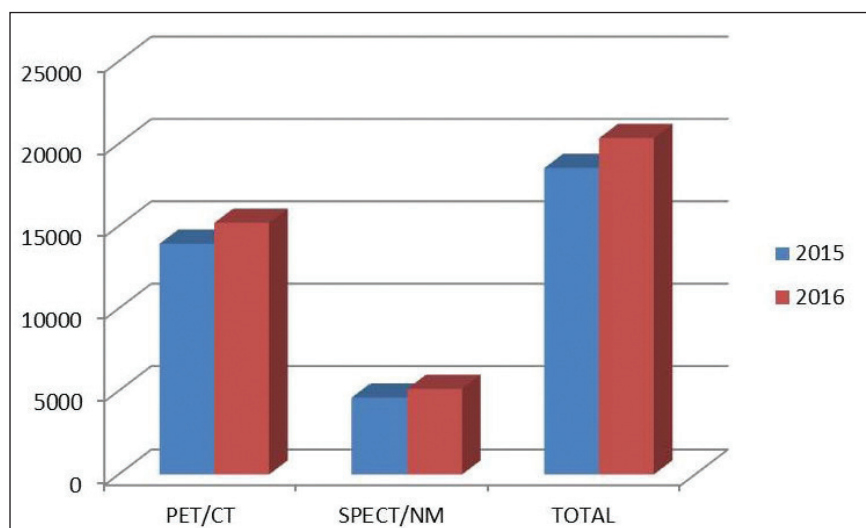
year 2016 saw introduction of 188Rhenium; 188Rhenium HEDP for pain palliation and 188Rhenium-Lipiodol for TARE.

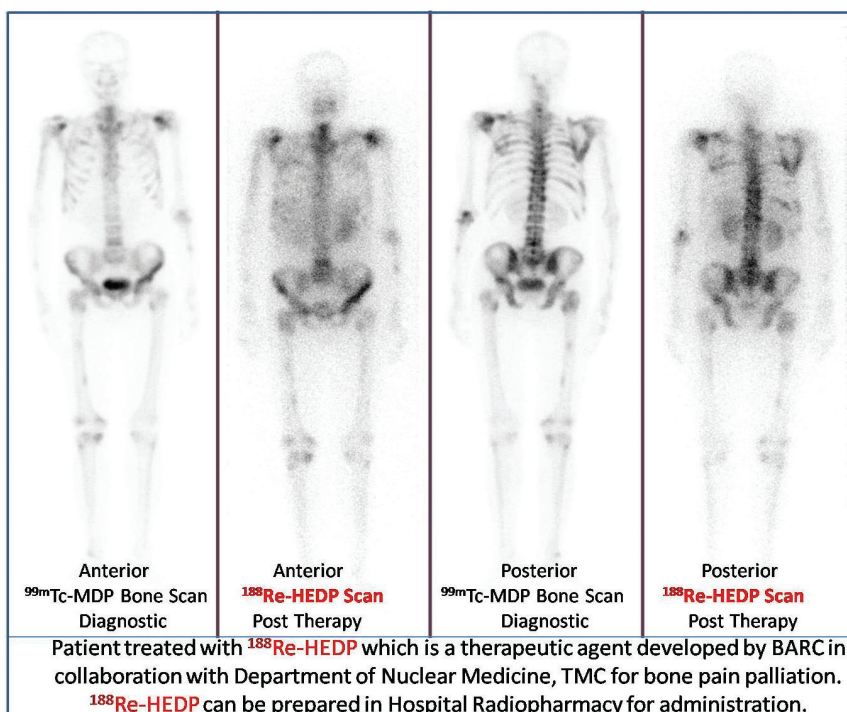
## Research

Under the radio immunotherapy programme, 131I labelled monoclonal antibody against CD20 and its biosimilar were imaged and dosimetry studies

done. 177Lu Trastuzumab diagnostic studies were done in metastatic Her2 positive patients. 131I labeled trastuzumab had completed preclinical studies.

68Ga – macro aggregated albumin, 68Ga – EDTA and 68Ga –NODAGA-RGD had been labeled at the departments' radiopharmacy and, completed preclinical tests and entered clinical services.





The departmental staffs were investigators and coinvestigators in 48 IEC approved projects.

## Education

Besides the HBNI affiliated MD Nuclear Medicine & the PGDFI programmes, several observers from hospitals in India and SAARC countries were trained in hybrid imaging. Special review course was conducted before the Radiation Safety Officer regulatory examination.

## Nursing

**Mrs. Swapna Joshi,**  
Professor & Nursing Superintendent



The nursing staff played important roles in patient management besides their normal duties of patient monitoring, administration of medications, maintenance of IV lines etc. They provided an atmosphere that was physically, socially and psychologically conducive for the patients. They maintained prompt and accurate patient data and, maintained good communications with the doctors. Beyond the physical support and care that was provided to the patients, they were also emotional pillars to the patients and their family members. Specialized nursing staff educated the patients on individualized special care and provided information on home care after their treatment and taught individuals and their care-takers, how to administer medication or complete other self-care tasks.

### Service

The nursing fraternity of Tata Memorial Hospital created exceptional experiences for the patients that its staff were privileged to serve. The nurses were the driving force behind quality initiatives for the patients. They initiated important research studies and provided critical insight to collaborative decision making and raised the levels in patient care.

The nurse-led clinics such as C.V.A.D. and Enterostomal Therapy augmented patient care and, few nurses from operation theatre were trained in assisting for minimal invasive surgery

Mrs. Carmine Lasrado,  
Deputy Nursing Superintendent  
Mrs. Prathepa Jagdish,  
Associate Professor  
Mrs. Manorama Anilkumar,  
Asst. Nursing Superintendent  
Mrs. Anita R. D'Souza,  
Professor cum Vice-Principal  
Mrs. Sindhu Nair,  
Asst. Nursing Superintendent

### Education

Taking the mission of education forward, the nurses were involved in conducting "Indian National Training Program in Pediatric Oncology Nursing", under the project "My Child Matters" initiated by the SANOFI ESPOIR Foundation. Sixty five nurses from various hospitals across India participated in the workshop. The "Train the trainer" program was conducted with the objective of standardizing nursing care to pediatric cancer patients across India.

Using the principles of evidence-based methodology, many annual courses were offered in wound management, pain management, occupational safety, administration of cytotoxic drugs, stress management, critical care, care of patient with PICC, life support etc. There was constant influx of nurses from other institutions and they learnt from the large and varied cancer population in TMH.

Ms. Shweta Ghag had two oral presentations at the 48<sup>th</sup> Congress of International Society of Paediatric Oncology (SIOP) in Dublin - 2016.

**Dr. Mary Ann Muckaden,**  
Head (till October 2016)

**Dr. Jayita Deodhar**  
Officer in Charge  
(from November 2016)

## Palliative Medicine

Dr. Naveen Salins  
Dr. Arunanghsu Goshal



The palliative medicine department kept separate consulting days for pediatric and ward patients. The Hospice liaison services were provided throughout the week. The Respite palliative care services were offered in-house and at Bandra, Mumbai.

### Education

Various preconference courses, workshops and training courses were organized by the department for medical and paramedical staff throughout the year that also included

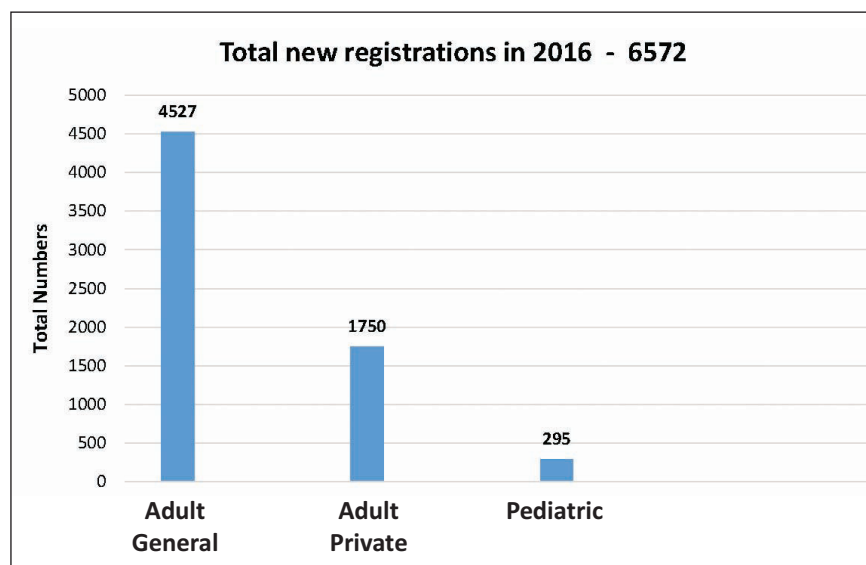
a neonatal palliative course in October 2016. A biannual pediatric palliative certificate program of 4-week duration each was organized in March and September 2016.

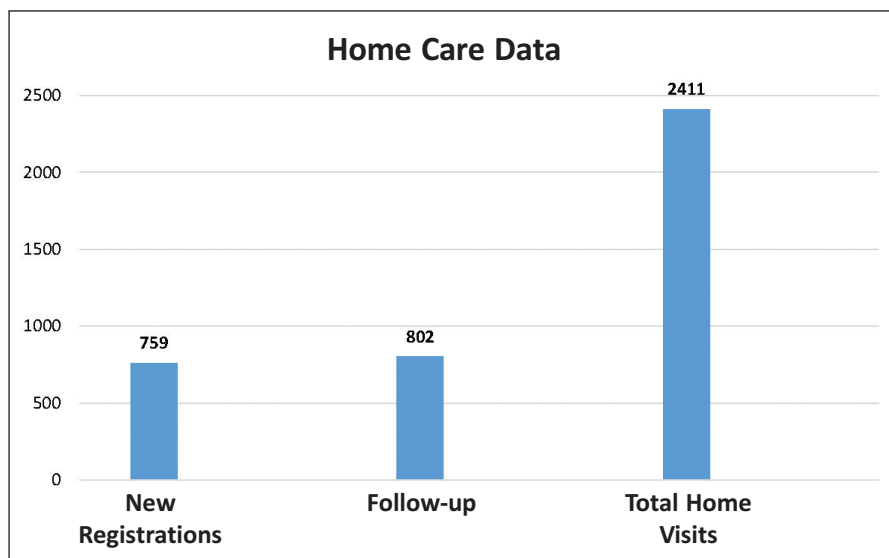
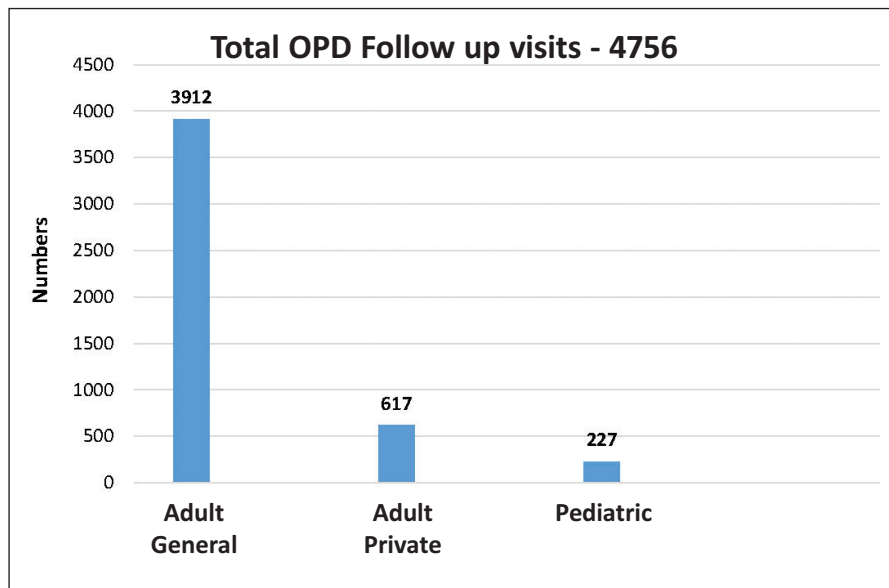
### Service

A total of 11328 patients were attended by the department. Where ward consultation was concerned, there had been 827 new referrals and 2254 follow-up cases. The Respite palliative care admission numbered 238, with Hospice referrals of 193 cases.

### Research

There were 24 publications in national and international journals from the department along with contribution for three book chapters. Five investigator trials and four audits were also conducted.





**Dr. Shubhada Kane,**  
Head

## Pathology



Dr. Sangeeta Desai  
Dr. Sumeet Gujral  
Dr. Tanuja Shet  
Dr. Mukta Ramadwar  
Dr. Kedar Deodhar  
Dr. Bharat Rekhi  
Dr. Munita Bal  
Dr. Santosh Menon  
Dr. Rajiv Kumar  
Dr. Neha Mittal

Dr. Ayushi Sahay  
Dr. Uma Sakhadeo,  
Dr. Subhash Yadav  
Dr. Katha Kante  
Dr. Aekta Shah  
Dr. Omshree Shetty  
Mr. Nitin Shinde  
Mrs. Neelam Prabhudesai  
Mr. Jennet Chowalloor

### **ACTREC Staff**

Dr. Asawari Patil, OIC  
Dr. Epari Sridhar  
Dr. Swapnil Rane  
Dr. Papagudi Subramanian,  
OIC, Hematology  
Dr. Meera Ghadge,  
OIC, Biochemistry  
Mrs. Ujjwala Joshi,  
OIC, Surgical Pathology Laboratory  
Mrs. Manisha Kulkarni,  
OIC, Pathology Academic Program

The department of pathology provided a wide range of diagnostic services viz. Surgical pathology, Fine needle aspiration cytology, Exfoliative cytology, Molecular pathology testing of solid tumors, Biochemistry and Hematopathology to all in-house patients and, the expertise was extended to cancer patients throughout the country as a referral center. The department maintained a National Tumor Tissue Repository to facilitate translational research.

### **Service**

The department offered diagnostic services to 57460 (TMH) histopathology cases in the year 2016 that included small biopsy, big specimen and outside processed referral material. Overall there had been a rise in total number of TMH cases by 3.47%. A total of 6264 frozen sections and 105000 immuno-histochemistry slides were examined.

### **Research**

Many senior medical staff members were Principal Investigators or co-investigators for the projects based on histopathology and molecular pathology related to their system subspecialty. There were more than 60 publications in the peer reviewed indexed journals from the medical & scientific staff.

## Education

The number of catalogued teaching and learning sets increased to 8187 glass slides and 1344 gross specimens (Mounted and unmounted).

The department conducted seven workshops on Grossing and Minimum dataset reporting for common cancers in the North east region of India, under the aegis of National Cancer Grid from Sept 12<sup>th</sup> to 21<sup>st</sup> 2016 with the aim to improve quality of surgical pathology reporting.

External Quality Assurance program (EQAS) in Histopathology was started in the month of January 2016 with TMH being the nodal centre. Technical assessment program was devised and implemented and three cycles were run in the year 2016. In one of the cycles, conventional HE SECTION and digitally scanned images of the same were simultaneously sent as an experiment, and that showed encouraging results from the EQAS participants.

**Dr. Meera Ghadge,**  
Officer in Charge

## Clinical Biochemistry

Dr. Nitin Inamdar  
Dr. Pranab Sadhukhan  
Dr. Geeta Rathnakumar  
Dr. Bhoopal Shinde  
Mrs. Purva Naik  
Mr. Tanaji Matale  
Mrs. Madhuri Godambe

The 24 x 7 department was equipped with fully automated analyzers and strived to maintain the highest standards of laboratory practices and provided timely and reliable reports. In fact, the department maintained reagent stock in their own cold room. This was underpinned by a robust internal quality control and external quality assurance systems. The department continued to be accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL); ISO 15189.

### Service

The department offered routine biochemistry and tumor marker services to the patients and, 3195789 investigations were performed in the year 2016.

The samples reached the department via pneumatic chutes and were processed through the Diagnostic Information System (DIS) at the counter or through the Pre Analytical System (Aim Lab Pathfinder 350A). The equipment were interfaced bi-directionally and thus facilitated report generation and reduced manual errors; the reports being directly transferred from the instrument to the DIS and thus reduced turnaround time. Critical alert values and sample rejections were automatic and conveyed to patients via sms on cell phone.

Tumor marker assays formed an important integral part of the



department and, had attained the status as national reference centre for marker assays. Electrophoresis, immunofixation and estimation of immunoglobulin and free light chains kappa and lambda were routinely performed for many institutions other than TMH.

### Research

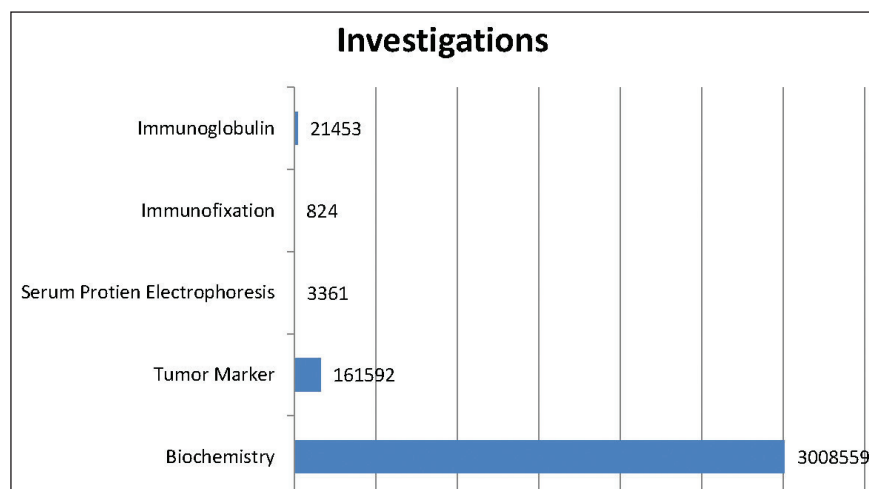
The department had participated in external quality control programs conducted by Bio-Rad Laboratories for clinical chemistry, urine chemistry,

glycosylated hemoglobin, therapeutic drug monitoring and immunoassay with good accuracy score.

“The study of Prognostic factors in Multiple Myeloma Patients” was a M.Sc. Project of Mr. Kamble ND and Mrs. Ghadge MS.

### Education

The Advanced Clinical Biochemistry Technologist Training Course focused on clinical biochemistry, tumor markers, serum protein electrophoresis and, training on therapeutic drug monitoring studies.



# Cytopathology

**Dr. Bharat Rekhi,**  
Officer in Charge



Dr. Shubhada Kane

Regular follow-up and clinical audit of all reported cytology samples was carried out to evaluate the performance characteristics. The reasons for diagnostic pitfalls, inadequacy rate, etc. were monitored and appropriate corrective and preventive measures implemented.

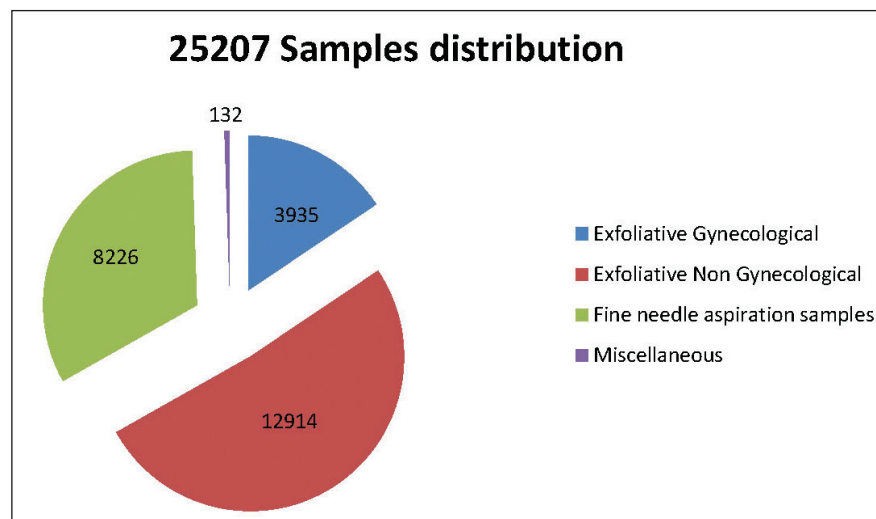
## Service

The workload of the department comprised of 25207 samples (100564 smears) as compared to 24328 samples in the year 2015.

The Immunocytochemistry services (with 30 immuno-markers) were provided to 132 cases (264 smears) and where the final diagnosis was attained; the need for biopsy for tissue diagnosis was obviated. EQAS Diagnostic Cytopathology service showed a 24% increase of participants (from 181 - 225) compared to the previous year and two cycles of the Proficiency Test series have been introduced this year instead of one cycle.

The department offered a 3-tier cancer screening & diagnostic services with a routine minimal Turnaround Time (TAT) of 24-48 hour for samples sent for cytology. It also offered special services like on-site adequacy testing of FNAC samples and image guided biopsy imprints to improve sample adequacy; immunocytochemistry enhanced diagnostic accuracy and provided faster diagnosis. Intensive Care Units (ICU) and other critical samples like cerebrospinal fluid (CSF) were reported within 4

hours. Synoptic formats were implemented that ensured uniform and unambiguous reporting. The department had been accredited for diagnostic services by Indian Academy of Cytologists (IAC) and National Accreditation Board for Testing & Calibration Laboratories (NABL) and also for training & examination by IAC. Department also provided National level EQAS Cytopathology Services for various laboratories in India.



## Research

The Department was involved in research in technical, diagnostic and quality control aspects of Cytopathology.

## Education

Staff attends training courses, conferences and undergoes regular technical and diagnostic proficiency tests in-house and run by IAC.

Every month, an interesting cytology case was uploaded on the TMC website in a quiz format.

**Dr. Papagudi Subramanian,**  
Officer in Charge

## Haematopathology Laboratory

Dr. Sumeet Gujral  
Dr. Nikhil Patkar  
Dr. Prashant Tembhare  
Dr. Ashok Kumar  
Dr. Shruti Choudhary  
Mr. Yajamanam Badrinath  
Mr. Shashikant Mahadik



Hematopathology Laboratory with state-of-the-art equipment was a service laboratory for the diagnosis of hematological malignancies, monitoring of patients while on therapy for all malignancies and, for preoperative & postoperative hematological workup of surgical patients. The laboratory performed molecular testing for initial risk stratification and identified targets for targeted therapy. The laboratory had started Next generation sequencing facilities for research in 2016. In addition, the laboratory did quality control in a cost effective manner and thereby, provided reliable results in the earliest possible time with minimal errors.

### Service

The routine hematology laboratory worked 24 hours and processed more than 1500 tests in a day. The laboratory carried out post Allogenic stem cell transplant monitoring like Chimerism analysis (1256 cases).

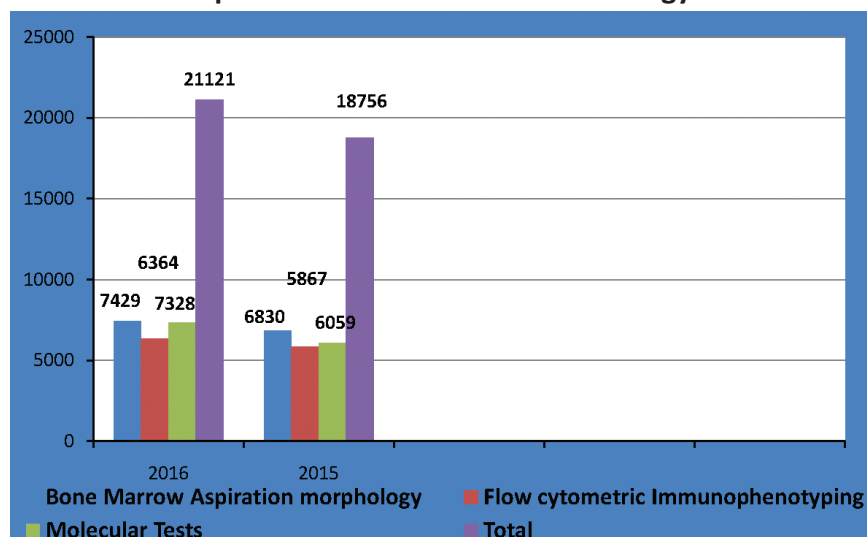
### Research

The department was actively involved in the evaluation of Minimal Residual Disease (MRD) in hematolymphoid malignancies. Gene mutation studies and Immunogenetics were other frontiers of departmental research.

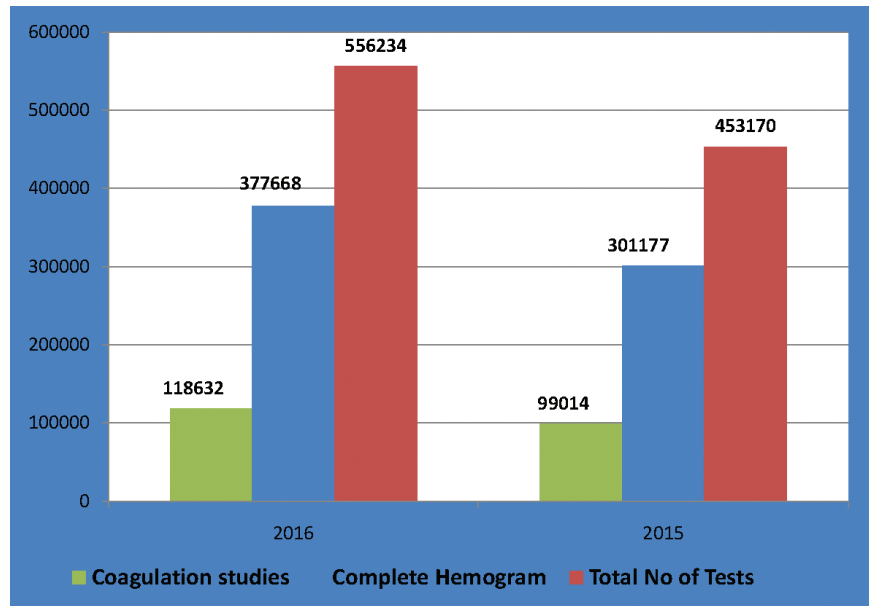
### Education

The department conducted 6-month and 1-year courses for technologists and doctors in CBC, Immunophenotyping and hematopathology. In addition, the laboratory trained and shared its knowledge and expertise to medical community in other parts of India. Thirty Five M.D. Pathologists from various parts of the country came as observers for training in morphology, cytochemistry and flow cytometry.

### Specialised test for Hemato-oncology



### Routine Hemalogical Tests



**Dr. Sangeeta Desai,**  
Officer in Charge

## Molecular Pathology

Dr. Omshree Shetty



The department of Molecular Pathology Laboratory was one of the well-recognized referral laboratories for PCR, FISH, Gene sequencing, and MLPA. All the molecular diagnostic tests were performed as per the NABL norms.

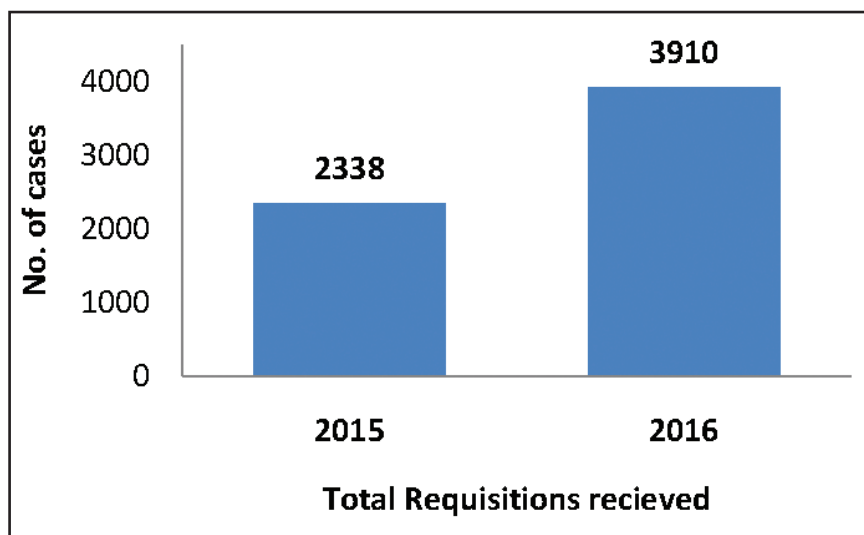
### Service

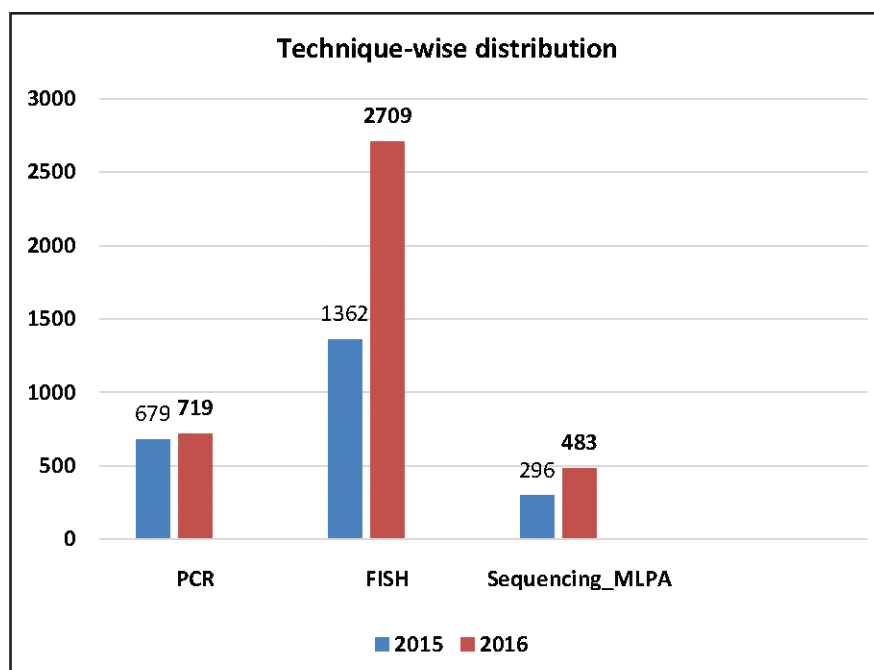
At Molecular Pathology facility, various molecular techniques were used for the diagnosis, prognostication and prediction of solid tumours. Keeping in tune with current trends in the field of molecular diagnostics, the laboratory had strived towards its goals to introduce new and clinically relevant assays. Lung gene panel comprising of *ROS1* gene rearrangement and *MET* gene amplification were introduced along with *ALK* gene rearrangement by FISH to help in target based therapy for non-small lung cancer patients. Along with the existing single gene *MYCN* amplification assay by FISH and PCR, a multigene panel (120 genes) spanning 9 chromosomes for neuroblastoma was

offered using Multiplex Ligation Probe Amplification Assay (MLPA) that aided exploration of the genetic profile of the disease and, that was instrumental in risk stratification and disease management of the patients. *MYD88* mutation analysis by Sanger sequencing also included in the Molecular

Pathology test menu helped classification of small B-cell lymphoproliferative disorders.

The laboratory also participated in the College of American Pathologists (CAP) Proficiency Testing program and UK NEQUAS proficiency testing.





## Research

There were fourteen Principal Investigator initiated projects in the laboratory with the dedicated project staff working on them.

In CNS tumors, Sanger sequencing for *hTERT* promoter mutation and Histone mutation as well as in Endometrial Stromal sarcomas, *JAZF1-SUZ12* and *YWHAE-NUTM2A* translocation detection by FISH had been standardized, and was offered as a routine service.

Gene expression profiling for lymphoma using Lymph C2X gene panel, characterization of medulloblastoma using differential expression profile 12 genes and 10 miRNA panels, had been standardized and were validated.

## Education

Two preceptorship programs for *ALK* testing in lung cancer were conducted in Molecular Pathology Laboratory during 5<sup>th</sup> - 7<sup>th</sup> February and 20<sup>th</sup> - 21<sup>st</sup> August 2016.

Under the Molecular Pathology Academic program, one-year fellowship was offered to postdoctoral candidates. Intense training was provided in various techniques viz. PCR, FISH, Primer designing, Gene sequencing, Data Analysis and interpretation.



The Department of Plastic and Reconstructive Surgery provided the best of primary and secondary reconstructive surgeries. The department also focused on resolving surgically complicated issues and also performed salvage surgery. Functional and cosmetic aspects of the patients were also addressed during the course of these surgeries.

### Service

The department performed 1006 major and 303 minor surgeries in 2016. The main operative workload (85%) was from the Head & Neck section of the institution. Free micro vascular tissue transfers (Free Flaps) with 96% success rate, continued to be the main operative workload (617 cases); the largest by any single center in India. For breast reconstruction, 45 free flaps were performed. Three hundred eighty nine (389) pedicle flaps and other major surgeries were also performed.

### Research

The department awaited the Medical Council of India (MCI) inspection and the permit for the use of the fully functional "Anatomy Laboratory for Cadaveric Dissection" at ACTREC.

### Education

On the occasion of the Annual Plastic Surgery day, the 15<sup>th</sup> July 2016, the department organized a 5-day lecture series cum workshop. Each day was devoted to a subspecialty of plastic and reconstructive surgery and, eminent faculty were called from all over the country to deliver lectures in their field of specialization.

## Psychiatric Unit

**Dr. Jayita Deodhar,**  
Psychiatrist and ad hoc Officer in Charge,  
Department of Palliative Medicine



The multidisciplinary mental health professional Psychiatric Unit conducted psychological assessment of cancer patients of all age groups and, in the in-ward and outpatient settings. The service conducted neurocognitive testing, both for clinical purposes and as part of research projects. Psychological support was provided to staff who accessed the services or were referred by the hospital Staff Clinic. A liaison input was provided in specialized clinics like Survivors Clinic (After Completion of Therapy) and Palliative Care. Individual and group psychotherapeutic sessions were conducted. The Psychiatric Unit worked in patients' career involvement by arranging psychoeducational and support activities for patients and their caregivers and survivors.

### Service

A total number of 3396 patients were seen in 2016, including 1938 new referrals and 1458 patients were

reviewed as part of consultation and liaison inputs of the psycho-oncology service. Twelve Mentoring and Capacity Building group sessions were conducted for survivors of childhood cancer. Monthly support group meetings were facilitated by Psychiatric Unit for brain tumour patients.

The Psychiatric Unit initiated a specialist pediatric psycho-oncology clinic slot, dedicated to assessing children and adolescents with their parents and addressing their specific needs.

### Research

The Psychiatric Unit was invited to conduct the translation of an online survey to Hindi that had been devised by the International Psycho-Oncology Society, in an international effort to gauge the psychosocial needs of elderly cancer patients and their family members. This information was to be collected from psycho-oncology researchers and clinicians over the world.

The current research projects of Psychiatric Unit focused on neurocognitive functioning in cancer patients undergoing treatment and their spiritual/religious well-being.

The department had one book chapter contribution.

### Education

The Psychiatric Unit staff was invited to create awareness of psycho-oncology in undergraduate and postgraduate students of SNTD University. The departmental staff was also involved in the institute's Summer School in Oncology Programme, emphasizing the importance of psycho-oncology in comprehensive care of the cancer patients.

The Psychiatric Unit undertook lectures in 29 training programmes in various specialties like for Medical Oncology (Adult and Pediatrics), M. Sc Nursing, Oncology Nursing, Palliative Medicine, Stoma Care, Speech Therapy, Rehabilitation services and NGO's.

**Dr. Shyam Kishore Shrivastava,**  
Head (till October 2016)  
**Dr. Jai Prakash Agarwal,**  
Head (from November 2016)

## Radiation Oncology



Dr. Rajiv Sarin  
Dr. Rakesh Jalali  
Dr. Siddhartha Laskar  
Dr. Sarbani Ghosh Laskar  
Dr. Tejpal Gupta  
Dr. Umesh Mahantshetty  
Dr. Ashwini Budrukkar  
Dr. Reena Engineer  
Dr. Nehal Khanna

Dr. Santam Chakraborty  
Dr. Rahul Krishnatry  
Dr. Lavanya G.  
Dr. Rima Pathak  
Dr. Shirley Lewis  
Mr. Channeveer Magai  
Mr. Premnath Yadav  
Mr. Shibnu J.  
Mr. Shrinivasan Iyer  
Mrs. Meeta Bagalkar

### ACTREC

Dr. Vedang Murthy  
Dr. Supriya Jayant Sastri  
Dr. Jayant Goda Sastri  
Dr. Tabassum Wadasadawala

The department boasted of Six Linear Accelerators (LA) and four Telecobalt Units. In addition, there was one indigenous conventional Simulator (Imagin), a CT Simulator (Somatom-Emotion) with Virtual Simulation and a Mould Room. The state-of-the-art radiation therapy CT - Simulator (Light Speed) was capable of image acquisition for 4D treatment planning & Gated Radiotherapy, along with advanced linear accelerators with facilities for Image Guided Radiation Therapy (IGRT). At ACTREC, there was one modern linear accelerator, Tomotherapy Hi-Art IGRT Linear Accelerator, the indigenous

Bhabhatron-II Cobalt Unit, and an Integrated Brachytherapy Unit with HDR Brachytherapy facilities.

Other state-of-the-art facilities included, 3-D conformal radiotherapy (3D-CRT), Intensity Modulated Radiotherapy & Radiosurgery (IMRT & IMRS) and Stereotactic radiotherapy/radiosurgery units. The "Brain-Lab" offered intra-cranial Stereotactic Radiotherapy and Radiosurgery. The Total Body Irradiation (TBI) for Bone Marrow Transplant (BMT) – built in-house was offered at ACTREC. The Oncentra Planning System was used for brachytherapy contouring and planning. The newer linear accelerators

(Novalis, Trilogy, Trubeam and Tomotherapy Hi-Art) had the facility of image guidance using Cone Beam CT and Mega Voltage CT.

### Service

In the year 2016, 6528 patients underwent radical or palliative radiotherapy treatment with a Private: General ratio of 1:2.5. Brachytherapy procedures using Iridium-192 were performed on 790 patients (3816 sittings). There was a Radiation oncology ward with 33 beds for radiotherapy and Brachytherapy patients; they were monitored 24 x 7 by competent medical staff.

For increased turnaround time, the Aria Network System transferred digital data from any CT, MR, PET and treatment planning systems to the Linear Accelerators; and, with ECLIPS TPS, fusion of PET/MR/CT images were possible for accurate planning.

The Radiation Oncology Information System (ROIS) was an integral component of the day- to- day clinical work in the department that helped streamline the process for radiotherapy procedures.

## Research

The research areas had ranged from clinical to basic research. There was focus on Indigenous Technology Development & Technology Evaluation. Some of the achievements as part of the technology / equipment development efforts included the indigenously built cobalt-60 teletherapy machine (Bhabhatron II), the intracavitary brachytherapy applicators (BARC applicator, SIVA), the interstitial brachytherapy catheters, the special fixation device for lung shields used for total body irradiation & the low density base plates for patient positioning and fixation. The indigenization of various aspects of radiation therapy equipment & accessories had a significant impact in reducing recurring cost to the institution. Most of the indigenously developed equipment were used for patient treatment within the country & abroad (Bhabhatron). As part of research, there were 112 publications including 77 original articles in international peer reviewed journals.

## Education

As an initiative towards dissemination of knowledge & hands-on training on various advanced aspects of radiation therapy IGRT, Brachytherapy and Quality, the department had organized the annual "Radiation Oncology Practicum". The department was instrumental in initiating a teaching course for radiation oncology residents under the aegis of the "Indian College of Radiation Oncology (ICRO)".

**Dr. Meenakshi Thakur,**  
Head

## Radiodiagnosis

Dr. Supreeta Arya  
Dr. Subhash Desai  
Dr. Subhash Ramani (till June 2016)  
Dr. Suyash Kulkarni  
Dr. Nitin Shetty  
Dr. Abhishek Mahajan  
Dr. Nilesh Sable  
Dr. Palak Popat  
Dr. Ashita Rastogi  
Dr. Kunal Gala  
Dr. Akshay Baheti  
Dr. Amrita Guha  
Dr. Suman Kumar Ankathi  
Mr. Trilokinath Mishra  
Mr. Wadiraj Kulkarni  
Mr. Pandurang Wagh  
Mr. Shripad Kulkarni  
Mr. Mahadeo Salunkhe  
Mr. Satish Pandit  
Mr. Ajay Girdhar  
Mr. Bhausaheb Sangle



### ACTREC

Dr. Seema Kembhavi  
Dr. Ashwin Polnaya  
Dr. Amit Janu

### Honorary Consultants

Dr. Nikhil Merchant  
Dr. Shashikant Juvekar

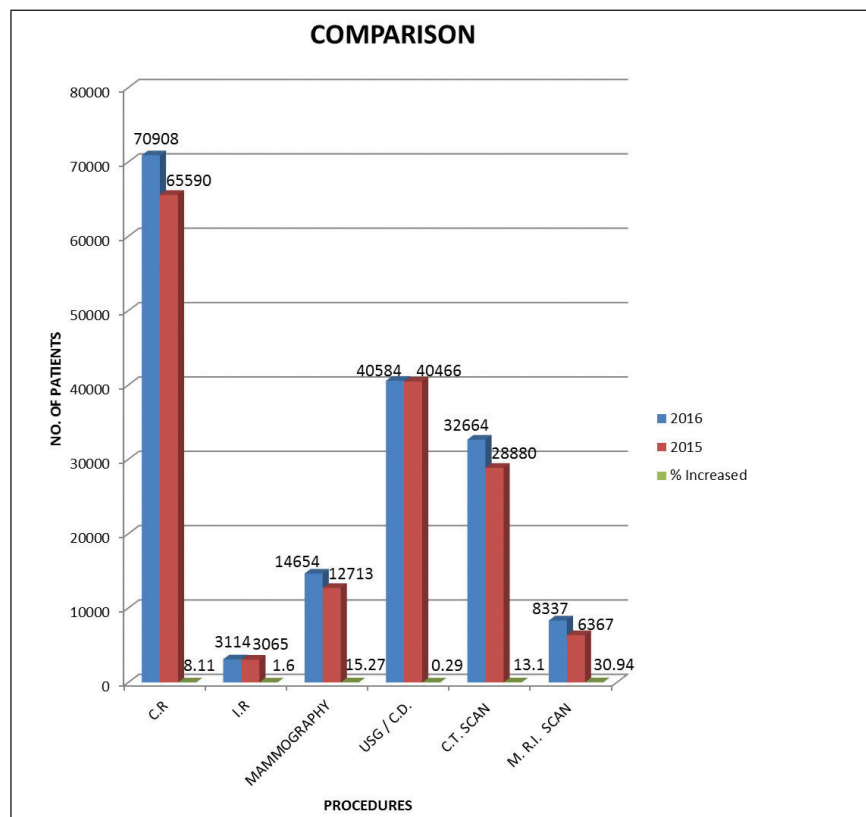
The department of radiodiagnosis was fully equipped with the latest imaging modalities and also for interventional radiology. There was tangible reduction in the waiting period for patients undergoing various investigations in the department. Mammographic examinations were performed on the day of the request itself and, ultrasonographic examination performed within 2 days.

### Research

Drs. MH Thakur, S Desai, A Mahajan and N Sable were actively involved in image processing and texture analyses, in collaboration with Shri Guru Gobind Singhji Institute of Engineering and Technology, Nanded - India.

Drs. MH Thakur, P Popat and N Sable developed an App. on the treatment aspect "Improving Gynaecology Cancer

### Service



Management”, as one of the collaborating institution with the Federation of Gynaecology and Obstetrics, and supported by the RCA wing of IAEA.

Dr. MH Thakur was the National Project Coordinator for IAEA project “RAS-6.076 (Improving cancer management through strengthening the Computed Tomography Cancer Staging process)”. With IT department Dr. S Desai

developed the TMH Patient Navigation Mobile phone application (TMH-DISHA) on all cell phone platforms.

A prototype was developed to capture live, the cumulatively patient radiation dose in diagnostic imaging and linking the same with their Aadhar card number by Drs. Subhash Desai, Suryash Kulkarni and Nitin Shetty with AERB and GE Healthcare.

## Education

There had been many national and international publications. Drs. S Arya, SS Kulkarni, N Shetty and A Polnaya had contributed to chapters in textbooks on Head & Neck surgery and hepatocellular carcinomas.

**Dr. Prabha Yadav,**  
Head

## Surgical Oncology

Dr. Indraneel Mitra  
Dr. Rajendra Badwe  
Dr. Anil D'cruz  
Dr. Rajendra Kerkar  
Dr. Ajay Puri  
Dr. Amita Maheshwari  
Dr. Devendra Chaukar  
Dr. Pankaj Chaturvedi  
Dr. Prathamesh Pai  
Dr. Vani Parmar  
Dr. Shailesh Shrikhande  
Dr. Shanmugham Pramesh  
Dr. Sajid Qureshi  
Dr. Aliasgar Moiyadi  
Dr. Vinay Kant Shankhdhar  
Dr. Gouri Pantvaidya  
Dr. Ganesh Bakshi  
Dr. George Karimundackal  
Dr. Anuja Deshmukh  
Dr. Deepa Nair  
Dr. Sudhir Nair  
Dr. Nita Nair  
Dr. Ashish Gulia  
Dr. Mahesh Goel  
Dr. Prakash Shetty



Dr. Dushyant Jaiswal  
Dr. Thumkur Shylasree  
Dr. Sabita Jiwnani  
Dr. Avanish Saklani  
Dr. Gagan Prakash  
Dr. Ashwin D'souza  
Dr. Shalaka Joshi

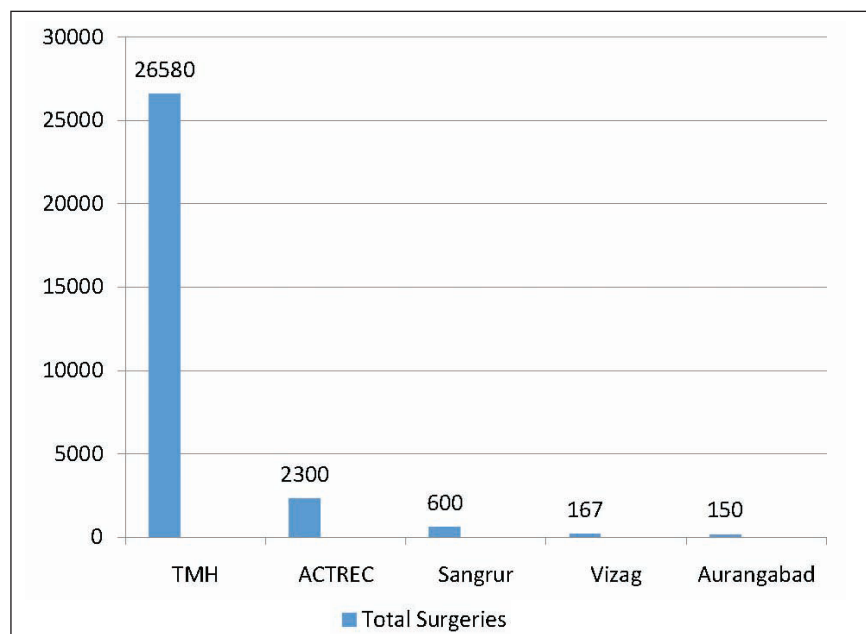
Dr. Shivakumar Thiagarajan  
Dr. Prakash Nayak  
Dr. Venkatesh Madhugiri  
Dr. Vikram Chaudhari  
Dr. Manish Bhandare  
Dr. Shraddha Patkar  
Dr. Mahendra Pal

The department continued to provide the state-of-the-art surgical care with minimal access surgeries, skull-base procedures, major vascular replacements, limb salvage, microvascular surgery and robotic surgeries.

The department extended its outreach program to Sangrur, Visakhapatnam and Aurangabad in addition to Ratnagiri, providing surgical oncology expertise in under-served areas.

The department had entered into a MOU with Lifeline Express to offer Head Neck surgical services on the world's first hospital on a train.

### Service



## Research

The department continued to conduct investigator-initiated and sponsored research studies. This year the department members edited and authored a book “Atlas of Operative Surgical Oncology 2016”. This book was an effort to give surgical oncologists access to the principles of surgery and detailed steps of established operative techniques. It emphasized the contra-indications for surgery, the operability assessment and on “what not to do”. The target audience for this book included the practicing surgical

oncologists, trainees, fellows and postgraduate students. Besides this, staff members contributed chapters to various other books and had numerous publications in international peer reviewed journals. As part of the platinum jubilee celebrations, a live surgical demonstration workshop for advanced, minimally invasive and robotic surgeries was conducted in November 2016; eight international surgeons demonstrated high quality surgical techniques over a period of 4 days. This workshop was attended by 400 surgical oncologists from across the country.

## Education

Besides the “in-house training”, the residents were exposed to basic and advanced laparoscopic hands on courses in collaboration with the clinical laboratories at ETHICON. In an effort to encourage feedback and further enhance the training activities of residents the department introduced an interactive work based assessment of residents and an assessment of teachers.

**Dr. Astrid Lobo Gajiwala,**  
Head

## Tissue Bank

Ms. Urmila Samant  
Ms. Cynthia D'Lima



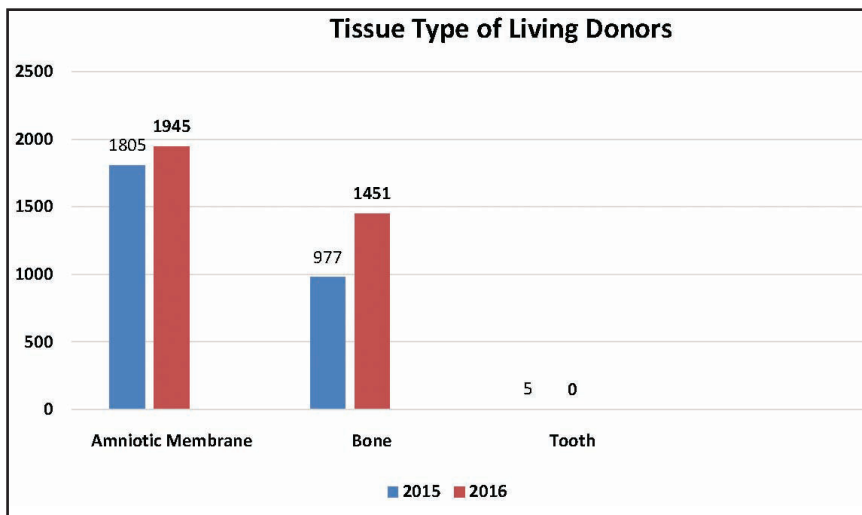
The Tissue Bank provided processed human allografts for transplantation. The tissues were procured from living donors and included amnion, a biological dressing and bone. Preserved by lyophilisation and, terminally sterilized by gamma radiation, these indigenous grafts had improved the quality of life of patients from all economic strata with concurrent reduction in hospital and medical costs due to faster healing.

The total number of Allografts produced in 2016 was 9366 that also included amniotic membranes, tendons, tooth, dentin granules, miscellaneous bone etc.

### Service

The department provided safe and effective human allografts (living and dead) for transplantation. There were five deceased and 3396 living donors.

The total number of grafts issued during 2016 was 9844 (318 TMH patients



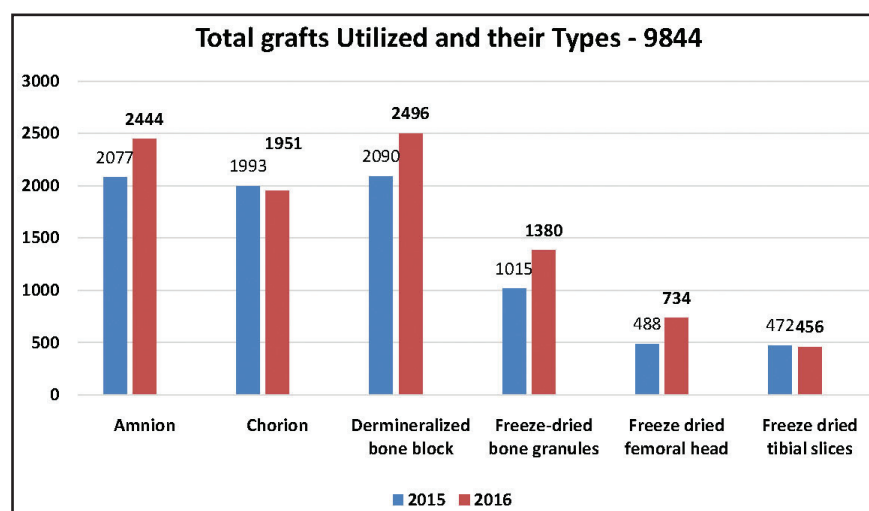
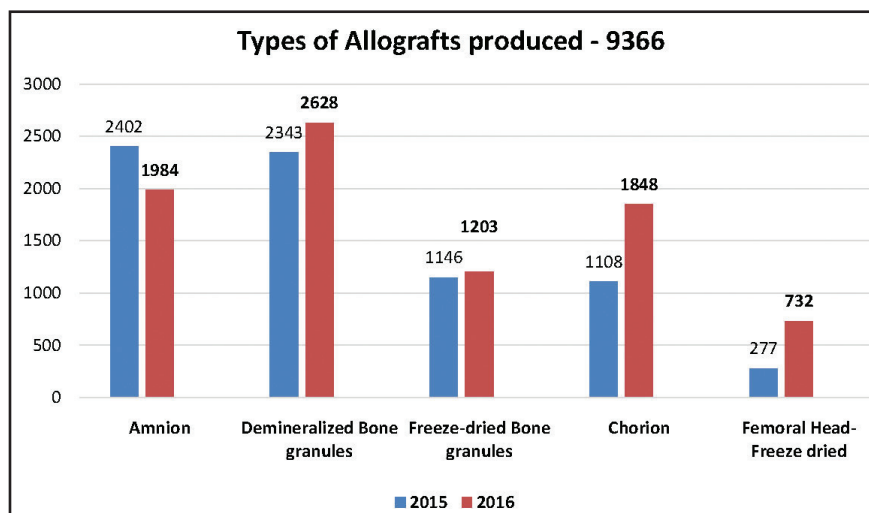
benefited) and, they were used in patients across 382 hospitals and nursing homes in Mumbai, and in 311 hospitals in the other States of India.

Eight hundred fifty one (851) amnion dressings were used in the management of moist skin desquamation (ulceration) subsequent to radiotherapy, bed sores and, as a

surgical wound cover. Twenty amnion dressings were also utilized in HBCH at Sangrur.

### Research

Besides evolving and improvising techniques for extraction and preservation of amniotic membrane, bone allografts etc. and optimal use of



irradiation, there was an ongoing project with IAEA on studying the functional properties of irradiated tissue grafts.

Dr. Astrid Lobo Gajiwala was an invited speaker in the National Summit on Best Practices in Organ & Tissue Donation in September 2016.

## Education

In 2016, 182 medical professional, transplant coordinators and medical professionals were shown around the TMH Tissue Bank and were given a lecture on the regulatory requirements of tissue banking as well as the donation, processing, and clinical use of human allografts.

The departmental staff were regularly deputed to various national and international conferences and workshops to augment their skills and stay abreast with the latest techniques in tissue banking.

The department regularly held programs via newspapers and TV for public education and awareness.

Dr. Anita Tendulkar  
Dr. Priti Desai  
Dr. Meenakshi Singh  
Mrs. Shubha Jathar  
Mr. Ravindra Kenjale



The Department of Transfusion Medicine was a vital support service that provided for the ever increasing and special haemotherapy requirements of cancer patients. The rational use of blood and blood components had encouraged more judicious use of blood resources and reduced its consumption.

## Service

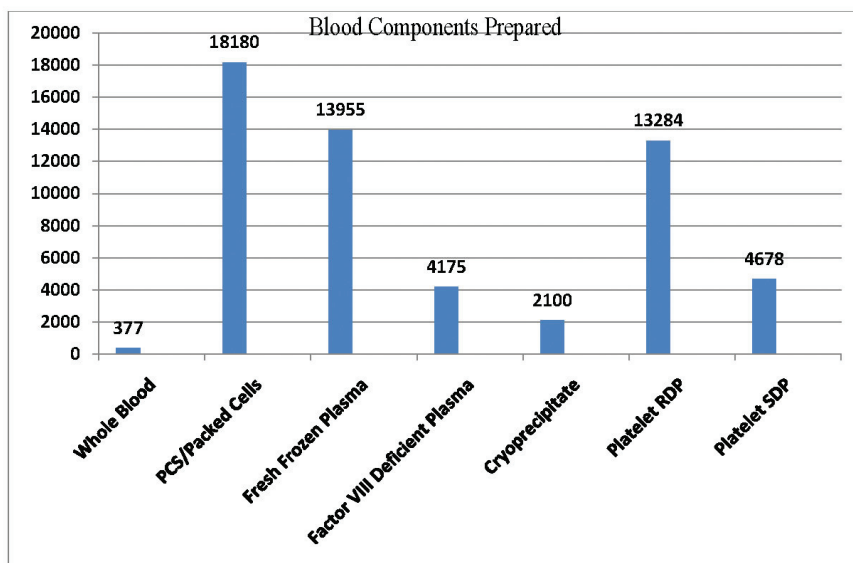
To augment voluntary donations 158 blood donation camps and 11 Platelet donor recruitment camps were held. Regular donors were also motivated for registering as marrow donors. Blood componentization was almost 100%. For patients with neutropenia and sepsis, 10 granulocyte transfusions

were provided compared to one in the previous year. Many healthcare institutions in the city availed of the specialized facility of irradiation of blood components. New assays viz. Sequence based HLA typing (SBT), Panel reactive antibodies (PRA) and Donor specific antibodies (DSA), were standardized. These tests improved outcomes after HLA-mismatched, haploidentical and unrelated stem cell transplantation.

In 2016, Twenty two thousand two hundred and fifty one (22251) units of blood and platelets were collected and 52071 blood components prepared. The plateletpheresis units prepared were 4678 and 31358 blood components were irradiated.

The Red Cell Serology Laboratory performed 58207 blood groupings, 146 Antibody detections and 21069 Cross Matching.

Transfusion reactions were observed in 42 cases.



Molecular HLA-ABDR Typing was performed on 364 patients and 866 donors.

## Research

Research focused on studying various aspects of HLA in hematopoietic stem cell transplantation as well as, bleeding risk and platelet transfusion requirements in hematologic malignancies.

## Education

The department was selected as one of the few training centers in India by Ministry of Health and Family Welfare, Government of India to conduct training in Quality Management Systems. The department organized a CME in Advanced HLA typing strategies in haematopoeitic stem cell transplantation.



# Administration



Affordable healthcare to all .... at their doorsteps

**Dr. Venkata VPRP,**  
Chief Administrative Officer, TMC  
(till April 2016)

## General Administration

Mr. Gurunam Singh Dhanoa,  
Chief Engineer  
Mr. Anil Sathe,  
Senior Administrative Officer  
Mr. Syed Jafri,  
Senior Public Relations Officer  
Mr. Rajendra Jaiswar,  
Senior Personnel Officer

Mr. Perumpully Sukumaran,  
H. R.D. Coordinator  
Mrs. Indira Pasupathy,  
Joint Controller (F & A)  
Mrs. Shailaja Brid, Purchase Officer  
Mr. Johnson Lukose,  
Deputy Chief Security Officer

Mrs. Rajlaxmi Naik,  
OIC House Keeping Department  
Mr. Arun Kuvalekar,  
Stores Officer  
Mr. Rajendra Patil,  
Jr. Administrative Officer

Tata Memorial Centre, a Grant-in-Aid Institute of the Department of Atomic Energy, Government of India was keenly involved in upgrading its facilities to bring in the latest technology for diagnosis and treatment in Oncology. Its infrastructure was regularly augmented to suit the needs of the doctors, staff and the patients. The progress and development of the institution depended to a great extent on the functioning of its personnel; and the activities and management of the centre involved a highly complex administrative machinery.

The **Administration** comprised of a team of officers such as Chief Engineer, Sr. Administrative Officer, Sr. Public Relations Officer, Sr. Personnel Officer, HRD Coordinator, Joint Controller (F & A), Purchase Officer, Dy. Chief Security Officer and Stores Officer.

The **Accounts Department** (Mrs. Indira Pasupathy and her team) was responsible for patient's billings, receipting and settling accounts of different categories of patients that included activities related to smart card, cash paying, trust, company refereed patients etc. The Department was also responsible for budgeting, utilization of the plan and non-plan grants, submission of various reports to DAE regarding utilization of funds and status of Plan Projects. During the financial

year 2016-17, Non Plan Grant of Rs.289 crores was received and was fully utilized. The Plan grant sanctioned Rs. 181 crores and all targets proposed were met. Implementation of Smart Card across all services provided unhindered financial transactions during the demonetization period.

The main function of the **Centralized Store** (Mr. Arun L. Kuvalkar and his team) was to stock and support regular requirements of the various Wards/OPD's/Labs/Departments as and when required. The stores received stock and non-stock consumables items such as paper and stationery, housekeeping items, disinfectant, crockery, engineering items, nursing items except drugs and surgical goods. After receiving the same, they were entered into the system and GRIN generated. The soft copy of GRIN was forwarded to accounts dept. for payment as a paperless activity, holding 352 items. The inventory of the department was computerized and supported timely supply of requested items and was completed as a paperless activity. The stores also received capital items required by Surgical Oncology, Radiation Oncology, Radiodiagnosis, Laboratories and other supporting departments and, maintained their records. Materials like consumable or capital items received free of cost or as

donations or under projects were also recorded in the system. The stores also conducted physical verification and tagging of assets routinely; the tagging of assets was completed till December 2016. There was no discrepancy in the ledger and of the physical balance during the annual stock taking. The store ensured environment friendly disposal method for all discarded items including empty printer cartridges.

The primary aim of the **Engineering Department** (Chief Engineer, Mr. Gurunam Singh A. Dhanoa and his team of Mr. Renzo R. Rodriques, Mr. Milind K. Nate, Mr. Rohit Swarup K. Sharma, Mr. Kishore K. Karle, Mr. Sandip R. Kalwaghe, Mr. Ravindra B. Kapshe, Mr. B. D. Patil and others) was to ensure smooth functioning and maintenance of the hospital complex, its infrastructure and, various electrical and gaseous utilities including MEP Services, medical gas, HVAC, telephone and AV, PAS, FAS, FF, pneumatic chute, power and water supply, elevators and escalators, etc. Timely maintenance (routine & preventive) ensured reduced breakdowns & smooth functioning of the hospital. To further enhance the overall performance of the department and maximizing the use of available manpower, the department had implemented Computerized Complaint Management System in late 2016. The

saving in power consumption was achieved by maintaining highest power factor, replacing existing florescent light fittings by LED lights, modification in the existing HVAC system, etc. While selecting new MEP equipment, emphasis had been on energy efficiency. This resulted in less power consumption and remarkable cut in electricity consumption bills. The department undertook modification and renovations works as per the hospital requirements and also kept on upgrading the MEP facilities for improved performance. Modification of general OPD at Golden Jubilee building for better crowd management and creation of additional Day Care (approx. 60 beds) at Annex building were major projects in the pipeline.

The department also played a major role in developing the following facilities:

- A state of art dedicated radiotherapy facility, the Radiological Research unit (RRU) at ACTREC. The proposed building to be; basement + 7 - storey structure with buildup area of roughly 1,25,000 sq.ft. to house various radiotherapy and diagnostic imaging equipments, wards, day care center, research laboratories etc.
- Construction of Hematolymphoid Block and, Women & Children Cancer wing at ACTREC. It was proposed and planned as ground + seven - storey building that will have total build up area of roughly 1,86,000 sq.ft.
- Construction of National Hadron Beam Therapy Facility at ACTREC
- Proposed construction of Residential Quarters for Doctors & Dharamshala for patients on plot no.3/330, adjacent to Haffkine Institute
- Construction of Homi Bhabha Cancer Hospital & Research Centre, Mullanpur for Tata Memorial Centre at Mullanpur Village, Dist. Mohali, Punjab.

All these above buildings are to be designed / planned as green buildings that would be environmental friendly and with resource efficiency throughout the buildings' life cycle.

The **Food services** team (Mr. Rajendra A. Patil and his team) had a core belief that hard work, passion and dedication was the only motto to provide gastronomic delights. They considered it not only their duty, but also as a sense of satisfaction, to see satiated and happy faces of patients, doctors and nurses. Food quality was never an option; it was mandatory in the kitchen. They never compromised on quality and, also offered different menu options with improved catering. Their greatest strengths were their cooks, helpers and the other kitchen staff who kept up a strong spirit. They took pride in catering for around 1, 700 persons daily, four times in a day (TMH staff and patients from 16 different wards) and, also arranged for party catering to approximately 107 national and international conferences in 2016. They always made an effort and designed their menus in such a way that it not only excited the taste buds, but was also healthy and balanced. They also took keen interest in innovative new recipes and style of cooking. The presence of different mixture of cook types with specialist cooking techniques in different cuisines, helped try out different authentic styles and techniques in cooking.

The **General Administration** (Mr. AN Sathe and his team) added 292 employees as members to the Contributory Health Service Scheme (CHSS) and deleted 197 beneficiaries. The total Contributory Health Service Scheme beneficiaries of Tata Memorial Hospital were 5,578. Of the total 1, 143 claims received, one thousand sixty six (1,066) were sanctioned under Contributory Health Service Scheme. Information was provided to 109 requests received under Right to Information (RTI) Act, 2005. Further, the First Appellate authority received 13 appeals that were resolved within the stipulated period. The administration

supported and processed 1,525 applications for National Deputation and 450 applications for International Deputation during the year.

The role of **Housekeeping Department** (Mrs. Rajlakmi K. Naik and her team) was critical in providing a peaceful, infection free and pleasant atmosphere for the speedy recovery of the patients. The department ensured cleanliness and hygiene using latest equipment, materials and techniques. The department saw to pest control activities with proper planning and by, maintaining proper schedule so that the routine patient and doctors schedule and activities were not affected. The relocation of equipment and furniture was done in a systematic and timely manner. The department also overlooked façade cleaning, flower arrangements, garden maintenance and green waste recycling (Organic Manure Plant). The house keeping department also coordinated the speedy actions on complaints of electrical, civil, linen and laundry with the respective departments. The department actively participated in providing the appropriate arrangements during social, cultural and academic events across the hospital. They successfully co-managed the TMH Platinum Jubilee Celebration event at Tata Institute of Fundamental Research, Mumbai, along with WAMA, an Event Management Company. The annual events of Evidenced Based Management Conference and Convocation Ceremony were managed successfully with in-house services from Housekeeping Department.

The **Human Resource Development** (HRD) Department (Mr. Hemant J. Arekar and his team) ensured optimum utilization of paramedical manpower by deploying the right person at the right place. Recruitment actions for various posts and after following all procedures were taken and 95 personnel were appointed during the year. The HRD also looked after approximately 425 staff working for 323 ongoing extra mural & intramural projects.

Category	Orthopedic (OH)	Visually (VH)	Hearing (HH)	Total
Group A	–	–	–	-
Group B	04	–	–	04
Group C	05	03	03	11
Group D	09	01	01	11
			<b>Total</b>	<b>26</b>

(Total Disabled / Handicapped personnel employed)

Category	Group A	Group B	Group C	Group D	Sweepers	Total
SC	11	127	91	157	179	565
ST	01	12	10	03	02	28
OBC	14	155	16	76	09	270
<b>Total</b>	<b>26</b>	<b>294</b>	<b>117</b>	<b>236</b>	<b>190</b>	<b>863</b>

(Total SC/ST/OBC staff in TMH as on 01.01.2016)

A total of 26 disabled / handicapped personnel in different categories were employed in TMH as per details given in Table – I (Grouping depended on the salary structure).

SC/ST/OBC Officers were included in selection committees for the interview. Mr. R.P. Jaiswar, Senior Personnel Officer, TMH was the Liaison Officer for SC/ST/PH and Mr. A.N. Sathe, Senior Administrative Officer, TMH as the Liaison Officer for OBC categories.

The department conducted staff promotional activities and promoted 168 employees. Thirty nine (39) employees ceased from services during the year. All SC/ST employees were interviewed for merit based review promotion with relaxed norms and were promoted. The HRD facilitated recruitment of trainees for various short term and long term training programmes. There were 22 advanced specialized skilled courses for doctors, nurses & technicians from across the country. 181 trainees benefited during the year.

Skills of in-house employees were developed through various training programmes and workshops. Staff members were deputed for training programmes conducted by ATI, DAE and ISTM, New Delhi.

The **Maintenance, Verification & Disposal Cell** (Mr. Renzo R. Rodriques and his team) was mainly responsible for the maintenance, verification and support for repairs of medical equipments in critical areas like operating theatres, intensive care unit, recovery ward, central sterile supplies department and laboratories. They also looked into calibration of all laboratory equipments. The department ensured the continuous supply of medical gas throughout the year and coordinated with IT, Dept., and Fire Dept., for finalizing the AMC and CAMC maintenance contracts. The cell also looked after the disposal of obsolete items. About 172 tonne (470 kg x 365 days) of routine scrap was disposed of by their Condemnation and Disposal cell during the year.

The **Personnel Department** (Mr. RP Jaiswar and his team) organized training programs for the labor staff through the Central Board for Worker's Education, Ministry of Labor and Employment, Govt. of India. About 110 labor staff benefitted during the year. The hospital had 862 labor staff who are governed by the Brihanmumbai Municipal Corporation (BMC) and the Central Government (CG); the labor staff playing an important role in the areas

of cleanliness, transport of specimens, documents etc., that form an important aspect in efficient patient care. During the year, the department conducted staff promotional activities and promoted 12 labor staff; 25 labor staffs superannuated or voluntarily retired. The labor staffs were trained on behavioral aspects, communication, family budget, dignity of labor, absenteeism etc. Weekly meetings were conducted with recognized unions to resolve the common issues for smooth functioning of the hospital work and patient care. Allocation of man power to different wards, departments and sections was fulfilled to maintain a high standard of cleanliness and hygiene. The personnel department continued to provide mediclaim cashless benefit to labor staff. Submission of Identity Card form for labor staff as well as pensioner and festival advance forms were made available through online process. The Time Keeper Office functions 24 x 7 to facilitate deployment of labor staff to various departments in the hospital.

The **Personnel Department** in co-ordination with the selection committee nominated labor staff with good work and conducts record, for nomination of the "Best Worker Award"

and were felicitated at Annual Hospital Function.

The role of the **Public Relations Office** (Mr. SH Jaffrey and his team) was multifaceted and involved interaction with all TMH staff, the patients, the visitors, the volunteer organizations, the visit by guests and dignitaries and, the interaction with the media. The office was also involved in various administrative activities of the patient as well as those of the medical staff. The arrangement of venues for conferences and the lodging and boarding of visitors and guests were also handled by the department. The Public Relations (PR) played an important role in maintaining a positive image of the organization. The PR officers had to be proactive with the various publics of the institution. The department followed the simple principle of compiling data by active research, evaluating & analyzing the problems / data and plan with the management and. implemented programs keeping in consideration the resources available. Prompt feedback was accumulated to analyze the success of these programs and to improvise.

The various important areas looked into included:

- The PR staff looked in the legal technicalities of all foreign national patient's registration in the hospital and also that of their medical attendants in the hospital
- Information booklets, pamphlets were regularly distributed to the patients
- Facility to translate patient's documents from their local or foreign languages to Indian

languages (English, Hindi, Marathi) was also provided

- All LIC Policy death claims were processed by the PR department so that relatives did not have to face any hardship for claiming their insurance. 194 death claims had been processed in 2016
- The PR Department in co-ordination with various NGO's organized programmes like outings, cultural programmes, yoga sessions, movie shows etc. for the patients regularly
- The PR department was also in charge of the Hindi Cell that monitored the Implementation of the Official Language Policy of the Government of India in the Hospital.

**The Purchase Department** (Mrs. Shailaja E. Brid and her team) through their automated systems was involved in the procurement of various consumables, capital equipments, minor equipments, spare parts, local purchases etc. The primary aim of the purchase department was to provide efficient and exceptional service to the entire centre by way of arranging materials and services of requisite quality minimizing the lead time.

E-tendering system is carried out satisfactorily with the help of DAE's Tender Vizards.co,

During the financial year 2016-17 Purchase Department facilitated acquisition of:

- Capital Equipment's, Spares, Consumables, and Work Order worth Rs.25 crores from Import Cell

- Consumables, Spares, Local Equipment worth Rs.13 crores from Non-Rate Contract channel and,
- Reagents, Consumables, and other essential services for the Centre worth Rs.46 crores from Rate Contract Cell through its automated systems. Total material and services worth Rs.84 crores was arranged in the concluded financial year.

The **Security Department** (Mr. Johnson Lukose and his team) was responsible for all the security aspects of all the 5 buildings within the campus of TMH. Fire safety measures and fire-fighting, calamities through nature like earthquakes and, water logging due to rains or pipe burst / block, electrical malfunctions including short circuiting, were all under their jurisdiction. Vigilance for all and addressing criminal complaints fell under their purview. The staff regulated the movement of people, material and vehicles, and scrutinized and verified, the documents of foreign nationals and their attendants before registration and admission, and liaised with the local police and civic officials. The department was the custodian of all vehicles, donated or otherwise, and was free to deploy them as and how they were required.

The vigilance Awareness Week 2016 was observed from 31.10.2016 to 05.11.2016 and the pledge in Hindi and English was administered. Adequate arrangements were made during VIP visits in coordination with Police and related agencies.

## Assistant Medical Superintendents

Dr. Sandeep Sawakare  
Dr. Sumedha Patankar  
Dr. Vinit Samant

The Medical Superintendent (MS), Dr. Sarita V. Khobrekar and her team was in charge of all the medical administrative, patient and other clinically related activities of the institution.

The Medical Administration liaised between the patients, the medical staff and the administration. Their association with patients began from patients' registration till their discharge and their grievances were also addressed. They took proactive steps for quality control and patient safety. They addressed the administrative issues from the nursing department and the medical staff. The functioning of the pharmacy, staff medical clinic, operation theatre sterilization, bioengineering, medical social workers etc. were also under their purview.

## Biomedical Engineering

Justified by the increased emphasis on effective management and maintenance of medical equipment, the department of Biomedical Engineering headed by Mr. Milind H. Raut, was established as an independent entity from 1<sup>st</sup> Feb. 2016. The team comprised of three engineers including the department in-charge, one administrative officer and other supporting staff.

The department actively oversaw the maintenance and repair activity of hospital's medical equipment. One of the major activities of the department was the processing of AMC, CMC, Repair work orders etc. that included cost estimation, vendor liaison, price negotiations and verification of the medical equipment procured and used. It also coordinated all issues pertaining

to I.T., Fire & Safety, and office equipment contracts. Another crucial role of the department was to ensure calibration and validation of all medical equipment in compliance with NABL accreditation.

The department also contributed to new capital equipment purchase by conducting equipment planning, survey, understanding the needs of user, drawing technical specifications for tendering and later processing received offers (technical comparisons, arranging demos etc.). Thereafter, the department over looked the installation / commissioning of the procured equipment. This role was fulfilled not only for TMH, Mumbai but also at other centers of Tata Memorial Centre across the country such as HBCH Sangrur, Visakhapatnam and, all other centers. Importantly, all these functions were completed in the set time frames.

## Central Registration Office (CRO)

The Central Registration Offices for General and Private OPDs led by Mr. Sreenivas Sunkarapalli, collectively comprised of about 100 employees, who were usually the first point of contact for patients that chose to seek services at the hospital. The front office staff was dedicated to guiding the patient in activities such as determination of appropriate category and specialty, conducting registration and issued smart cards. To guide and assist patients in the OPD areas, there were secretaries in every DMG engaged in preparing investigation requisitions, memos, protocol letters and cost and other medical certificates. They also issued appointment slips to the patients for their subsequent visit and various

travel concession forms. In the year 2016 and excluding preventive oncology patients, the CRO office registered 64, 258 new cases out of which 27, 279 were registered under the General category, 13, 505 were registered under the Private category and 23, 474 were cases referred to TMH for Expert Opinion.

## Central Sterile Supplies Department (CSSD)

The CSSD headed by Mr. Rajeev G. Sawant, provided service to 23 operating theatres and other related areas in the hospital with sterile equipment and supplies. The department was well equipped with five state-of-the-art steam sterilizers, one ethylene oxide sterilizer, one plasma sterilizer, two washer disinfectors and one ultrasonic cleaning machine. The department provided uninterrupted service for patient care needs with twenty loads of steam sterilizers, 30 cubic feet materials, one load of 5 cubic feet of gas sterilizer per day and 6-8 loads of 5 cubic feet of plasma sterilizer per day. Several other items like gowns, linen packs, gauze gloves etc. were all sterilized and/or provided to service the needs of the hospital. In year 2016, the department took over the packing of all surgical instruments including MIS and Robotic Surgeries. It was planned to install two new steam sterilizers from CISA (Italy) and doubling the steam sterilization capacity in year 2017.

## Medical Social Services

Medical Social Services department headed by Mr. Ramkrishna N. Bhat, led the oncology social work to meet

challenges of diverse population across the country and, to strike a balance against odds of socioeconomic inequity, by reaching out to the patient and families to help combat cancer. The primary task was to dilute the crisis of cancer diagnosis by a wide advocacy network.

Activity	Numbers
General Treatment Guidance and Information	27, 212
In depth counseling	29, 031
Partial waiver on drugs	10, 651
Improving treatment compliance in Radiotherapy (Home Visits and Phone calls)	180
Nutritional supplements Donor and NGO	660
No of Individual Donors	359
Railway Concession Beneficiary	1, 94, 210

Support through Hospital Funds	No of Patients
Seed Money	467
Supplementary fund	171

Support through CSR	No of Patients
SBI Life CSR	162
ICICI Fund CSR	65

A trustworthy and transparent transaction for critical and needy patients was maintained by the social workers at all levels. The train-the-trainer faculty in cancer taught the oncologic social work to doctors, nurses and volunteers. For Master Program in Social Work, there was incorporation of Field Practicum Cell (theory integration into practical skills) in colleges all over India. International guests visited TMH to understand management of Social Advocacy in Cancer care in India.

### Medical Superintendent's (MS) Office

The Office of the Medical Superintendent oversaw the

functioning of various activities such as the Out-Patients Department (OPDs), Quality Management, Biomedical Engineering, Dispensary and administrative aspects of other clinical facilities. The department acted as a liaison between the medical fraternity to understand their requirements and the management to ensure appropriate execution of tasks.

The hospital saw an increase of about 5% in its new patient registrations during the year 2016, taking the number of new patient registrations to almost 70, 000. These numbers were in addition to the almost five times more number of patients visiting for follow-up care. Such burgeoning of numbers stretched-out the hospital infrastructure and service capacities that led to long waiting list for services. With an intention to reduce these waiting lists and to ensure that every patient was offered timely and adequate care, efforts were made to increase capacity and, adopted process and quality improvement measures for various services as mentioned below:

### Capacity Building:

- Hematology and Biochemistry Laboratories operated 24x7 on all days including weekends and public holidays
- Radiation Therapy timings were extended
- Day Care Services cover timings were extended and services offered on all days including weekends and public holidays.

### Process Changes:

- Admissions Desk functioning increased to 24x7 that ensured a transparent and appropriate centralized allocation of beds
- Streamlined the management of patients arriving in the Casualty Area by adding space and establishing a triage process that ensured prioritization of most critical patients
- OPD restructuring streamlined patient movement in General OPD

and, reduced congestion by shifting non-core activities out of the building.

### Quality Initiatives:

To initiate the process towards National Accreditation Board for Hospitals & Healthcare Providers (NABH) Accreditation, a team of doctors, nurses, administrative and technical staff were provided the Internal Counselors training for NABH Accreditation with a view to improve quality and consistency of patient care at the hospital.

### Recognition:

A nomination for SKOCH Good Governance Awards was applied for, which was greatly appreciated and endorsed with the SKOCH Order-of-Merit Award for Good Governance out of over 50 hospitals and healthcare institutes across India. TMC presented the 'Seed Funding' Model at the event wherein initial financial support was provided to needy patients before an alternative source of fund could be arranged for, in order to avoid delay in treatment due to financial constraints. This initiative helped by reducing the average time delay before initiation of treatment from 15 days to 2.5 days.

### Dispensary & Pharmacy Services

The Dispensary & Pharmacy Services department at TMH, headed by Mrs. Dipali D. Prabhu, comprised of three direct sales outlets, a medical items' store and surgical items' stores. The total turnover of the dispensary sales for the year 2016 was Rs.189 Crores, a 6% increase in sales over the previous year.

The mandate of Dispensary & Pharmacy Services was to adopt best inventory practices in order to ensure high availability with minimum inventory cost, remained at the heart of all practices adopted at the department.

The dispensary outlet was functional round the clock and ensured availability of medicines to patients at all times. During the year 2016, the three outlets of pharmacy handled nearly a million

sales transactions. The average number of transactions per day was 2,580 which was an increase of about 5% over the previous year.

In line with the mission of the hospital to provide service to all patients irrespective of their socio-economic background, the dispensary issued concessions on medicines to non-affording patients, based on verification and recommendation by the social worker's team. During the year 2016, concessions on medicines were provided to 10, 651 patients and the value of concession amounted to approximately Rs.1.33 crores.

During the year 2016, the Rate Contract for 2016-17 was finalized and implemented at all four centers of Tata Memorial Centre. The Rate Contract, not only provided a consistent and faster supply of medicines, but also benefitted from considerable discounts availed due to bulk pricing. The TMH formulary and rate contract was used as a benchmark by various other government and non-government institutes across the country.

## Quality Management

The quality team led by Mrs. Chitra V. Hingekar, in co-ordination with the respective Clinical Department Heads/ OICs facilitated the maintenance of continual Grant from National Accreditation Board for Testing & Calibration laboratories (NABL) Accreditation through Desktop surveillance for the Clinical laboratories.

The Amalgamation of Emergency Laboratory Services w.e.f 1<sup>st</sup> Jan, 2016 and the subsequent relocation of Hematopathology – Bonemarrow Aspiration Morphology, Immunophenotyping, Cytochemistry & Body Fluid Morphology and Cancer Cytogenetic services from TMH to ACTREC provided an opportunity to MS office for

- Expanding the services of Clinical Biochemistry and Hematopathology from general shift to round the clock services and,

- Establishing the sample transportation system from TMH to ACTREC considering the safety and sample integrity aspects respectively.

As a part of continual improvement of Clinical Laboratories, various training programmes were conducted for the existing and new staff on various aspects of Quality Management, Universal safety precautions, Fire Safety and Information technology in co-ordination with the competent TMH staff.

The First National CME Cum Workshop on "Managing Quality" in Clinical Laboratories was co – organized by Quality Manager and Clinical Laboratories on 5<sup>th</sup> and 6<sup>th</sup> March 2016 as a part of the year long Platinum Jubilee Celebrations of Tata Memorial Centre. This meeting was unique as it brought together laboratory professionals who shared their experience and discussed the Ideologies, realities and practices of Quality Management System across Clinical Laboratories.

Chitra Hingekar was presented with Bharat Seva Ratan Gold Medal Award for outstanding individual achievement in Management by Global Economic Progress & Research Association (GEPR), on 9<sup>th</sup> July 2016 at Chennai. She received the award from Hon'ble Justice K. Swamidurai of Madras High Court.

## Staff Clinic

Staff Physician Dr. Sandeep P. Tandon with Assistant Dr. Pankaj P. Rajput were involved in providing medical treatment to 2, 398 TMH staff members that included 1, 490 super staff (excluding CHS dependents) and 908 labor staff (including their dependents) for their day-to-day ailments.

## Services:

Besides providing routine activities of clinical medicine as well as occupational health related administrative responsibilities, the staff clinic managed

and reported Needle prick Injuries, vaccinated the staff against Hepatitis B, conducted pre-employment examination and, prepared health-related policies and guidelines. The staff clinic also conducted regular health check up of all staff apart from pre-employment Medical examinations.

In 2016, the staff Clinic had approximately 33,993 consultations, 319 pre-employment examinations, 183 Hepatitis B vaccinations (Super Staff 176 & Labour staff 7) and 86 Needle stick injuries. In order to facilitate more efficient management of records and patient care, the clinic had been promoting online employee portal facility to staff through which they could check their reports and prescriptions. The Health Insurance Scheme for the Labor staff ran smoothly with increasing number of Labour staff opting for it. The staff clinic started on-line activities like, prescriptions, EMR, daily notes and medical certifications.

## Research:

The clinic started initial work on computerization of health related data of all TMH staff including administrative staff and health care workers; this helped identify staff with increased risk for various lifestyle diseases so that, timely execution of appropriate interventional policies focused on these individuals helped reduce long-term disease morbidity.

## Education:

Though the staff clinic OPD was perpetually packed with around 150 to 200 staff patients daily, the clinic used every possible opportunity to educate the staff about their illness and positive health by encouraging and conducting check-ups for early detection of modifiable and treatable risk factor for lifestyle diseases like Hypertension, Diabetes, and Dyslipidemias. The staff was educated about the importance of hepatitis B Vaccination and its completion.

# Research



Affordable healthcare to all .... at their doorsteps

## TMC Research Administrative Council (TRAC)

The main objectives that lead to the constitution of TRAC in 2008 were to maintain and improve all aspects of basic, translational and clinical research at the Tata Memorial Centre (TMC). Thus, the core areas under TRAC supervision included:

- Establishment of Human Research Protection Program (HRPP) and its implementation
- To set directions, priorities and thrust areas for research as per institute's mandate
- To suggest and review proposals for collaborations between TMC and other Indian or International Institutions / Groups / Individuals / Industry
- As and when required, to suggest the names of possible Principal and Co-investigators within TMC for collaborative research
- To review the expenditure and income incurred on hospital services, laboratory and administrative functions for investigator initiated and sponsored research conducted in TMC.

(IEC: Institutional Ethics Committee; DSMSC: Data Safety Monitoring Subcommittee)

The core activities of TRAC included:

- Implementation of systematic and comprehensive HRPP that protected all research participants. Individuals within the Organization were knowledgeable and followed the policies and procedures of HRPP with the Association for the Accreditation of Human Research Protection Programs (AAHRPP)
- Quality Improvement plans – Audited the functioning of IEC-I, II, III and research projects at regular intervals
- Financial support was granted for 40 new research projects approved in 2016 that were investigator initiated and the support was extended for 35 ongoing research projects
- Timely assistance extended to accounts department on queries for non-functional research accounts.

### Meeting

As per decision of the Collegium, the progress of the approved research projects that received Intra-Mural (IM) funds in year 2010, were presented by the respective investigators. The committee members had discussed the progress of their projects and recommendations were given to those investigators.

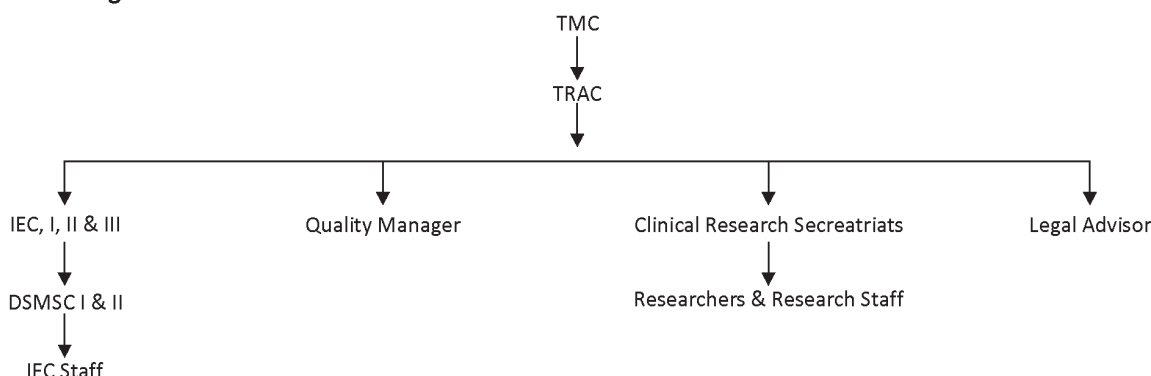
### Achievements:

- TMC-Institutional Ethics Committees (TMC-IEC) were awarded re-recognition by the collaborative initiative of the World Health Organization (WHO), called the Strategic Initiative for Developing Capacity in Ethical Review (SIDCER), at the Forum for Ethical Review Committees in Asia and the Western Pacific Region (FERCAP) Annual international conference in Bangkok, Thailand on November 20-23, 2016
- The AAHRPP completed site visit for re-accreditation of Tata Memorial Centre - Institutional Ethics Committees on November 29-30, 2016.

### Future Goals:

- The quality control program for research projects
- To develop in house program for online project submissions, tracking and review process.
- Drug Controller General of India (DCGI) mandated National Accreditation Board for Hospitals & Healthcare Providers (NABH) accreditation
- To monitor the progress of research studies supported by institutional funds.

### HRPP Organization Chart



# Clinical Research Secretariat and Department of Atomic Energy Clinical Trials Unit

**Dr. Manju Sengar,**  
Officer in Charge

The Clinical Research Secretariat (CRS) along with Department of Atomic Energy Clinical Trials unit (DAE-CTC) played a key role in facilitating research in field of oncology at Tata Memorial Hospital since its inception. The mandate of CRS included promotion of clinical research, training & education of researchers and trial-coordinators, for scientific and ethical conduct of clinical trials and propagation of practice of Evidence Based Medicine (EBM) across the country. In year 2016 following activities were conducted in each of the above mentioned domains.

## 1. Promoting clinical research

### A. Expansion of infrastructure

- i) Hub: In order to provide adequate work space for researchers and support staff, the clinical research secretariat area was expanded. This included a hub with 16 dedicated and fully equipped workstations (desktop with internet connections and one network printer) and a room for statisticians
- ii) Central Pharmacy: Was in place for storage of all trial related drugs at required temperature in compliance with Schedule Y (Investigator Product Management), ICH-GCP (E6) with controlled access. For storage of trial medicines under strict temperature control, a walk-in cooler with along with automated alarm system for temperature excides was installed
- iii) Storage space: To store all the clinical trial records in compliance with the Good Clinical Practice guidelines of

International Conference on Harmonization (ICH-GCP), a dedicated storage space with controlled access to authorized trial personnel was allocated.

### B. Statistical support for the clinical trials

The statisticians at CRS provided the expert help to clinical researchers in designing of trial, sample size calculation, randomization list generation and analysis. In year 2016, statistical support to 102 clinical trials and projects was provided in the following areas:

Analysis - 86

Randomization list generated - 06

Sample size calculation - 07

Sensitivity and Specificity analysis – 02

ROC Curve analysis and C Statistic - 02.

In addition, the CRS supported the process of randomization on on-going basis for 7 trials.

### C. Financial support for the clinical trials – A total of 15 Intramural trials was supported through the DAE-CTC and a total of Rs. 86,19,754/- were provided as financial grant.

### D. Translational support for consent forms for clinical trials – To support the increasing translation work burden, a dedicated Translator was appointed at CRS. The Translator provided expert help to clinical researchers in Informed consent translation in both, Marathi and Hindi languages. A total of 63 clinical trials consent forms had been translated in Hindi and Marathi language. Translation services also helped in proof reading and error corrections for 19 clinical trial consents.

### E. Standard Operating Procedure (SOP)

CRS was involved in conducting numerous trials that included Investigator initiated, pharma sponsored, collaborative studies (International and National) and the thesis of postgraduate students.

A detailed SOP was designed to conduct research at TMC. The SOP's were designed for uniformity in standard, quality assurance and quality control to conduct clinical studies/research at TMC.

The key element of the SOP included; Assessing Protocol Feasibility, Clinical trial agreement with sponsors or Contract Research Organizations (CRO), Interaction with IEC, Study/Research team responsibilities, Communication with sponsor or CRO, Site Initiation, activation, conduct and close out, Reviewing and obtaining Informed consent form, Recruiting study subjects, Source documentation, Managing Investigational Product, Archival of Essential documents, Safety reporting, Managing biological samples, reimbursement policies, Study team training and study handover and Transfer of patients between TMH and ACTREC.

The SOP's were designed to ensure execution of research in accordance with Institutional guidelines, updated applicable national guidelines and regulations (e.g. Schedule Y, Indian GCP, ICMR guidelines, ICH-GCP).

SOP training and education was given to the research team of TMC. It was mandatory that every research staff should be trained and must be aware of the TMC SOP before conducting research.

## 2. Training and education of researchers

- A. Clinical research methodology workshop was organized on 28<sup>th</sup> and 29<sup>th</sup> May 2016 to train researchers on various aspects of trial design and analysis. A total of 143 delegates (local and national) attended the conference.
- B. Good clinical practice workshop was organized for to train TMC Staff on ICH-GCP principles on 6<sup>th</sup> February 2016. The advanced course module was attended by 77 participants and 85 delegates attended the basic course.
- C. M Sc. Clinical Research: CRS was actively involved in MSc. Clinical Research course. In 2016, there were total 40 students in first and second year of their course. 19 students completed their course successfully and were doing Internship training in various Disease Management Groups. CRS through its clinical trial coordinators

provided support to the following activities:

- Conducted entrance exam and interview
- Coordinated lectures and study material
- Managed lectures, invigilating exams
- Managed mini library and arranged for the study books
- Rotations through various external postings.

## 3. Evidence-based meeting 2016- Tata Memorial Centre's Platinum Jubilee Conference, the first event to commemorate "A Conference of New Ideas in Cancer-Challenging Dogmas":

One of the important aims of CRS / DAE-CTC was to propagate and promote practice of evidence based medicine especially in cancer. In this regard Evidence Based Management meetings were started about a decade ago. Tata Memorial Centre

celebrated 75 years of its existence; to mark the 75<sup>th</sup> year, the Centre planned three scientific meetings. This first conference was to celebrate platinum jubilee, devoted to challenging the current dogmas and to debate the 'currently entrenched versus contrarian viewpoints' in cancer research and treatment. Key international speakers and participants deliberated on these issues critically over 3 days of the conference on carefully chosen themes in the form of symposia, debates and special lectures. Some of the emerging messages would lead to potentially paradigm shifting approaches to how cancer was perceived and treated. A total of 1025 national and international delegates (including SAARC countries) participated in the meeting. The abstracts of the meeting were published in European Journal of cancer and proceedings of the conference were published in an abstract book.

# Institutional Ethics Committee (TMC IEC - I & II)

**Dr. George Karimundackal,**  
Member Secretary, IEC - I

**Dr. Sarbani Ghosh Laskar,**  
Member Secretary, IEC - II

The Institutional Ethics Committees-I & II (IECs) were constituted by the Director, Tata Memorial Centre (TMC) under authority vested by the Governing Council of the TMC and registered with Drug Controller General of India. IECs were appointed for duration of 2-year and each functioned with the same purpose and based on Standard Operating Procedure(s) (SOPs). They bore registration numbers ECR/170/Inst/MH/2013 and ECR/414/Inst/MH/2013 for IEC-I and II respectively, issued under Rule 122DD of the Drugs & Cosmetic Rules 1945.

The institution had a Federal Wide Assurance (FWA) with the Department of Health and Human Services (DHHS) through the Office for Human Research Protections (OHRP). The assurance number was FWA00006143 and was periodically renewed as required.

The IECs were also registered with Office for Human Research Protections (OHRP) and had Institutional Review Board Organization (IORG) Nos. IRB00003414 and IRB00007802 for IEC-I & IEC-II respectively and was periodically renewed as required.

The IEC did not address or interfere in matters of administration, nor did it function as a grievance cell for staff members.

## **The IEC mandate included:**

- Ensuring the highest scientific and ethical standards of research at TMC
- Reviewing and approving proposals for clinical, basic or translational research projects (Intra and Extra mural) for scientific and ethical content
- Improving ethical standards and issuing guidelines on ethical dilemmas related to patient care services
- Functioning as a forum to advise the administration in case of any ethical issues that may arise from patients, families or public
- Maintaining leadership as a national standard of reference in all fields
- Issuing and periodically updating, the revised SOPs and guidelines for effective functioning of IEC as and when necessary
- Continuing education in clinical research bioethics and ethical aspects of clinical practice through seminars, workshops and interactive discussions for all categories of staff members including nursing and paramedical staff
- Initiating and commissioning research studies on ethical aspects of practice in TMC.

The IEC endeavored to provide guidance on a broad range of topics such as disclosures of diagnosis, diagnosis of brain death, indications for stopping resuscitation, true informed consent, etc.

The Institutional Ethics Committees - I and II (TMC-IECs) were involved in the review of both industry sponsored & investigator initiated research proposals (national and international) as well as intramural and multicentric ones. The committees also reviewed number of research projects submitted as part of students' thesis. The meetings of the two Committees were conducted once every month in order to facilitate timely and accurate ethical reviews while maintaining high standards of the review process.

The Tata Memorial Centre, Ethics Committees had both in-house members as well as experts from outside the institution. Each Committee, IEC I & IEC II, consisted of 15 members and included scientific and non-scientific, clinicians and non-clinicians, clinical pharmacologist, medico-legal expert, social worker, and a layperson / patient representative in order to have representation from a wide range of stakeholders.

## Institutional Ethics Committee (IEC-I) w.e.f. April 2016

Sr. No.	Names	Position	Affiliation	Gender	Expertise
1.	Dr. Tapan Saikia	Chairperson	Head, Dept. of Medical Oncology & Research Director, Prince Aly Khan Hospital	Male	Medical Oncologist
2.	Dr. Nithya Gogtay	Co-chairperson	Professor, Dept. of Clinical Pharmacology, KEM Hospital	Female	Clinical Pharmacologist
3.	Dr. George Karimundackal	Member Secretary	Professor, Dept. of Surgical Oncology, Tata Memorial Hospital	Male	Surgeon
4.	Dr. Prachi Patil	Member & DSMSC Secretary	Associate Professor, Dept. of Digestive Diseases & Clinical Nutrition, Tata Memorial Hospital	Female	Gastroenterologist
5.	Ms. Manisha Naikdalal	Member	Member of Ethics Committees at KEM Hospital (ECRHS) & Hinduja Hospital(CREC)	Female	Lay Person
6.	Prof. Bindhulakshmi P	Member	Associate Professor, Advanced Centre for Women's Studies, School of Development Studies, Tata Institute of Social Sciences	Female	Social scientist
7.	Dr. Suganthi Iyer	Member	Dy. Director (Legal & Medical) Hinduja Hospital	Female	Medicolegal expert
8.	Dr. Sanjay Gupta	Member	Scientific Officer, CRI- Advanced Centre for Treatment, Research and Education in Cancer (ACTREC)	Male	Basic Scientist
9.	Dr. J P Agarwal	Member	Professor & Head Dept. of Radiation Oncology, Tata Memorial Hospital	Male	Radiation Oncologist
10.	Dr. Vijaya Patil	Member	Professor, Dept. of Anesthesia Critical Care and pain, Tata Memorial Hospital	Female	Anesthetist
11.	Dr. Devendra Chaukar	Member	Professor, Dept. of Surgical Oncology, Tata Memorial Hospital	Male	Surgeon
12.	Dr. Amit Joshi	Member	Professor, Dept. of Medical Oncology, Tata Memorial Hospital	Male	Medical Oncologist
13.	Dr. Tanuja Shet	Member	Professor, Dept. of Pathology, Tata Memorial Hospital	Female	Pathologist
14.	Dr. Seema Kembhavi	Member	Associate Professor, Dept. of Radiodiagnosis, Tata Memorial Hospital	Female	Radiologist
15.	Mr. Sanjay Talole	Member	Scientific Officer, Dept. of Medical records, Tata Memorial Hospital	Male	Statistician

## Institutional Ethics Committee (IEC-II) w.e.f April 2016

Sr. No.	Names	Position	Affiliation	Gender	Expertise
1.	Dr. Urmila Thatte	Chairperson	Professor & Head, Dept. of Clinical Pharmacology, KEM Hospital	Female	Clinical Pharmacologist
2	Dr. Rajesh C. Mistry	Co-Chairperson	Director, Dept. of Oncology Centre for Cancer, Kokilaben Dhirubhai Ambani Hospital	Male	Surgeon
3	Dr. Sarbani Ghosh Laskar	Member Secretary	Professor, Dept. of Radiation Oncology, Tata Memorial Hospital	Female	Radiation Oncologist
4	Dr. Yashashri Shetty	Member	Senior Assistant Professor, Department of Pharmacology & Therapeutics, Seth GS Medical College & KEM Hospital	Female	Clinical Pharmacologist
5	Mr. K.V. Ganpathy	Member	CEO, JASCAP, Jeet Association for Support to Cancer Patients since 1996	Male	Lay Person
6	Dr. Mrunal Marathe	Member	Freelance Counselor and Trainer associated with NGO-St. Jude's Childcare Centre and Adoption Group, Asha Sadan Orphanage, Byculla	Female	Social Scientist
7	Dr. Leena Gangolli	Member	Member, Institutional Ethics Committee, Nirmala Niketan College of Home Science, Consultant, Children's Palliative Care Program, Consultant, Silver Innings Foundation	Female	Medico-Legal expert
8	Dr. Narendra Joshi	Member	Scientific Officer, Advanced Centre for Treatment, Research and Education in Cancer (ACTREC)	Male	Basic Scientist
9	Dr. Umesh Mahantshetty	Member	Professor, Dept. of Radiation Oncology, Tata Memorial Hospital	Male	Radiation Oncologist
10	Dr. Priya Ranganathan	Member	Associate Professor, Dept. of Anaesthesia, Tata Memorial Hospital	Female	Anesthetist
11	Dr. Gouri Pantvaidya	Member & Joint Secretary, DSMSC	Associate Professor & Assistant Surgeon F, Head and Neck Oncology, Tata Memorial Hospital	Female	Surgeon
12	Dr. Girish Chinnaswamy	Member	Associate Professor, Dept. of Medical Oncology, Tata Memorial Hospital	Male	Medical Oncologist
13	Dr. Kedar Deodhar	Member	Professor, Dept. of Pathology, Tata Memorial Hospital	Male	Pathologist
14	Dr. Suyash Kulkarni	Member	Associate Professor & Radiologist F Departmental of Radiology, Tata Memorial Hospital	Male	Radiologist
15	Ms. Rohini Hawaldar	Member	Scientific Officer, Tata Memorial Hospital	Female	Statistician

## Project Review Process:

The IEC committees meet once every month and, as and when required. The projects were randomly assigned to either committee and, each project was allocated a unique "IEC Identification Number".

Decisions were arrived at by consensus or, by voting if the consensus was not reached. Projects for intramural funding were scored by the members as per the specified IEC scoring sheet.

The Data Monitoring & Safety Committee (DSMSC) was a subcommittee of the IEC that reviewed Serious Adverse Events (SAE's), status reports and monitored the conduct of approved projects.

Adhering to the dictum of "Good Science is Good Ethics", the IEC reviewed the projects for ethical aspects in

- Scientific Design and Conduct of the Study

- Care and Protection of Research Participants
- Protection of Research Participant Confidentiality
- Informed Consent Process
- Community Considerations
- Recruitment of Research Participants.

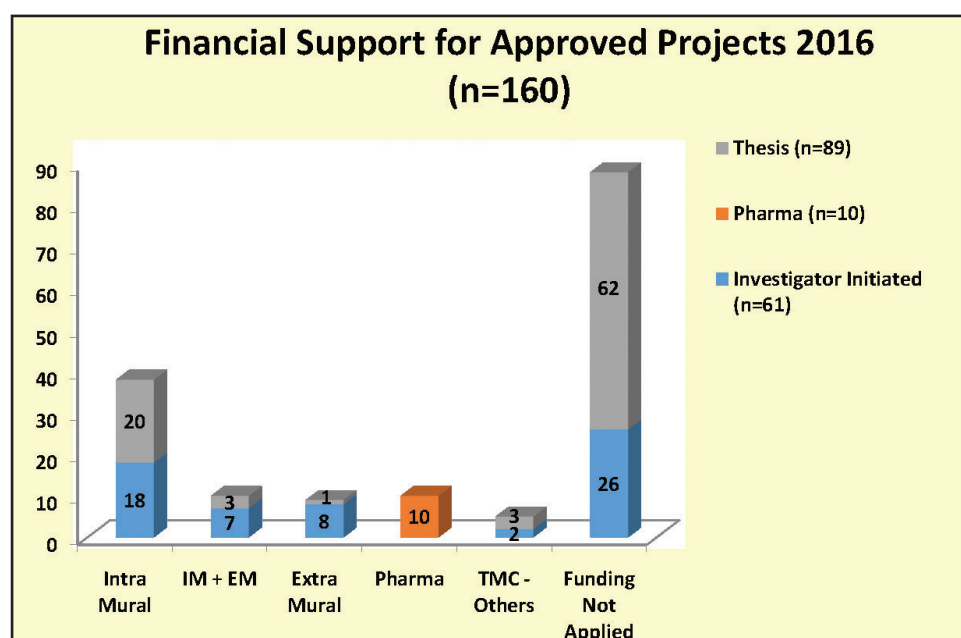
The IEC functioned as per the SOPs available on the TMC website that were laid down for this institution.

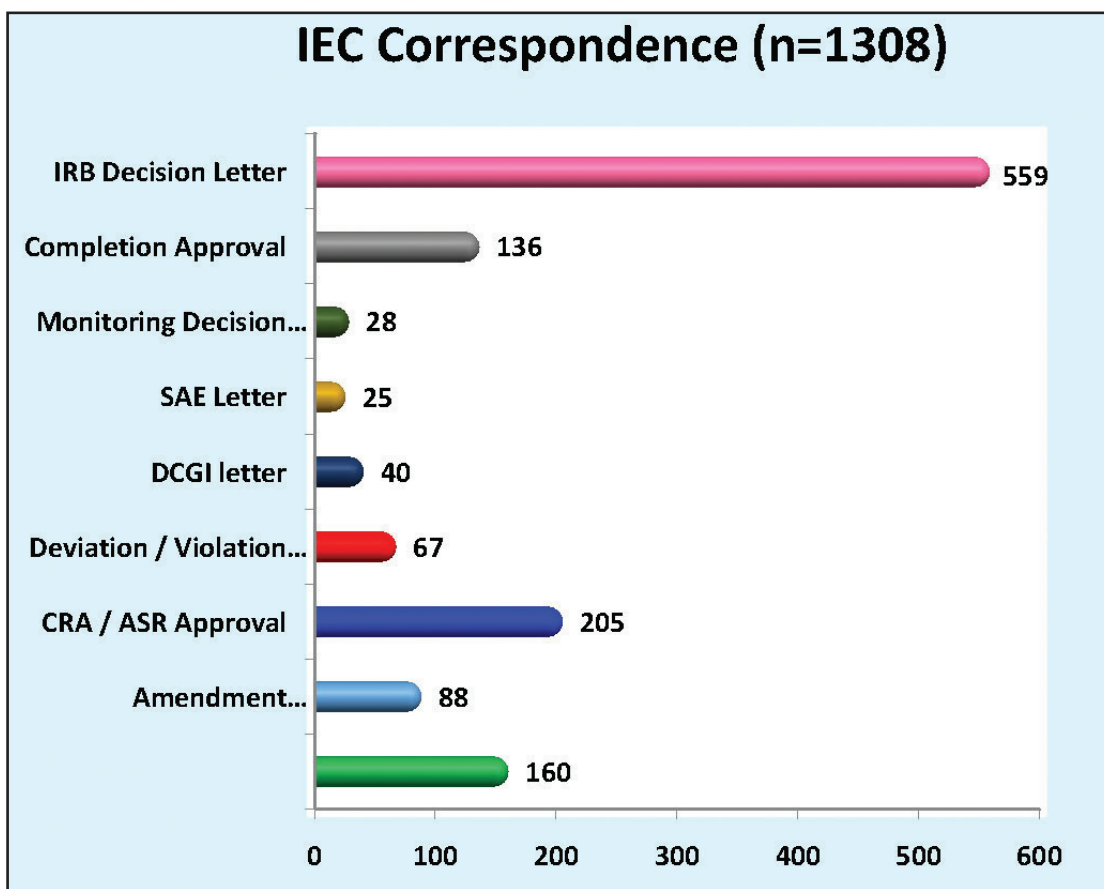
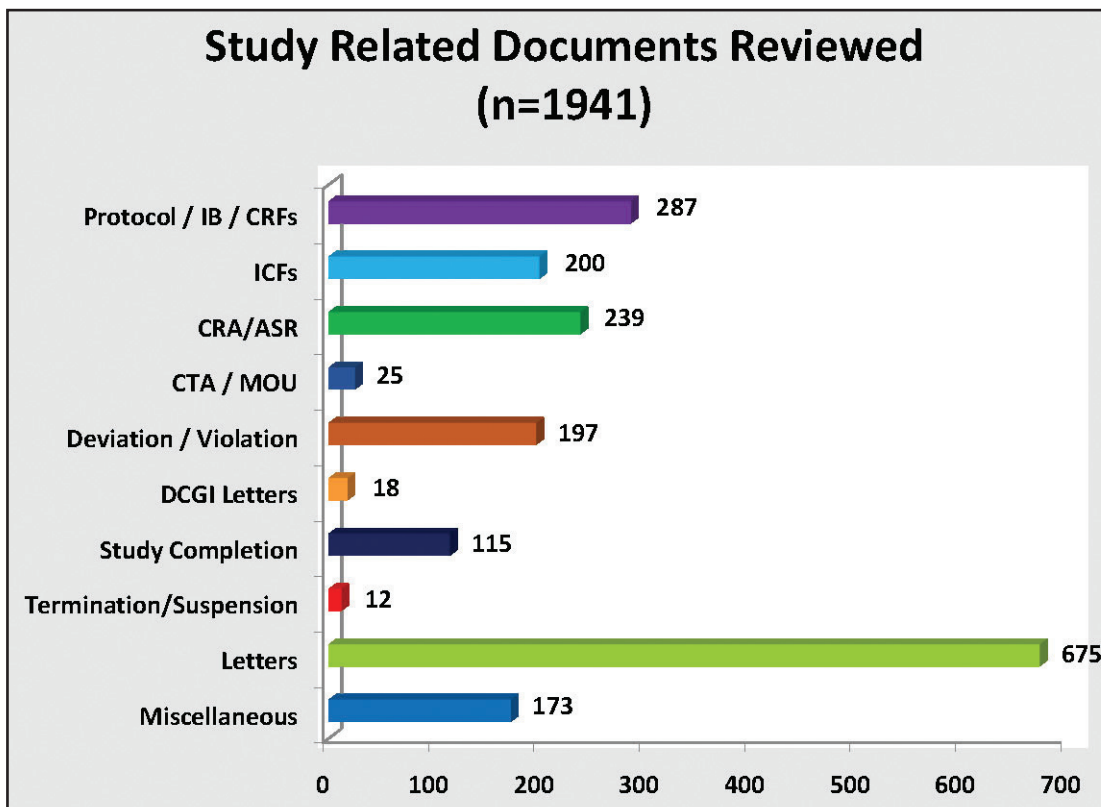
## Summary of research proposals reviewed in 2016

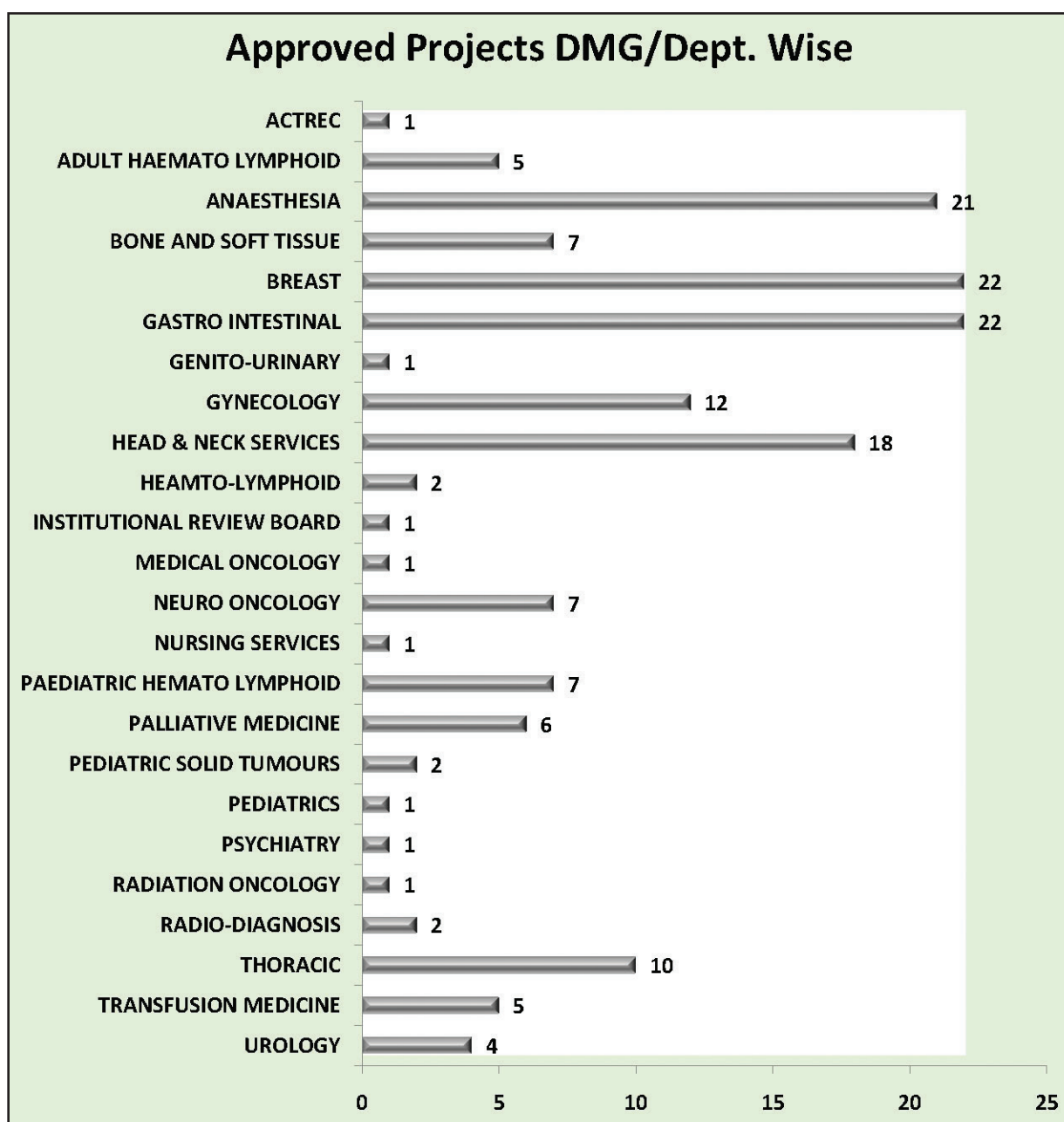
Review Year	2016		
Institutional Ethics Committee	IEC-I	IEC-II	Total
Research Proposals Reviewed	112	113	225
Research Proposals Approved	78	82	160
Research Proposals Awaiting Approval	26	27	53
Research Proposals Not approved	05	04	09
Research Proposals Exempted	03	00	03

Types of Review	Committees		
	IEC I	IEC II	Total
Full Board	102	113	215
Expedited	07	00	07
Exemption	03	00	03
<b>Total</b>	<b>112</b>	<b>113</b>	<b>225</b>

The turnaround time from date of submission to final decision was 13.7 weeks.







## Achievements

The TMC- Institutional Ethics Committees were awarded re-recognition by WHO, Strategic Initiative for Developing Capacity in Ethical Review (SIDCER) at the Forum for Ethical Review Committees in Asia and the Western Pacific Region (FERCAP) Annual international conference in Bangkok, Thailand on November 20-23, 2016.

The Association for the Accreditation of Human Research Protection Programs (AAHRPP), Inc. completed site visit for

re-accreditation of Tata Memorial Centre - Institutional Ethics Committees on November 29-30, 2016.

The accreditations provided assurance that the TMC- Institutional Ethics Committees met rigorous standards through policies, procedures, and practices of the Institutional commitment to scientifically and ethically sound research and to continued improvement.

Clinical Development Services Agency (CDSA), an extramural unit of Translational Health Science and

Technology Institute (THSTI), an autonomous organization of Department of Biotechnology, Ministry of Science & Technology, Government of India in collaboration with Tata Memorial Centre organized 3-day Program on "Good Clinical Practice" and "Current Regulatory Requirements for Members of Institutional Ethics Committees" at Tata Memorial Hospital Mumbai on February 16-18, 2016 for investigators and sub-Investigators involved in clinical research / trial, and for the Ethics Committee Members.

## Institutional Ethics Committee III

### TMC IEC - III (ACTREC)

**Dr. Vedang Murthy,**  
Member Secretary, TMC-IEC III,  
ACTREC

The TMC-ACTREC Institutional Ethics Committee (IEC-III) was established in December 2009 (reconstituted in 2012, 2014 & 2016) as per the ICMR and ICH-GCP guidelines for Ethics Committees, with a mandate for combined scientific and ethics review of research projects being conducted at ACTREC and Tata Memorial Hospital. In addition, the IEC-III seeks the help of domain experts to deliberate on projects where in-house

expertise is not available. The committee is well rounded with representation from clinical faculty, basic scientists, lay community, and legal profession. The committee met 62 times in the past seven years and 238 projects were discussed. The entire spectrum of studies involving human subjects, epidemiological studies, biological studies on human tissues, audits and human clinical trials using drugs or additional invasive

intervention were discussed and approved.

The IEC-III, constituted by the Director, TMC under the authority vested upon him by the Governing Council of TMC, monitors projects carried out predominantly at ACTREC. The term of the present committee is from 1 April 2016 to 31 March 2018. The Member Secretary of IEC-III is also a member of Tata Memorial Centre Research Administrative Council (TRAC).

Sr. No.	Name & Position	Affiliation	Expertise
1.	Dr. Rita Mulherkar Chairperson	Kharghar, Navi Mumbai	Basic Scientist
2.	Dr. Nobhojit Roy Co-Chairperson	Head, Dept. of Surgery, BARC Hospital, Mumbai	Surgeon
3.	Dr. Vedang Murthy Member Secretary	Professor, Dept. of Radiation Oncology, ACTREC	Radiation Oncologist
4.	Dr. Padmaja Marathe Member	Prof, Dept of Pharmacology and Therapeutics, Seth GS Medical College and KEM Hospital, Mumbai	Clinical Pharmacologist
5.	Mrs. Deepa Ramani Member	Ex-Play Group Teacher, Stores and Purchase in-charge, Kharghar, Navi Mumbai	Layperson
6.	Mrs. Lakshmi R. Member	Co-ordinator, Sanjeevani - life beyond cancer, Mumbai	NGO representative
7.	Dr. B.B. Singh Member	Advocate, Mumbai High Court	Legal Expert
8.	Dr. Sanjeev Waghmare Member	Scientific Officer 'E', ACTREC	Basic Scientist
9.	Dr. Tejpal Gupta Member	Professor, Dept. of Radiation Oncology, ACTREC	Radiation Oncologist
10.	Dr. Prafulla Parikh Member	Assistant Professor, General Medicine, ACTREC Secretary, DSMSC, ACTREC	Physician
11.	Dr. Amita Maheshwari Member	Associate Professor, Dept. of Gynecology, TMH	Surgeon
12.	Dr. Brijesh Arora Member	Professor, Pediatric Oncology, TMH	Medical Oncologist
13.	Dr. Bharat Rekhi Member	Professor, Dept. of Pathology, TMH	Pathologist
14.	Dr. Pritha Ray Member	Scientific Officer 'F', ACTREC	Basic Scientist
15.	Dr. Navin Khattry Member	Professor, Dept. of Medical Oncology, ACTREC	Medical Oncologist

## IEC-III PERFORMANCE 2016

The committee conducted 12 full board committee meetings in 2016 for meticulous scrutiny of the scientific and ethical content of submitted projects, during which a total of 36 new projects and nine projects carried forward from 2014-16 were examined, six projects were reviewed and approved through expedited process, while one project was exempted from review.

**Table 1 : Review type**

Review type	2015	2016
Full Board	34	36
Expedited	06	06
Exempted	0	01
<b>Total</b>	<b>40</b>	<b>43</b>

**Table 2: IEC decision on new projects (full board review)**

Full board review	2015	2016
Approved	23	27
Approved with modification	01	0
Resubmitted	04	07
Not approved	01	01
Withdrawn by PI	02	0
Deferred	01	01
Under review process	02	0
Review exempted	0	01
<b>Total</b>	<b>34</b>	<b>37</b>

**Table 3: IEC decision on projects carried forward from previous years**

Projects carried forward	2015	2016
Approved	07	07
Resubmitted	01	0
Closed by IEC	01	02
Withdrawn by PI	0	0
Deferred due to incomplete submission	0	0
Exempted from review	0	0
<b>Total</b>	<b>09</b>	<b>09</b>

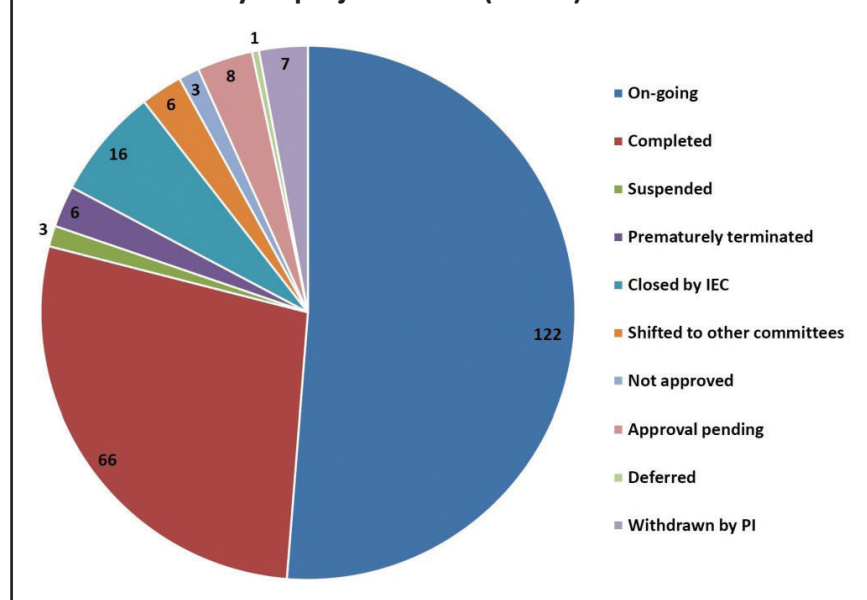
**Table 4: IEC decision on expedited review projects**

Expedited projects	2015	2016
Approved	06	06
<b>Total</b>	<b>06</b>	<b>06</b>

**Table 5: Summary of the source of funding**

Source of funding	2015	2016
IM	18	14
EM	03	01
IM + EM	09	14
Pharma	02	02
Others	01	09
Non funded projects	01	0
<b>Total</b>	<b>34</b>	<b>40</b>

**Overall summary of project status (n=238)**



## Data Safety Monitoring Subcommittee (DSMSC IEC - I, II)

**Dr. Prachi Patil,**  
Member Secretary

The Data Safety Monitoring Subcommittee (DSMSC), a subcommittee of the Institutional Ethics Committee

(IEC) I & II at Tata Memorial Centre held responsibility of monitoring patient safety during the course of the study,

in a manner that ensured the integrity of scientific and ethical aspects.

Sr. No.	Names	Affiliation	Gender	Expertise
1.	Dr. Prachi Patil, Secretary, DSMSC Member, IEC-I	Associate Professor & Assistant Gastroenterologist, Dept. of Digestive diseases & Clinical Nutrition, Tata Memorial Hospital	Female	Medical Gastro- enterologist
2.	Dr. Gouri Pantvaidya, Jt. Secretary, DSMSC	Associate Professor, Dept. of Surgery, Tata Memorial Hospital	Female	Surgeon
3.	Dr. Anuja Deshmukh, Member	Associate Professor, Dept. of Surgery, Tata Memorial Hospital	Female	Surgeon
4.	Dr. Sabita Jiwnani, Member	Assistant Professor, Dept. of Surgical Oncology, Tata Memorial Hospital	Female	Surgeon
5.	Dr. Ashwin Desouza, Member	Assistant Professor, Dept. of Surgical Oncology, Tata Memorial Hospital	Male	Surgeon
6.	Dr. Santosh Menon, Member	Associate Professor, Dept. of Pathology, Tata Memorial Hospital	Male	Pathologist
7.	Dr. Sneha Shah, Member	Associate Professor, Dept. of Nuclear Medicine, Tata Memorial Hospital	Female	Radiologist
8.	Dr. Sohan Solanki	Assistant Professor, Assistant anesthesiologist, Tata Memorial Hospital	Male	Anesthesiologist
9.	Dr. Jyoti Bajpai Member	Associate Professor, Dept. of Medical Oncology, Tata Memorial Hospital,	Female	Medical Oncologist
10.	Dr. Santam Chakraborty, Member	Assistant Professor, Dept. of Radiation Oncology, Tata Memorial Hospital	Male	Radiation Oncologist
11.	Dr. Gaurav Narula, Member	Professor, Dept. of Medical Oncology, Tata Memorial Hospital	Male	Medical Oncologist
12.	Dr. Hasmukh Jain, Member	Assistant Professor, Dept. of Medical Oncology, Tata Memorial Hospital	Male	Medical Oncologist
13.	Dr. Gauravi Mishra, Member	Associate Professor, Dept. of Preventive Oncology, Tata Memorial Hospital	Female	Preventive Oncologist
14.	Dr. Sheela Sawant, Member	Associate Professor, Dept. of General Medicine, Tata Memorial Hospital	Female	Physician
15.	Dr. Nitin Shetty, Member	Associate Professor, Dept. of Radiodiagnosis, Tata Memorial Hospital	Male	Radiologist
16.	Dr. K Manjunath N, Member	Scientific Officer, Dept. of Pharmacology, Advanced Centre for Treatment, Research & Education in cancer (ACTREC)	Male	Pharmacologist
17.	Dr. Sumitra Bakshi, Member	Professor, Dept. of Anesthesia, Tata Memorial Hospital	Female	Anesthetist
18.	Dr. Tushar Vora, Member	Associate Professor, Dept. of Medical Oncology, Tata Memorial Hospital	Male	Medical Oncologist
19.	Dr. Deepa Nair, Member	Associate Professor, Dept. of Surgery, Tata Memorial Hospital	Female	Surgeon

The mandate of the Committee included:

- Continuous assessment, evaluation and monitoring of Serious Adverse Event(s) (SAEs) reports on all aspects of trials conducted at the TMH
- Monitoring of the overall progress of institutional clinical trials and their significant events for ensuring adherence to clinical trial and procedural requirements
- Ensuring that the safety of participants, validity of data and projected accrual goals were maintained
- Reviewing and reminders for Continuous Review Applications (CRA)
- Providing regular reports to the Institutional Ethics Committee.

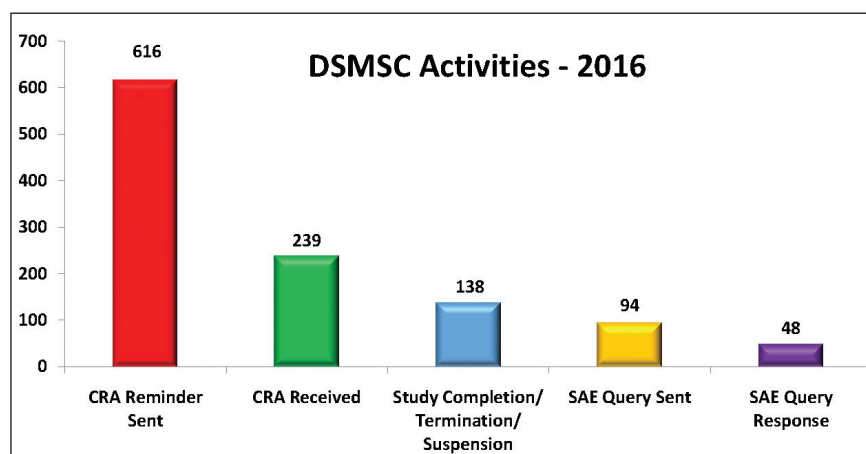
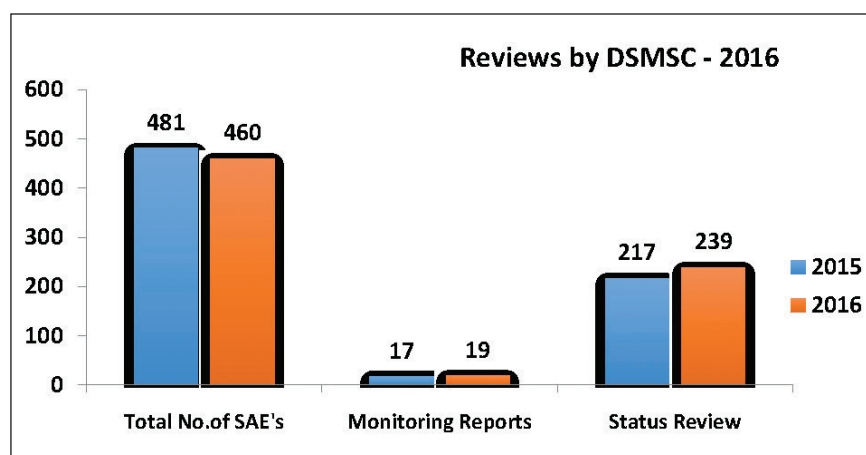
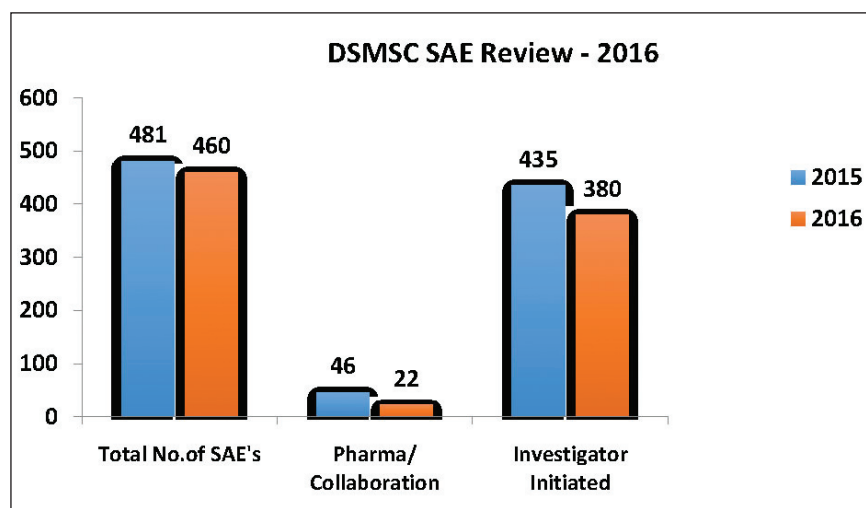
The committee had conducted 12 meetings in 2016. Besides the scheduled monthly meetings and review of SAEs reported on all the studies, SAEs on regulatory trials were evaluated continuously (to meet the 30-day timeline) on mail, by a group of 6 members consisting of the 2 secretaries of the IEC 1 and 2, the 2 lead discussants assigned to each project and the secretary and Jt. secretary of the DSMSC.

The primary responsibility of the DSMSC was to review and address the SAE and the unexpected events involving all trials.

Every month, the committee received on an average, forty (40) SAE reports on trials conducted at TMC (Investigator initiated and sponsored studies). A total of 460 SAE reports on 37 clinical trials were received and reviewed by the DSMSC.

In addition, the DSMSC also received 182 off-site safety reports on multicenter trials ongoing at Tata Memorial Hospital 2016. Nineteen (19) trials were modified that year.

A detailed review of the Annual Status Reports (239) and Continuing Review Application (616) were done by DSMSC Member Secretary and comments from the DSMSC forwarded to the IEC.



# Data Safety Monitoring Sub Committee DSMSC IEC - III (ACTREC)

**Dr. Prafulla Parikh,**  
Member Secretary

The Data Safety Monitoring Sub Committee (DSMSC) is a subcommittee of the IEC-III, whose primary responsibility is to review annual reports and safety issues such

as serious adverse events (SAE) and periodic safety update report (PSUR) pertaining to the projects approved by IEC-III. The DSMSC comprises of a physician, an intensivist, basic scientists

and medical, surgical and radiation oncologists. The members of the DSMSC are trained in causality assessment as per WHO criteria and routinely implement them in assessing the relatedness of adverse events.

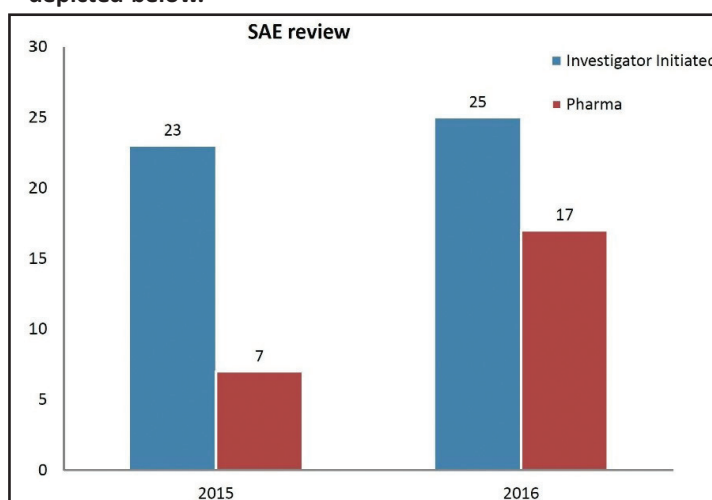
## DSMSC (1 April 2016 to 31 March 2018)

Sr. No.	Names	Affiliation	Expertise
1.	Dr. Prafulla Parikh Member Secretary	Assistant Professor, General Medicine, ACTREC	Clinician
2	Dr. Jayant Goda Sastri Joint Secretary	Associate Professor, Radiation Oncology, ACTREC	Clinician Scientist
3	Dr. Kakoli Bose Member	Scientific Officer 'F', ACTREC	Basic Scientist
4	Dr. Vikram Gota Member	Associate Professor, Dept. of Clinical Pharmacology, ACTREC	Clinical Pharmacologist
5	Dr. Sudhir Nair Member	Associate Professor, Dept. of Surgical Oncology, ACTREC	Clinician Scientist
6	Dr. Deepa Philip Member	Assistant Professor, Medical Oncology, TMH	Clinician
7	Dr. Reshma Ambulkar Member	Associate Professor, Anesthesia, ACTREC	Clinician
8	Dr. Abhishekh Mahajan Member	Assistant Professor, Radiology, Dept. of Radio-diagnosis, TMH	Clinician
9	Dr. Rajani Nagrani Member	Scientific Officer, Epidemiologist, TMH	Epidemiologist
10	Dr. Rukmini Govekar Member	Scientific Officer, ACTREC	Basic Scientist

## DSMSC activities

The DSMSC conducted 12 meetings and the minutes were forwarded to IEC-III for further action. The committee conducted 30 site monitoring visits, 42 SAE reviews and sent 108 reminders to PIs for annual status report (ASR) submission as required. At every IEC meeting, the DSMSC Secretary or Representative discussed minutes and activities of DSMSC. Thirty monitoring reports were discussed in the full boards and, based on IEC comments, recommendation and query letters were issued to PIs. In all, 20 replies were reviewed by DSMSC and their comments were forwarded to IEC.

A comparison of SAE reviews during the period 2015-16 is depicted below.



## Training and Education

TMC- IEC-III conducted an in-house training program on “Overview of IEC SOPs / ICH-GCP training” for ACTREC researchers, scientists, research staff, students and IEC / DSMSC members on November 25, 2016. Over 150 delegates from ACTREC and TMH participated in this program. Dr. Durga Gadgil, TRAC consultant, was the keynote speaker. The objective of this training was to strengthen the knowledge and awareness of IEC-SOPs and good clinical practice (GCP). The session provided an overview of GCP, and emphasized on its principles, essential documents, the role of the investigator, and importance of monitoring in clinical research.

## Group achievements

- **WHO’s Strategic Initiative for Developing Capacity in Ethical Review (SIDCER)** in collaboration with the Forum for Ethical Review Committees in Asia and the Western Pacific Region Forum for Ethical Review Committees in Asia and the Western Pacific Region (FERCAP) have awarded recognition to the TMC - IEC-III in November 2016. As per SIDCER report, the IEC-III has maintained very high standard with respect to scientific and ethical review process and IEC documentation / archiving.
- **Tata Memorial Centre underwent re-accreditation visit** by the Association for the Accreditation of Human Research Protection Programs (AAHRPP) on 29-30 November 2016.

## Research Projects Approved by IEC - I & II



Principal Investigator (PI)	Project Title
Dr. Agarwal, Jai Prakash	Distress screening and Quality of Life in treatment of naive lung cancer patients attending radiotherapy outpatient department.
Dr. Agarwal, Jai Prakash	A prospective observational study to evaluate the outcomes of radiotherapy in metastatic spinal cord compression in lung cancer.
Dr. Agarwal, Jai Prakash	Study to evaluate the variability in delineation of the target volumes in lung cancer by comparing two techniques using Four-dimensional computed tomography.
Dr. Agarwal, Jai Prakash	Image Texture Analysis in assessing tumour heterogeneity: A tool to predict, prognosticate cancers and individualize radiotherapy.
Dr. Agarwal, Jai Prakash	Extra-Capsular Spread (ECS) and lymph node density in Oral Cavity Squamous Cell Carcinoma (OSCC).
Dr. Agarwal, Vandana	Patients Knowledge and Perceptions towards anaesthesia and anaesthesiologists.
Dr. Agrawal, Archi	An observational study to assess the role of FDG PET/CT in detection of systemic metastatic spread in patients of rectal cancer with lateral pelvic lymph nodes.
Dr. Ambulkar, Reshma	A prospective study to evaluate the ability of anaesthetists to give effective cricoid pressure using a McGrath Mac Video Laryngoscope.
Dr. Amin, Nayana	Observational study on Cuffed endotracheal tubes in infants and children: Should we routinely measure the cuff pressure?
Dr. Amin, Nayana	Prospective observational study on Non Operating Room Anesthesia (NORA) in pediatric patients.
Dr. Arora, Brijesh	A prospective randomized study comparing the safety and cost-effectiveness of antibiotic discontinuation without neutrophil recovery (ECIL approach) versus with neutrophil recovery (IDSA strategy) in young febrile-neutropenic patients with cancer.
Dr. Arora, Brijesh	A multi-site Prospective Study to Determine Household Out-of-Pocket Expenditure Incurred by Families of Children Newly Diagnosed with Cancer in India (HOPE Study) Protocol.
Dr. Arora, Brijesh	Predictors and Prognostic value of early treatment response in Pediatric B-NHL.
Dr. Arya, Supreeta	A retrospective study to evaluate the accuracy of MRI in locally advanced carcinoma rectum in assessing response to neoadjuvant chemoradiotherapy and predicting extent of surgical resection in patients who are unresponsive to first line chemoradiation.
Ms. Awatagiri, Kasturi	A survey to evaluate conflict of interest management (COI) practices within Ethics Committees (EC).
Dr. Badwe, Rajendra	A Randomized Controlled Trial of Navya Patient Preference Tool - An Online Self-administered adaptive conjoint analysis based decision aid, for women undergoing surgery for early breast cancer.
Dr. Badwe, Rajendra	A5481037: A study of palbociclib in combination with letrozole as treatment of post-menopausal women with hormone receptor positive, her2 negative advanced breast cancer for whom letrozole therapy is deemed appropriate.
Dr. Bajpai, Jyoti	Study of quality of life of CA Ovary patients from a tertiary care cancer centre.
Dr. Bajpai, Jyoti	Retrospective study of Prognostic Factors In Non Metastatic Osteosarcoma patients treated with Intensive Chemotherapy Protocol.

Principal Investigator (PI)	Project Title
Dr. Bajpai, Jyoti	Scalp Cooling for the prevention of chemotherapy induced alopecia in breast cancer from a tertiary care cancer center in India.
Dr. Bajpai, Jyoti	Evaluation of VEGF expression of tumor cells as a potential prognostic marker in Ewing's sarcoma.
Dr. Bajpai, Jyoti	Protocol No. - I3Y-CR-JPBQ: A Randomized, Double-Blind, Placebo-Controlled, Phase 3 Study to compare NSAI plus abemaciclib, a CDK4 and CDK6 Inhibitor, or plus placebo and to compare fulvestrant plus abemaciclib or plus placebo in postmenopausal women with Hormone Receptor-Positive, HER2-Negative Locoregionally recurrence or metastatic breast cancer.
Dr. Bakshi, Ganesh	Study of the Nephron Sparing Surgeries done at Tata Memorial Hospital.
Dr. Bakshi, Sumitra	Preparation, validation and evaluation of Patient Information Leaflet (PIL) for patients undergoing Day Care Surgeries under General anaesthesia at Tata Memorial Centre.
Dr. Bakshi, Sumitra	Effect of patient information leaflet on working pattern and patient satisfaction level in a busy Indian day care operative theater complex.
Dr. Bakshi, Sumitra	Incidence and management of Post Dural Puncture Headache post spinal and accidental dural taps from a non obstetric hospital: A 2 year data.
Dr. Bal, Munita	Clinicopathological Spectrum of Adenoid Cystic Carcinoma of Head and Neck region: Conventional and High Grade Transformation.
Dr. Banavali, Shripad	A pilot project to determine the expression of adrenergic receptors (ADRs) in the archival formalin-fixed, paraffin embedded (FFPE) tissue blocks of different subtypes of bone or soft tissue Sarcomas - Feasibility study.
Dr. Budrukhar, Ashwini	Audit of clinical outcomes of adjuvant whole breast or chest wall with or without regional irradiation in women of breast cancer treated with different fractionation schedules over two years.
Dr. Chatterjee, Aparna	Pain severity and its impact on daily function following major mandibular resections with reconstructive surgery at a tertiary care cancer centre.
Dr. Chatterjee, Aparna	Epidural Analgesia: Adherence to protocol, failure rates and reason for failure.
Dr. Chatterjee, Aparna	Postoperative Pain Severity: Incidence of chronic pain and its impact on daily function following total knee replacements at a tertiary cancer institute.
Dr. Chaturvedi, Pankaj	Metronomic Adjuvant Chemotherapy Evaluation in locally advanced oral cancers post surgery and appropriate adjuvant therapy.
Dr. Chinnaswamy, Girish	Protocol No. - NA: Platinum induced ototoxicity in long term survivors of pediatric cancer patients.
Dr. Chopra, Supriya	Evaluation of compliance, acute toxicity and intermediate outcomes of Carcinoma Cervix patients treated in 2014 in Tata Memorial Hospital.
Dr. Chopra, Supriya	Protocol No. - NA: Image guided intensity modulated External beam Radiotherapy and MRI based adaptive Brachytherapy in Locally advanced Cervical Cancer. EMBRACE-II.
Dr. Chopra, Supriya	Randomized study of stereotactic body radiation therapy (SBRT) versus transarterial chemoembolization (TACE) in hepatocellular carcinoma (IAEA study).
Dr. D'cruz, Anil	Integrative genomic, transcriptomic and methylation study on oral cancer progression.
Dr. Deodhar, Jayita	Study of Resilience and its relation with Quality of Life in caregivers of patients with advanced cancer.
Dr. Deodhar, Jayita	Knowledge of hospice and attitude towards hospice admission in patients with advanced cancer in palliative medicine setting in the Indian socio cultural context.
Dr. Deodhar, Jayita	Understanding Coping skills in adolescent with Acute Lymphoblastic Leukemia undergoing curative treatment - a prospective observational study.

Principal Investigator (PI)	Project Title
Dr. Deodhar, Jayita	Standards based audit of documentation of assessment of spiritual concerns/needs in adult advanced cancer patients referred to hospital based palliative care services.
Dr. Deodhar, Kedar	Histopathology reports of colorectal adenocarcinoma: Assessment of different histology parameters including lymph node yield in surgically resected specimens, operated at TMH and ACTREC (year 2013-15).
Mrs. Desai, Abhidnya	Understanding the challenges faced by the researchers during the conduct of trials at Tata Memorial Centre: A questionnaire survey.
Dr. Desai, Madhavi	Audit of Trend of Preoperative Fasting in TMH-II.
Dr. Desai, Priti	Serial monitoring of ionized calcium levels during plateletpheresis procedure in voluntary platelet donors in a tertiary care oncology centre.
Dr. Desai, Priti	Study of immediate and delayed adverse donors reactions in voluntary whole blood donors.
Dr. Desai, Sangeeta	A pilot study to determine the utility of alternate, non centromeric chromosome 17 reference probe for human epidermal growth factor receptor (HER2) fluorescence in-situ hybridization (FISH) testing in breast cancer cases.
Dr. Desai, Subhash	Retrospective evaluation of tumours of long bones on plain radiograph and their histopathologic correlation.
Dr. Dholam, Kanchan	Study of factors affecting dental rehabilitation following jaw reconstruction with free-fibular graft in head and neck cancer patients
Dr. Divatia, Jigeeshu	Effect of 6 % hydroxy ethyl starch (130/0.4) on renal function, coagulation and mortality in patients undergoing hemipelvectomy surgery involving major blood loss- a retrospective study.
Mrs. D'Souza, Anita	A cross-sectional survey to assess prevalence of xerostomia and related problems among patients who have received teletherapy for head and neck cancer in TMH.
Dr. Engineer, Reena	Perioperative therapy (preop chemo v/s CTRT) in locally advanced gall bladder cancers (POLCA-GB).
Dr. Engineer, Reena	Upfront short-course radiotherapy followed by early systemic chemotherapy for metastatic rectal cancer.
Dr. Epari, Sridhar	Telomerase activation in malignant diffuse gliomas, a novel genetic alteration: Evaluation of its molecular and clinical significance in routine practice.
Dr. Epari, Sridhar	Meningiomas: Is TERT promoter mutations, a better prognostic marker than histological grade?
Dr. Ganesan, Subramanian	An observational study to evaluate early treatment response in peripheral blood on Day 15 by flow cytometry in B cell Acute Lymphoblastic Leukemia patients treated with ICiCle protocol.
Dr. Gehdoo, Raghuveersingh	A retrospective audit of perioperative mortality and morbidity in patients who underwent emergency laparotomy in tertiary care cancer hospital.
Dr. Goda, Jayant	Radiation Dose Optimization in diffuse large B- cell Lymphoma - A Randomised Phase III non- inferiority trial.
Dr. Goel, Mahesh	Effect of pre-Operative Transarterial Chemo-Embolisation on circulating tumor cells and recurrence in Hepatocellular Carcinoma.
Mrs. Goswami, Savita	Problems faced by children and adolescents with cancer referred to a specialist psycho-oncology service: A 5-year retrospective analysis.
Dr. Gupta, Sudeep	ML29282 -A Phase IV, Multicenter, Open-Label, Single-Arm Study Of Pertuzumab (In Combination With Trastuzumab And Docetaxel) In First Line Treatment Of Indian Patients With Her2-Positive Advanced (Metastatic Or Locally Recurrent) Breast Cancer.

Principal Investigator (PI)	Project Title
Dr. Gupta, Sudeep	CAPCYR07568/ METRO- ABC - A Phase II Open-label Randomized Study of a Fixed-dose Combination of Capecitabine and Cyclophosphamide Administered at Different Doses /Regimens with Metronomic Schedule in Patients with Metastatic Breast Cancer.
Dr. Gupta, Sudeep	Protocol No. ML29662- A Multicenter, Open-Label, Single-Arm, Phase IV study of trastuzumab emtansine in Indian patients with Her2-Positive unresectable locally advanced or metastatic breast cancer who have received prior treatment with trastuzumab and taxane.
Dr. Gupta, Sudeep	CBYL719C2301: "A phase III randomized double-blind, placebo controlled study of alpelisib (BYL719) in combination with fulvestrant for men and postmenopausal women with hormone receptor positive, HER2-negative advanced breast cancer which progressed on or after aromatase inhibitor treatment".
Dr. Gupta, Tejpal	Prognostic significance of pre-treatment quantitative FDG-PET/CTparameters in non-nasopharyngeal head and neck squamous cell carcinoma treated with definitive (chemo) radiotherapy (ProsPECT study).
Ms. Jain, Hemani	Cytogenetic studies in Indian patients with de novo acute leukemia: A large, single centre study from India.
Ms. Jain, Hemani	Comprehensive genetic analysis by integration of conventional karyotyping and interphase FISH for refinement of biological subclasses in chronic lymphocytic leukemia (CLL).
Dr. Jain, Parmanand	Validation and assessment of patient adherence to Opioids for cancer pain using MMAS 8 Questionnaire.
Dr. Jain, Parmanand	Comparison of efficacy of patient controlled epidural analgesia versus continuous epidural infusion following thoraco-abdominal surgeries in cancer patients.
Dr. Jain, Parmanand	Prevalence of Paclitaxel induced CIPN-related pain and CIPN in Indian patients with breast cancer: A Prospective Observational Study.
Dr. Jalali, Rakesh	A prospective study to evaluate the feasibility of hippocampal sparing intensity modulated radiotherapy in preserving neurocognitive functions in adult patients with pituitary adenoma.
Dr. Jalali, Rakesh	An audit of demographics, clinical features, pathological parameters, molecular profiling and their impact on outcomes in adult patients with medulloblastoma.
Dr. Jiwnani, Sabita	Assessment of changes in hypoxia related biomarkers during surgery in resectable non-small cell lung cancer.
Dr. Joshi, Amit	Protocol no. B7391003: A phase 3 randomized, double-blind study of pf 06439535 plus paclitaxel-carboplatin and bevacizumab plus paclitaxel-carboplatin for the first-line treatment of patients with advanced non-squamous non-small cell lung cancer.
Dr. Joshi, Amit	Retrospective analysis of palliative metronomic chemotherapy in Head and Neck cancers.
Dr. Joshi, Amit	Protocol no. NOPRODPCR4001: A multicenter, prospective, longitudinal registry of patients with prostate cancer in Asia.
Dr. Joshi, Amit	Retrospective audit of using Abiraterone acetate in patients of castrate resistant prostate cancer (CRPC) at Tata Memorial Centre.
Dr. Joshi, Malini	Acute kidney injury in post hepatectomy patients in a tertiary cancer hospital.
Dr. Joshi, Malini	Factors predicting blood transfusion in colorectal surgery and effects on short term outcome in a tertiary cancer centre.
Mrs. Joshi, Swapna	A study to assess the knowledge and practice followed by nurses during administration of chemotherapy at tertiary cancer care centre, Mumbai.

Principal Investigator (PI)	Project Title
Dr. Juvekar, Shashikant	An audit of Magnetic Resonance Imaging of Brain and Spine for evaluation of leptomeningeal metastases and its comparison with cerebrospinal fluid analysis.
Dr. Juvekar, Shashikant	Pattern of recurrence on Computed tomography in recurrent ovarian carcinoma.
Dr. K, Manjunath	Monitoring Adverse Drug Reactions of Pemetrexed + Platinum doublet chemotherapy in patients with non- squamous non-small cell lung cancer or mesothelioma in Tata Memorial Centre.
Dr. K, Manjunath	Monitoring of Adverse Drug Reactions for Docetaxel + Cisplatin/Carboplatin + 5-Fluorouracil (DCF) based combination chemotherapy in patients with Head-Neck or esophageal cancer in Tata Memorial Centre.
Dr. Kerkar, Rajendra	Retrospective review of patients with early stage adenocarcinoma and adenosquamous carcinoma of uterine cervix after surgery.
Dr. Kerkar, Rajendra	Comparison of accuracy of Intraoperative Frozen Section (FS) Versus Intraoperative Gross Visual Inspection (GVI) In the assessment of myometrial invasion in clinical Stage I Endometrial cancer.
Dr. Kulkarni, Atul	Incidence and outcomes of Cardiac Arrhythmias in critically ill Patients: A single center experience in an oncological ICU.
Dr. Kulkarni, Suyash	Radio frequency ablation in treatment of osteoid osteoma: retrospective audit.
Dr. Laskar, Siddhartha	Audit of tTime required by principal investigators for conducting regulated trials: A pilot study - ATRT study.
Dr. Mahajan, Abhishek	Cavitation, Attenuation, Ground Glass Opacity Components Evaluation with RECIST (CAGE RECIST): Impact on Objective Response Evaluation of Chemotherapy in NSCLC.
Dr. Mahajan, Abhishek	The Diagnostic performance of Thyroid Multimodal-imaging Comprehensive Risk Stratification Scoring (TMC-RSS) In characterizing thyroid nodules.
Dr. Mahajan, Abhishek	MR imaging features and its correlation with molecular alterations in driver oncogenes in NSCLC patients with brain metastasis.
Dr. Mahantshetty, Umesh	CONventional Radiography based Intracavitary Brachytherapy (Standard Arm) versus Magnetic Resonance Image based BrAchyTherapy (Study Arm) in Locally Advanced Cervical Cancers: A Phase III Randomized Controlled Trial (COMBAT - Cervix Trial).
Dr. Mahantshetty, Umesh	Defining optimal utilization and loading patterns of additional needles in Intracavitary plus Interstitial (IC + IS) Brachytherapy (BT) application in Locally Advanced Cervical Cancer (LACC) - A Retrospective Analysis.
Dr. Mahantshetty, Umesh	Radical Radio (chemo) therapy in elderly patients with locally advanced cervical cancer - A Retrospective Analysis.
Dr. Mehta, Shaesta	Efficacy and tolerability of two different bowel preparation regimens for pre-colonoscopy bowel cleansing in treatment naive Indian patients with colorectal cancer; a single center prospective randomized single blind study.
Dr. Menon, Hari	An audit of clinicopathological characteristics and outcomes to therapy in PCNSL treated at a tertiary care centre.
Dr. Mishra, Gauravi	Cervical Cancer Screening: Video Based tutorials for skills development of ANMs/ASHAs/ PHWs.
Dr. Muckaden, Mary	Effect of sleep hygiene on the quality of sleep of patients with advanced cancer referred for palliative care.
Dr. Muckaden, Mary	Effect of early integration of specialized palliative care into standard oncologic treatment on the quality of life of patients with advanced head and neck cancers: A randomized controlled trial.
Dr. Muckaden, Mary	A study to assess feasibility of topical radiation disinfected honey based gel for the management of malignant fungating wounds.

Principal Investigator (PI)	Project Title
Dr. Myatra, Sheila	Validation of a novel quality of death scale in Hospital (QODH).
Dr. Myatra, Sheila	Incidence and risk factors associated with Ocular Surface Disorders in ventilated ICU patients and impact of protocolised eye care.
Dr. Nair, Deepa	Evaluation of swallowing in patients with oral cavity cancer.
Dr. Nair, Deepa	Narrow band imaging observed oral mucosa microvasculature as a tool to detect early oral cancer.
Dr. Narula, Gaurav	A preclinical translational study to evaluate the efficacy of scfv-CD28-CD3 $\alpha$ CAR T-cells manufactured from hHealthy volunteers and patients with relapsed / refractory Acute Lymphoblastic Leukemia in ex-vivo Setting.
Dr. Ostwal, Vikas	Effect of Structured Teaching Module on Incidence of Capecitabine Induced Hand Foot Syndrome in patients of colorectal cancer at tertiary cancer care centre: A prospective randomised controlled study.
Dr. Ostwal, Vikas	Retrospective analysis of second line palliative chemotherapy in metastatic gall bladder cancers.
Dr. Ostwal, Vikas	Retrospective analysis of the treatment outcomes and tolerability of continuous or maintenance Gemcitabine and platinum based chemotherapy versus observation in locally advanced or/and metastatic adenocarcinoma of the gall bladder.
Dr. Ostwal, Vikas	Retrospective analysis of chemotherapy treatment outcomes in post NACTRT locally advanced unresectable non metastatic rectal adenocarcinoma.
Dr. Ostwal, Vikas	Retrospective analysis to assess the survival outcomes with Gemcitabine-nab paclitaxel as palliative chemotherapy locally advanced unresectable or metastatic pancreatic cancer”.
Dr. Ostwal, Vikas	Retrospective analysis of prospective database assessing the efficacy and safety of First line Docetaxel based chemotherapy followed by Docetaxel or Capecitabine maintenance in non-progressive, metastatic stomach adenocarcinoma - Experience from a Tertiary Referral centre.
Dr. Ostwal, Vikas	Validation study of the HURRIA Score in predicting chemotherapy toxicity risk In elderly population undergoing chemotherapy for breast, gastrointestinal and gynecological cancers in Indian setup.
Dr. Ostwal, Vikas	Prevalence of MMR status in locally advanced rectal cancer and its correlation with response to neoadjuvant therapy and survival.
Dr. Pantvaidya, Gouri	A prospective study assessing diagnostic accuracy of the clinical sign of ankyloglossia compared to MRI scan to predict extrinsic muscle involvement in tongue cancer.
Dr. Parab, Swapnil	A multicentre survey of current practice of acute postoperative pain management in tertiary care hospitals in Maharashtra.
Dr. Parmar, Vani	A Retrospective study to analyze the impact of systemic therapy on Breast Density seen on mammography in Premenopausal Breast Cancer patients estimated on a quantitative imaging analysis software (Hologic).
Dr. Parmar, Vani	Digital pathology based low-cost outcome predictor for ER+ Breast Cancers.
Dr. Patil, Asawari	Clinicohistopathological correlation of esthesioneuroblastoma and assessment of prognostic impact of expression of apoptosis markers cleaved Caspase 3, XIAP, Survivin and proliferative marker Ki-67.
Dr. Patil, Prachi	A randomised double-blind study in two parts: Part A - Comparing two humanized monoclonal antibodies that target VEGF in combination with mFOLFOX6 in patients with non-resectable metastatic colorectal cancer (mCRC) and, Part B - Comparing two humanized monoclonal antibodies that target VEGF in combination with pemetrexed and carboplatin in recurrent or advanced non- squamous non-small cell lung cancer (NSCLC).

Principal Investigator (PI)	Project Title
Dr. Patil, Prachi	An audit of colorectal cancer in a tertiary center.
Dr. Patil, Vijay	Shadow study: Comparison of conventional clinic follow up with clinician led video follow up in newly diagnosed patients with intermediate and high grade glioma undergoing adjuvant temozolamide therapy.
Dr. Patil, Vijaya	Evaluation of impact of nitrous oxide on PONV in breast surgeries.
Dr. Patil, Vijaya	Study to compare the effect of two different types of humidifier on the endotracheal tube patency.
Dr. Patkar, Nikhil	Precursor B-ALL in children: An audit of minimal residual disease and correlation with standard prognostic factors.
Dr. Phillip, Deepa	Protocol No. RI-02-003: Reditux TM Registry to compare Effectiveness, Safety and Resource Utilization of Reditux vs. the Reference Medicinal Product to treat Diffuse Large B-Cell Lymphoma and Chronic Lymphocytic Leukemia in routine clinical practice.
Dr. Pimple, Sharmila	Performance of HPV DNA Test in presence of co-infection with common RTIs.
Dr. Pimple, Sharmila	Phase I- Device Development : Development of portable transvaginal digital colposcope.
Phase II- Development and Non-Inferiority	Evaluation of a portable transvaginal digital colposcope with smartphone interface for single visit cervix cancer screening in low resource setting.
Dr. Purandare, Nilendu	Prognostic value of metabolic parameters measured by 18 F FDG PET CT in surgically resected non small cell lung cancer patients.
Dr. Qureshi, Sajid	Study of pattern of lymph nodal spread in pediatric renal tumors.
Dr. Qureshi, Sajid	Local therapy in non-metastatic primary Ewing Sarcoma of the mandible and maxilla in children.
Dr. Rajadhyaksha, Sunil	Prospective observational study to determine bleeding risk and platelet transfusion requirements in haematological malignancies.
Dr. Ramadwar, Mukta	Clinicopathological features of resected primary Liver tumors In adults with special emphasis on Post Transarterial Chemoembolisation (TACE) resections.
Dr. Ramani, Subhash	Audit of CT guided retroperitoneal lymph node biopsies in TMH.
Dr. Rangarajan, Venkatesh	NIS expression detection in metastatic breast cancer with 131I NaI.
Dr. Rekhi, Bharat	Histopathologic and Immunohistochemical features of Solitary Fibrous Tumors of Soft Tissues.
Dr. Sable, Nilesh	Retrospective audit to find the incidence and trend of adrenal masses in CT Scans done for other indications (Incidentalomas) at Tata Memorial Centre.
Dr. Salins, Naveen	Understanding patients' and caregivers' preferences and attitudes towards disclosure of cancer related diagnosis and prognosis: A descriptive cross-sectional study.
Dr. Sengar, Manju	Protocol No. - NA: A prospective observational study to determine the risk of Hepatitis B viral reactivation in adolescent and adult acute lymphoblastic leukemia/lymphoblastic lymphoma (ALL/LBL) with Occult Hepatitis B infection (OHBI).
Dr. Shankhdhar, Vinay	Health-related quality of life after free fibula flap reconstruction for segmental resection of mandible in oral cancer patients.
Dr. Shanmugham, Pramesh	A phase III, double blind, Placebo controlled, randomized trial assessing the effect of aspirin on disease recurrence and survival after primary therapy in common non-metastatic solid tumor.
Dr. Shet, Tanuja	Comparative Exome profile of mucinous breast carcinoma vs micropapillary breast carcinoma.
Dr. Shet, Tanuja	CMET abnormalities and their impact in behavior of Her2neu positive breast cancer.

Principal Investigator (PI)	Project Title
Dr. Shet, Tanuja	Fibroepithelial tumors in children and young adults (< /=20 years of age): Should we be using different criteria to diagnose phyllodes tumor?
Dr. Shetmahajan, Madhavi	Inferior alveolar nerve block for intraoperative analgesia for maxillofacial cancer surgery requiring unilateral mandibular resection: A randomized controlled study.
Dr. Shrikhande, Shailesh	Optimal approach for Siewert type II and type III esophagogastric junction adenocarcinoma : LTA Vs Transabdominal approach.
Dr. Shrikhande, Shailesh	Developing a CORe-set of Patient-Reported outcomes in pAncreatic Cancer (COPRAC): an international Delphi survey.
Dr. Solanki, Sohan	A prospective audit of perioperative parameters of cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (CRS-HIPEC).
Dr. Solanki, Sohan	Correlation between intraocular pressure measurement by tonometer and anterior chamber depth measurement by ultrasound in steep trendelenberg position during robotic assisted surgery.
Dr. Tembhare, Prashant	Investigating the role of flow cytometric immunophenotyping in staging of pediatric solid round cell tumours.
Dr. Tendulkar, Anita	Evaluation of leukoreduction efficiency of 3 different cell separators by ADAM-rWBC.
Dr. Tendulkar, Anita	Establishing Maximum Surgical Blood Ordering Schedule (MSBOS) in a tertiary care oncology hospital.
Dr. Thakur, Meenakshi	Bowel distention and bowel wall appearance evaluation on MDCT: A retrospective comparison of efficacy of low attenuation contrast (mannitol) versus positive intraluminal contrast.
Dr. Thakur, Meenakshi	Retrospective evaluation of mammographic findings of male breast cancer.
Dr. Thakur, Meenakshi	Retrospective study to histopathologically correlate prostatic carcinoma with multiparametric magnetic resonance imaging.
Dr. Vasudevan Nair, Sudhir	Adjuvant Radiotherapy in early stage oral tongue cancers (AREST) - A prospective randomized control trial.
Dr. Wadasadawala, Tabassum	Post-Mastectomy Radiation Therapy in High Risk, Node Negative women with Early Breast Cancer (PMRT-NNBC).
Dr. Wadasadawala, Tabassum	Assessment of patient satisfaction of outpatient care in the multi-disciplinary breast clinic.
Dr. Wadasadawala, Tabassum	Randomized trial of effect of two fractionation schedules of Adjuvant Radiation following immediate Autologous Breast Reconstruction (ARIA-BR) on toxicity and patient reported outcome measures.

## Research Projects Approved by IEC - III (ACTREC)



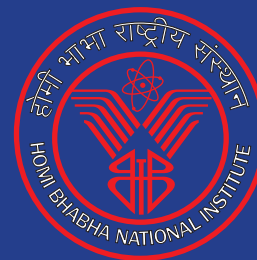
Principal Investigator (PI)	Project Title
Dr. Abhijit De	Elucidating the role of non-canonical STAT3 signalling in triple negative breast cancer as a promising therapeutic target
	Investigation of association of human sodium iodide symporter and p53 expression in human breast cancer tissue samples
Dr. Aliasgar Moiyadi	Advanced ultrasound image analysis study
Dr. Amit Joshi	Pain during concurrent chemoradiation in head and neck cancers: a randomised study to compare analgesic effect of diclofenac vs tramadol
Dr. Anuradha Chougule	Role of WNT16B, p53 and telomerase activity in tumorigenesis signaling in head & neck cancer before and after maximum tolerated dose (MTD) based chemotherapy and after metronomic therapy
Dr. Indraneel Mittra	A study to assess the effect of resveratrol-copper (R-Cu) on inflammatory cytokines in multiple myeloma patients undergoing autologous peripheral blood stem-cell transplantation
Dr. Jigeeshu Divatia	A prospective, randomized, controlled trial to compare the effect of total intravenous anesthesia with propofol vs sevoflurane anesthetic on serum levels of HIF-1a, VEGF-C and other cytokines and on PBMCs in patients undergoing breast cancer resection surgery
Dr. Kakoli Bose	Investigating the molecular basis of CaM/c-FLIP interaction to design specific c-FLIP inhibitor for modulating its anti-apoptotic function
Ms. Kasturi Awatagiri	Impact of a planned training session on GCP related knowledge in research professionals
	Informed consent forms (ICFs) lacunae: a retrospective audit
Dr. Kumar Prabhash	A randomized study for evaluation of metronomic adjuvant chemotherapy in recurrent head and neck cancers post R0 salvage surgical resection who are ineligible for re-irradiation
	A randomized study to compare gefitinib vs chemotherapy with gefitinib in EGFR mutation positive non-small cell lung cancer in palliative setting
Dr. Manoj Mahimkar	Genome wide DNA methylation profiling in oral cancers and leukoplakia
Dr. Meenakshi Singh	Non-HLA genes associated with allogeneic hematopoietic stem cell transplantation
Dr. Milind Vaidya	Development of a molecular prognostic tool for patients stratification and personalized treatment of oral cancer
Dr. Narendra Joshi	A study to explore association between IL17A and IL17F linked SNPs and intra-tumoral expression of the cytokines
Dr. Navin Khattry	Allogeneic stem cell transplant in acute leukemia: analysis of graft versus host disease prophylaxis, impact of conditioning regimen, prognostic factors and long term outcomes
	Evaluation of in vitro effects of novel aurigene CDK7 inhibitors on primary patient-derived AML blasts and determination of anti-tumor activity in patient-derived AML xenograft models
	Impact of surveillance stool culture guided selection of antibiotics in allogeneic hematopoietic stem cell transplant patients

Principal Investigator (PI)	Project Title
Dr. Neelam Shirsat	Integrated genomic and proteomic analysis of embryonal brain tumors and deciphering functional role of genetic alterations in medulloblastoma, the most common embryonal tumor
Dr. Prasanna Venkatraman	Determination of ATP bound structure of 14-3-3 proteins and role of oligomerization in ATPase activity
Dr. Prashant Tembhare	Investigating value of circulating microRNAs and clonal plasma cells in the prediction of therapeutic outcome and prognostication of multiple myeloma
Dr. Pritha Ray	Investigating potential of Notch 3 and Jagged-1 based therapy for epithelial ovarian cancer
Dr. Rukmini Govekar	Genomic profiling of immature hematopoietic cells from different clinical stages of CML to identify stage-specific chromosomal aberrations
	Proteomic profiling of leukemic cells in Philadelphia chromosome positive leukemia
Dr. Shilpee Dutt	Discovering molecular mechanisms that drive resistant cells to escape therapy induced cellular senescence (TICS) in glioblastoma
Dr. Shubhada Chiplunkar	To evaluate the role of $\gamma\delta$ -T cells in colorectal cancer
	Understanding the crosstalk of mesenchymal stem cells and immune cells in the tumor microenvironment
Dr. Subramanian Ganesan	Evaluating the effect of long term preservation of PBSC using low concentration (4.35%) DMSO in a mechanical freezer at -80°C on the viability and concentration of stem cells
Dr. Sudeep Gupta	Exploring the utility of circulating tumor DNA in monitoring response to therapy and in aiding follow up of breast cancer patients using the neoadjuvant setting as a model
Dr. Suyash Kulkarni	Image guided central venous catheters insertion: a retrospective study
Dr. Tanuja Teni	Evaluation of the association of MCL-1-interacting proteins USP9X, TCTP and MULE in stabilization/destabilization of MCL-1 in human oral cancers
	Prognostic evaluation of MCL-1 protein and its stabilizing factors (USP9X and TCTP) in head and neck squamous cell carcinoma patients treated with chemoradiotherapy
Dr. Vanita Noronha	An open label randomized trial comparing paclitaxel and platinum chemotherapy with 5-FU and platinum in patients following resection for high risk carcinoma of the penis ('BACuP' - Best Adjuvant Chemotherapy for use in Penile carcinoma)
	EMERALD: EMERgency visit audit of patients treated under Medical Oncology in a tertiary cancer centre: logical steps to decrease the burden
Dr. Vedang Murthy	Prospective randomized trial of adjuvant radiotherapy following surgery and chemotherapy in muscle invasive transitional cell carcinoma of urinary bladder
Dr. Vijay Patil	Evaluation of adherence to ASCO antiemetic guideline in a major tertiary cancer centre in India
	MACE-CTRT: metronomic adjuvant chemotherapy evaluation in locally advanced head and neck cancers post radical chemoradiation
	Stage I/ II study of oral metronomic methotrexate with celecoxib and erlotinib as palliative chemotherapy in oral cancer patients
Dr. Vikram Gota	Assessment of the quality of generic drugs available in the Indian market
Dr. Vivek Bhat	Epidemiology of NDM-1 and its variants in multidrug resistant gram negative bacilli isolated from infections in cancer patients

# E d u c a t i o n



Affordable healthcare to all ..... at their doorsteps



**ACTREC**



**Tata Memorial Hospital**

Prof. K.S. Sharma, Director (Academics) was in-charge of all educational activities at TMC. Tata Memorial Centre was affiliated to Homi Bhabha National Institute (HBNI) Mumbai, a Deemed University, under Department of Atomic Energy (DAE)-Govt. of India for imparting PG training in oncology and other broad specialties and, all these courses were recognized by Medical Council of India, New Delhi.

Tata Memorial Centre (TMC) comprised of Tata Memorial Hospital (TMH), the Advanced Centre for Treatment, Research and Education in Cancer (ACTREC) and the Centre for Cancer Epidemiology (CCE).

TMC provided the highest standard of patient care through its services and research, and built capacities by imparting knowledge through various educational activities.

### Academic Activities

Tata Memorial Center was a recognized training center in cancer Education and Research by several National and International organizations, including WHO, IAEA and INCTR. The Hospital

offered education through various activities like PG courses, and training through short term observerships and various other training programs. About 180 Post graduate Medical students were registered in 2016 for PG courses in various disciplines.

Tata Memorial Centre, in collaboration with Kings College, London had organized "A summer school in Oncology - 2016" training program for two weeks for Under-graduate and Post-graduate medical students. One hundred and twenty (120) students were selected from all Indian government medical colleges across India. After successful completion of this program, five (05) participants were given chance for internship at King College London for one month.

### Six months training program at Tata Memorial Centre

- The primary aim was to train various specialists on sponsorship basis in oncology and other supportive branches. Approximately 19 Oncology trainees had taken training at TMC for 06 months

(twice a year). Twenty five (25) Trainee Technology students had been trained at TMC for 06 month (twice in a year).

### Observership program at Tata Memorial Centre

- Approximately 444 specialist including dental surgeons had visited Tata Memorial Centre as Observer from all over India in the year 2016.

### Overseas trainees and observers at Tata Memorial Centre

- Tata Memorial Centre had taken initiative in training of African, sub-Saharan country doctors, nurses under Indo-African Forum Summit III, in the field of Oncology for periods ranging between 1 month to 6 months. This program would continue for 3 more years at TMC.
- In the year 2016, 32 overseas specialists visited Tata Memorial Centre as observers for periods ranging between 1 to 3 months (see table).

## COUNTRIES

BANGLADESH	PAKISTAN	WEST INDIES	KOREA	SOUTH AFRICA
MALAYSIA	SAUDI ARABIA	UK	KENYA	YEMEN
SRI LANKA	CANADA	IRAQ	MALDIVES	OMAN
NEPAL	MYANMAR	USA	GERMANY	

## Collaborative Exchange Programme

TMC had collaborative students exchange program with Seth G.S. Medical College & KEM Hospital, Children Wadia Hospital and Lokmanya Tilak Municipal General Hospital in Mumbai, India.



## Post Graduate, Superspeciality & Technical Courses

Sr.No	Postgraduate Course	Approved by	Affiliation	Duration in Years	Intake Number (2016)
	<b>Super specialty Courses (Post MD / MS)</b>				
1	D.M. (Critical Care)	Medical Council of India, New Delhi Approved	Homi Bhabha National Institute (Deemed University) (HBNI)	03	02
2	D.M. (Gastroenterology)			03	02
3	D.M. (Medical Oncology)			03	14
4	D.M. (Pediatric Oncology)			03	02
5	M.Ch. (Gynecological Oncology)			03	02
6	M.Ch. (Head & Neck Oncology)			03	04
7	M.Ch. (Plastic Surgery)			03	02
8	M.Ch. (Surgical Oncology)			03	16
	<b>Broad Speciality Courses</b>				
9	MD (Anesthesiology)			03	20
10	MD (Immunohematology & Blood Transfusion)			03	03
11	MD (Microbiology)			03	01
12	MD (Nuclear medicine)			03	04
13	MD (Palliative medicine)			03	02
14	MD (Pathology)			03	12
15	MD (Radiodiagnosis)			03	10
16	MD (Radiotherapy)			03	16
	<b>Technical Courses – Post-Graduate Students</b>				
17	Advanced Diploma in Medical Imaging Technology (ADMIT)	Maharashtra State Board of Technical Education (MSBTE) and the Directorate of Technical Education (DTE)	Government of Maharashtra	02	17
18	Advanced Diploma in Radiotherapy Technology (ADRT)			02	10
19	Postgraduate Diploma in Fusion Imaging technology	-	HBNI	01	10
	<b>M.Sc Courses</b>				
20	Clinical Research	-	HBNI	02	10
21	Nursing (Oncology)	Maharashtra Nursing Council & Indian Nursing Council	HBNI	02	05
	<b>Ph.D Courses</b>				
22	Epidemiology – Life Sciences	-	HBNI	04 -05	0
23	Health Science (Post Doctoral Fellowship)			04 -05	04
24	Medical Physics – Life Science			04 – 05	0
	<b>Post postgraduate Course</b>				
25	2-Year Certified HBNI Fellowship	-	HBNI	02	12
	<b>Total Number Of Students</b>				<b>180</b>

## Short Term Courses



Sr. #	Training Programmes	Department	Number of Trainees
1	Certificate course in Hospital Infection control	Nursing Department	13
2	Certificate course in Preventive Oncology	Preventive Oncology	63
3	Six months Advanced Hematology Training Course for Technologists	Haematology	05
4	Six Months Molecular Haematology Training Course for Technologists		06
5	Six months training course in Flow Cytometry		06
6	Advanced Clinical Biochemistry Technologist Training Course	Biochemistry	01
7	Advanced Cancer Cytogenetic Training Course	Cancer cytogenetics	02
8	Advanced MRI Imaging Training Course for Technologists	Radiodiagnosis	01
9	Train the Trainers Program in Palliative Care	Palliative Medicine	16
10	PB Desai / UICC Fellowship	Onco - Pathology, Surgical Oncology, Radiation Oncology	0
11	Certified Training in Oncology for Doctors	TMC	19
12	Oncology Speech Rehabilitation for Graduate Speech Therapists	Head & Neck Oncology	0
13	Post Basic Diploma in Oncology Nursing	Nursing Department	07
14	Certificate Course for Medical Secretary	M.S. Office	02
15	Library Trainees	Library Sciences	02
16	Certificate course in Intensive Care Nursing	Nursing Department	12
17	Certificate Course in Enterostomal Therapy	Nursing Department	0
18	Certificate course for CVAD	Nursing Department	08
19	Apprenticeship Training Programme for PET/CT	Nuclear Medicine	02
20	6-month Onco-physiotherapy course	Physiotherapy	03
21	Apprenticeship Training ( BOAT)	Pathology, Cytology	09
22	Oncology Training (Defense Doctor)	Anesthesiology	04
23	4-week Pediatric palliative care certificate program	Palliative Medicine	0
<b>Total Number of Trainees</b>			<b>181</b>



## Conferences / Workshops / Seminars

### Conferences - 2016

Event	Date	Organized By
	<b>January</b>	
ISCR Conference - Media Curtain raiser meeting	6th	Clinical Research Secretariat
National Breast Cancer Conference (WCI-TMH)	16th & 17th	Medical Oncology
KRM 2016 – Digital Contents, Copyrights and Libraries	28th & 29th	Digital Library
	<b>February</b>	
Women's cancer prevention, screening & early detection 17th Mah. State Jt.Conf of IAPSM & IPHA 2016	12th & 13th	Preventive Oncology
EPEC India trainers conference	14th & 15th	Palliative Medicine
Press Conference	24th	Public Relation
TMC Platinum Jubilee Celebrations: A Conference of new ideas in Cancer - Challenging dogmas	26th - 28th	Clinical Research Secretariat
	<b>March</b>	
2nd. Lung Cancer meet with ASCO, ISSLC-PGIMER-TMC	19th & 20th	Thoracic Surgery
	<b>April</b>	
CAN-REHAB 2017, 1st. International Conference on Cancer Rehabilitation	07th - 09th	Physiotherapy
Teaching Pathologists	14th	Pathology
	<b>May</b>	
5th Biennial International Conference on Metronomic & Antiangiogenic Therapies Pre Conference Press Conference	4th	Medical Oncology
	<b>August</b>	
National Cancer Grid (NCG)	9th & 10th	Clinical Research Secretariat
	<b>September</b>	
Education in Cancer & Acute Pain ECAP-2016	17th & 18th	Anesthesia
Mumbai Critical Care - 2016	30th	Anesthesia
	<b>October</b>	
XIV Annual TMH Radiotherapy Practicum: Practical Aspects of Radiotherapy for Lymphomas	7th & 08th	Radiotherapy
Advances in Breast Cancer 2016	14th - 16th	Breast
Imaging In Gynaecological Cancer	14th - 16th	Gynecology
	<b>November</b>	
PHOCON	4th & 5th	Medical Oncology
ONCOSURG-2016 - Conference	24th - 27th	Surgical Oncology

Event Name	Date	Organized By
	<b>December</b>	
3rd.TMC Head Neck Laser	3rd & 4th	Head & Neck Surgical Oncology
TMC National Conference on The Difficult Airway (TMC-DAC 2016)	9th - 11th	Anaesthesia
3rd. Indian Cancer genetics Conference & Workshop (An indo-UK Program)	7th - 14th	Clinical Research Secretariat

### Continuing Medical Education (CME) - 2016

Event	Date	Organized By
	<b>January</b>	
CME on Nuclear Medicine	28th	Nuclear Medicine
	<b>February</b>	
Second National CME Progm on Fusion of Imaging and Therapy with recent Advances in Technology	20th - 21st	Radio Diagnosis, Nuclear Medicine, Radiation Oncology and Medical Physics
	<b>March</b>	
National CME IIIrd Quality Conclave of Laboratory and Transfusion Services	19th	Tranfusion Medicine
	<b>June</b>	
Nuclear Medicine	23rd	Nuclear Medicine
	<b>July</b>	
Nuclear Medicine	1st	Nuclear Medicine
	<b>August</b>	
Palliative Care	10th	Palliative Medicine
CME on Grossing Techniques and Minimal Data Set Reporting in Oncopathology	12th & 13th	Pathology
Renal cell carcinoma	20th	Genitourinary
	<b>September</b>	
Nuclear medicine	4th	Nuclear Medicine
	<b>October</b>	
Nuclear Medicine	23rd	Nuclear Medicine
	<b>November</b>	
Ortho RadioPathology	19th	Bone & Soft tissue
	<b>December</b>	
6th CME for Medical Laboratoiry Technicians	23rd & 24th	Hematopathology

## Courses - 2016

Event	Date	Organized By
	<b>January</b>	
NABH Internal Assessor	21st - 23rd	Clinical Research Secretariat
	<b>February</b>	
Good Clinical Practise, Beginners' Course-2016	6th	Clinical Research Secretariat
Good Clinical Practise, Advanced Course-2016	6th	Clinical Research Secretariat
Preceptorship course on Lung Cancer	6th & 7th	Pathology
NACO training	8th - 12th	Transfusion Medicine
Pediatric Oncology Fellowship	8th - 12th	Pediatric Oncology
Pediatric Oncology Fellowship	15th - 20th	Pediatric Oncology
CPC Training	15th - 17th	Palliative Medicine
	<b>March</b>	
NACO training	8th - 12th	Transfusion Medicine
IACA 6-week Palliative care training	9th - 18th April	Palliative Medicine
Pediatric Oncology Nursing	14th & 15th	Nursing
CPC Training	16th - 19th	Palliative Medicine
Pediatric Oncology Nursing	21st - 24th	Nursing
Anaesthesia Review Course - 2016)	25th - 27th	Anesthesia
Pediatric Oncology Nursing	28th - 1st April	Nursing
	<b>April</b>	
Super staff training	20th - 21st	Public relations
Palliative care training	24th - 2th	Palliative Medicine
	<b>May</b>	
Summer school-Brachytherapy	17th	Radiation Oncology
10th Annual Short course in Clinical Research methodology	28th & 29th	Clinical Research Secretariat
	<b>June</b>	
Palliative care volunteer training	3rd	Palliative Medicine
Training for doctors and nurses	20th - 24th	Palliative medicine
Training for doctors and nurses	27th - 1st July	Palliative medicine
	<b>July</b>	
Master's course in Oral Cancer management	1st	Surgical Oncology
Sixth Basic Hematopathology	1st & 2nd	Hematopathology
NACO training course	14th	Transfusion Medicine
	<b>August</b>	
NACO training course	12th	Transfusion Medicine
Preceptorship Programme on ALK1 detection in lung cancer by FISH/IHC	20th & 21st	Pathology

Event	Date	Organized By
	<b>September</b>	
NACO training	19th -24th	Transfusion Medicine
CPC Training for doctors and nurses	27th - 29th	Palliative Medicine
	<b>October</b>	
Operation Theatre Personnel training -2016	1st - 2nd	Orthopedics
Training in Molecular Diagnostics	3rd - 8th	Molecular Pathology
Training for FDA Inspection	4th - 5th	Transfusion Medicine
Neonatal palliative care	25th - 26th	Palliative Medicine
November		
Robotic Colorectal Master Class	15th	Surgical Oncology
	<b>December</b>	
10-day Volunteers training	13th - 22nd	Administration
3rd. TMC Head & Neck Laser	16th	Surgical Oncology
ASHA workers training at Jawahar	26th	Palliative Medicine

### Other Events - 2016

Event	Date	Organized By
	<b>January</b>	
Annual Day	23rd	Nursing
	<b>February</b>	
Seminar for ADMIT Students	3rd Feb	Radiodiagnosis
World Cancer Day	4th Feb	Public Relations
	<b>March</b>	
3rd. Gastric Cancer Advisory meet with live global broadcast	1st	Gastrointestinal
WCI International Womens Day	8th	Medical Oncology
TOT on improving the quality of cause of death Certification	9th	Cancer Epidemiology
	<b>April</b>	
Presentation of ALK+NSLL	1st	Medical Oncology
ONAI programme	7th	Infection Control
UGAM Educational Programme	16th	Psychiatric
	<b>May</b>	
Florence Nightangle Week	3rd	Nursing
Max Foundation CML Patients Day	22nd	Medical Oncology
Annual Day Cum World No Tobacco Day by Shraddha Foundation	31st	Public Relations
	<b>June</b>	
Entertainment Summer Vacation Programme	2nd & 3rd	Medical Oncology
7th Anniversary of UGAM	4th & 5th	Medical Oncology
INTL Metronomic and Antiangiogenic Therapies Meeting	6th to 8th	Medical Oncology
Summer School	9th to 20th	Academics
	<b>December</b>	
4th. Educational program in honor of Dr. Aruna P. Tole	7th	Occupational Therapy

## Workshops - 2016

Event	Date	Organized By
	<b>January</b>	
Olympus Imaging & Application	06th	Digestive Diseases & Clinical Nutrition
Medical Oncology	18th & 19th	Medical Oncology
Tobacco Control	27th	Preventive Oncology
	<b>February</b>	
SIOP-PODC	5th	Medical Oncology
IAPCON Preconference	11th	Palliative Medicine
9th CBC Workshop: Bench to Clinic	9th - 11th	Hematopathology
CDSA	16th - 18th	Clinical Research Secretariat
	<b>March</b>	
Wound Management	3rd	Nursing
Managing Quality in Clinical Laboratories	5th - 6th	Cytopathology
Tobacco Control & Cessation	10th	Preventive Oncology
	<b>April</b>	
Preconference (PHOCON) Palliative Care	11th	Palliative Medicine
Preconference (PHOCON) Pediatric Nursing	11th	Nursing
Paediatric Solid Tumors	22nd - 24th	Paediatric Oncology
Communication Skills	27th	Medical Oncology
Art & Craft	28th	Medical Oncology
	<b>June</b>	
Medical Writing	4th	Medical Oncology
	<b>July</b>	
Annual Plastic day	15th	Plastic Surgery
	<b>August</b>	
3-day workshop on tobacco control & cessation	09th - 11th	Preventive Oncology
6th. Annual Workshop on Rehabilitation in Breast Cancer	13th - 14th	Physiotherapy
	<b>October</b>	
Diagnostic challenges & role of ancillary techniques in cytopathology	23rd & 24th	Cytopathology
Neonatal Palliative Care	25th & 26th	Palliative Medicine
	<b>November</b>	
Preconference (PHOCON) Palliative Care	4th	Palliative Medicine
Preconference (PHOCON) pediatric nursing	4th	Nursing
Ultrasound	10th	Anesthesia
Clinical Biochemistry-2016	11th & 12th	Biochemistry
ONCOSURG-2016 - Live Surgery Workshop	24th - 27th	Surgical Oncology
	<b>December</b>	
10th. Workshop on Immunohistochemistry	22nd	Pathology





**Advanced Centre for Treatment, Research and  
Education in Cancer  
(ACTREC)**



## Overview of ACTREC

The **Advanced Centre for Treatment, Research and Education in Cancer (ACTREC)**, located in Navi Mumbai, is the R&D wing of the Tata Memorial Centre, Mumbai. ACTREC comprises of two sub-units: the Clinical Research Centre and a 120-bed Research Hospital that focus on clinical and translational research and more importantly on the treatment of cancer patients; and the Cancer Research Institute that undertakes basic and applied research on cancer. Faculty at the Centre – both scientists and clinicians engage in basic, applied, translational and clinical research projects that are designed for a better understanding of cancer that would lead to early diagnosis and improved survival of cancer patients. Most of these projects involve collaborations within the Centre and also with national/ international centres of repute from academia and industry, and are supported by institutional, intramural or extramural funding. During 2016, there were 188 projects on-going at ACTREC. A sum of Rs. 8.89 crore was received from governmental agencies such as DBT, DST, ICMR, etc., to meet the expenditure on 79 of these on-going projects. In addition, 15 new extramurally funded projects to the tune of Rs. 10.00 crore for a three year period were sanctioned by these funding agencies, of which Rs. 3.91 crore were received during the calendar year. Research carried out by faculty of the Centre resulted in 125 PubMed-indexed publications during 2016, of which 66 articles accrued from basic/ applied research studies and 59 from clinical/ translational research or medical technology. During 2016, seven regular staff members were appointed at the Centre in the medical, scientific, technical and administrative cadres, while three employees superannuated,

one employee voluntarily retired, one resigned and one expired.

The **Clinical Research Centre (CRC) and Hospital** of the Centre continues to be at the forefront of new developments at ACTREC. Currently the CRC hospital has a total of 120 beds, including 88 ward beds, 10 ICU and recovery beds, six bone marrow transplant beds and 16 day care beds. The number of patients referred to and registered at ACTREC continued to increase this year. After successful installation last year, a new Mammography system was inaugurated for patient use in January 2016. A new state of the art Linear Accelerator with IGRT/ IMRT capability was also installed at the Centre for use in patient treatment and research. MRI under anesthesia for pediatric patients and intervention radiology under anesthesia were started at ACTREC. Continuation of NABL accreditation for diagnostic laboratories was granted through 'Desktop surveillance' in June 2016. Following successful completion of NABL verification assessment in September 2016, NABL accreditation was granted to the Hematopathology flow cytometry laboratory which relocated from TMH to ACTREC. Empanelment of ACTREC with 'A' grade for the RGJAY scheme was granted after an audit conducted in October 2016. A CME entitled 'III<sup>rd</sup> Quality Conclave of Laboratories and Transfusion Services' was conducted in March 2016. The second batch of trainee participants of the 1-year Advanced Training Course in Medical Laboratory Technology joined the Centre in November 2016.

The department of **Medical Oncology** had started its services at ACTREC in 2006. Today its adult solid tumor unit administers chemotherapy in neoadjuvant, adjuvant and palliative

setting for all solid tumors including cancers of the head & neck and the cervix. In 2016, this unit dealt with ~9,000 out-patient visits, and the five in-patient beds dedicated to solid tumors were always occupied. The Bone Marrow Transplant unit shifted to ACTREC in 2007. During 2016, 67 transplants were performed, and ~4500 out-patient visits took place at ACTREC. Since 2011, adult patients with hematolymphoid neoplasms not undergoing transplant have also been treated at ACTREC. In 2016, this unit handled around 700 in-patients and ~7500 out-patient visits. The pediatric oncology unit dealt with ~6000 out-patient visits in 2016 and the five in-patient beds dedicated to pediatric patients were always occupied. The department of **Radiation Oncology** provides high quality radiotherapy services and generates evidence for the use of advanced radiotherapy technology at various sites including brain, head & neck, cervix, bladder, and prostate. With the commissioning of a new linear accelerator (Varian TrueBeam), stereotactic body radiotherapy is now being provided particularly for liver and prostate cancer, and oligometastases. During the year, respiratory motion management using deep-inspiratory breath hold was standardized for breast cancers and mediastinal lymphomas, and total skin electron therapy for cutaneous lymphomas was put into clinical use. Over 850 patients received external beam radiotherapy and 165 patients underwent 362 brachytherapy procedures in 2016. The department of **Surgical Oncology** provides surgical services and in-patient care, and conducts OPDs for newly registered cases, pre- and post-operative care and follow-up clinics for a wide range of

cancer patients. The service runs four regular operating theatres five days a week. During 2016, ~2300 major surgical procedures were performed in pediatrics, head & neck, breast, gastro-intestinal, gynecology, urology and neurosurgery. Intra-operative neurophysiologic monitoring and image guided surgeries enabled the performance of safer surgeries in patients with neurological tumors in eloquent areas. Minimally invasive laparoscopic gastrointestinal surgeries were carried out routinely.

The department of **Anesthesiology, Critical Care and Pain** encompasses anesthesia at four major operation theatres, three peripheral locations and a pre-anesthesia check-up clinic, critical care through a 7-bedded ICU, 3-bedded PACU and a CPR team, and acute pain services. During 2016, the department provided anesthesia services for 2333 major OT procedures, 547 GA / local procedures in the radiotherapy OT, 272 MRI, 384 interventional radiology procedures and 1492 new / follow-up pre-anesthesia check-ups, critical care services for 2067 recovery room admissions, 284 ICU admissions and 36 ICU admissions for procedures, as well as 225 acute pain services. The **Radiodiagnosis** department at ACTREC provides diagnostic imaging services - conventional radiology, ultrasonography including color Doppler, digital mammography, PET-CT and magnetic resonance imaging and a wide spectrum of vascular and non vascular procedures in interventional radiology. The department of **Transfusion Medicine** (DTM) ensures safe and adequate supply of blood/ blood components through blood donation and apheresis, red cell serology; blood component preparation, testing, storage and issue, peripheral blood stem cell harvest, cryopreservation and storage, leukodepletion and gamma irradiation of blood. During 2016, DTM collected 2347 blood units, prepared 4413 blood components, and issued 3837 blood components. The **Nursing** department

provides quality nursing care to the cancer patients undergoing treatment at ACTREC. Due attention is also given to the implementation of patient safety goals, continuing education, and research. New initiatives in day care patient assessment, and peripheral insertion of central catheter were the highlights of 2016.

The **Pathology** laboratory at ACTREC, a part of the department of Pathology, TMC, provides diagnostic services for histopathology, frozen section, immunohistochemistry and cytology for patients treated at ACTREC and for referral cases from other hospitals. During 2016, the lab processed ~2900 histopathology specimens, 2300 frozen sections, and 350 cytopathology specimens, and also performed around 3600 IHC tests. The **Hematopathology** laboratory is a state-of-the-art referral diagnostic lab for hematolymphoid neoplasms and a translational research lab. Using a combination of morphology, cytochemical stains, flow cytometric immunophenotyping and molecular techniques, the lab handles initial diagnosis and predication/ prognostication of hematolymphoid neoplasms. In April 2016, TMC's morphology and flow cytometry facility moved to ACTREC. The lab saw a substantial increase in its workload for post-therapy response monitoring of acute leukemias. The **Cancer Cytogenetics** laboratory provides diagnostic services for hematolymphoid malignancies that encompass molecular cytogenetics and conventional karyotyping. In July 2016, the lab shifted to the ACTREC campus, and patient services were resumed within a week. During 2016, the lab performed ~11,775 diagnostic tests. The **Microbiology** laboratory at ACTREC provides patient related and hospital services encompassing bacteriology cultures, serological testing, clinical microbiology testing, viral antigen detection, sterility testing for Blood Bank services, mycology testing, and environmental surveillance. The **Composite Lab** at ACTREC provides routine hematology,

routine biochemistry and immunoassay, and cytology including FNAC services to the hospital at ACTREC.

The **Clinical Pharmacology** group is actively engaged in development of drugs and animal models for cancer and other conditions. Drugs in preclinical development include withaferin-A for prophylaxis against graft versus host disease (GvHD), and diseleno-dipropionic acid (DSePA) for radiation-induced pneumonitis, in collaboration with BARC. The group has developed and validated animal models of GvHD and radiation pneumonitis, and has made significant advances in pharmacokinetics (PK)-guided optimization of 13-cis-retinoic acid for neuroblastoma, meropenem for septic shock, and paclitaxel for breast cancer. The **Hypoxia and Clinical Genomics** group, established in 2014 at ACTREC, focusses on the effects of acute hypoxia on tumor biology and clinical genomics. In 2016, experiments utilizing the newly installed hypoxia workstation provided evidence that acute hypoxic exposure results in modulation of gene expression in cancer cells. Another milestone for the lab was installation of the MiSeq NGS platform that will enable clinician researchers to design and conduct experiments on targeted sets of genes. The **Chromatin Biology** group substantiated its seminal finding that chromatin emanating from dying cells (cell-free chromatin, cfCh) contains biologically active molecules that can lead to DNA damage, inflammation and apoptosis in healthy cells. Based on several novel observations made in 2016, the group has proposed a novel theory of cancer metastasis whereby circulating tumor cells undergo apoptosis on reaching target organs, and cfCh emanating from them oncogenically transform the resident cells, inducing new cancers that masquerade as metastasis.

During 2016, the on-going as well as newly initiated basic and applied research projects at the **Cancer Research Institute** were conducted

under the following newly formed thematic groups: Cancer Cell Biology; Cancer Genetics, Epigenetics and Genomics; Cell and Molecular Imaging; Protein Biochemistry, Biophysics and Structural Biology; Stem Cell Biology and Cell Signalling; Hemato-Oncology; and Tumour Immunology.

The **Cancer Cell Biology** group focused on gaining insights into the molecular basis of oral and cervical tumorigenesis in a bid to identify molecular targets. Oral cancer studies included *in silico* analysis of survivin isoforms and regulation of activin A, study of the functional relevance of down regulated secretory clusterin and its novel nucleolar localization, the association between HPV/p16 and outcome in head & neck cancers receiving radiotherapy with/ without chemotherapy, and the role of radioresistance related proteins. In cervical cancer, the utility of HR HPV viral load in predicting radiation response and HPV E6/E7 mRNA as a secondary screening test were explored. Other group members focused on understanding the mechanisms by which 14-3-3 proteins regulate cell cycle progression and the epithelial mesenchymal transition (EMT). Disruption of the cdc25C 14-3-3 complex led to a decrease in tumor progression. Loss of 14-3-3 $\phi$  led to induction of the EMT. The biogenesis of the cell-cell adhesion junction 'desmosome' was examined as were the consequences of desmosome dysfunction to development, tumor progression and metastasis. Loss of plakophilin3 increased the expression of LCN2; the requirement of LCN2 for radio/ chemo resistance upon plakophilin3 knockdown suggested that it could serve as a target for therapeutic intervention in radio/ chemo resistant neoplasia. Other group members examined the functions of keratin, vimentin and their associated proteins in epithelial homeostasis and cancer, and further used them as biomarkers of oral cancer. Up regulated vimentin and K5/14, and down regulated K1 expression together correlated

inversely with survival in oral squamous cell carcinoma (OSCC) patients. Transgenic mice expressing wild type K8 and serine 73/ serine 433 mutants in the epidermis were generated. 3D co-cultures revealed the role of stromal fibroblasts in the formation of hemidesmosomes. A nomogram was generated for prediction of nodal metastasis in node-negative OSCC patients. This group also examines minimal residual disease in solid tumors. Studies in breast cancer evaluated the impact of preoperative hydroxyprogesterone (test group) on the levels of circulating tumor cells (CTCs) disseminated during surgery. Premenopausal women in the test group had lower mean CTCs than controls; mean CTCs were also lower in the test group at the post-surgery time point in patients with large tumours, positive nodes and node positive post-menopausal status. Confocal microscopy and RT-PCR studies validated these findings.

The **Cancer Genetics, Epigenetics and Genomics** group examines the biology of medulloblastoma, a common malignant brain tumor in children. Molecular classification of 220 medulloblastomas revealed a higher (23%) representation of WNT subgroup tumors in the adult age group and a very high (92%) representation of male children in group 4 medulloblastomas in the Indian cohort, as compared to western cohorts. MiR-204 was identified as a marker for prognostication in non-WNT, non-SHH medulloblastomas. The group also examines genomic alterations at the level of copy number across the genome, and aims to identify genes/ gene clusters at the altered genomic loci in a bid to understand the genetic basis of tobacco-related cancers. Signatures associated with progression of pre-invasive lesions to invasive oral squamous cell carcinoma were identified, and candidate driver alterations unique to primary tumors with lymph node metastasis and poor survival were found. Another area

under study was alterations in epigenetic factors such as H2A isoforms/ H3 variants, and site-specific post-translational modifications that alter chromatin organization and cell cycle progression, and contribute to malignant transformation. The group also identified the critical role of mitogen activated stress kinase 1 and histone deacetylase in DNA damage response in cell lines and human gastric cancer tissues. Others in the group used genomic approaches - advanced Next Gen sequencing to interrogate somatic alterations in carcinomas of the breast, lung and the head & neck. Using computational genomic approaches, somatic genetic alterations were uncovered in cancers, and computational tools (HPVDetector and TMC-SNPdb) were developed as a community resource. Towards functional genomics, tumor-derived cell lines and transgenic mouse models helped identify *NOTCH1* and *FGFR3* as potential therapeutic candidate targets in Indian tongue and lung cancer patients, respectively. A computational pipeline helped discover non-typhoidal *Salmonella* in gall bladder cancer. Members of this group also focused on understanding the molecular basis of inherited and somatic cancers, and on developing translational algorithms. Projects included a large cohort of 4600 families with inherited cancer syndromes using banked DNA and lymphoblastoid cell lines, a BRCA-GEL case control study encompassing 2800 breast cancer cases/ matched healthy controls, a TMC International Sarcoma Kindred Study of 360 osteosarcoma cases/ matched controls, and an International Cancer Genome Consortium project covering 350 gingivo-buccal SCC patients with full clinico-pathological annotation, follow up, somatic/ germline NGS analysis and functional studies.

One of the mandates of the **Cell and Molecular Imaging** group is to develop and utilize molecular imaging methodologies to test experimental therapeutics in live cells and small

animal models, and ultimately translating the technologies for patient benefit. Since imaging of molecular functions provides real-time visualization and quantitative measurement of cellular and physiological processes, great value is added towards understanding normal and disease conditions. Another area receiving attention is intracellular organelle biogenesis and dynamics focusing primarily on size control mechanisms, since size and shape of organelles are greatly altered in cancer and even serve as hallmarks of cancer cells. The governing size control mechanism of the Golgi and nucleus are being examined using a basic cell biology approach, advanced microscopy techniques and yeast, cell lines and cultured neurons as model systems. Non-invasive and minimally invasive applications of Raman spectroscopy in cancer is another area under exploration. Raman spectroscopy could differentiate between normal, premalignancy and malignancy, and identify very early modifications such as cancer field effect and malignancy-related changes in a study of over 340 normal subjects and cancer patients. Raman spectra could also classify normal, premalignancy and malignancy in serum and exfoliated cells in studies involving healthy subjects, tobacco habitues, and patients with oral premalignant changes/ oral cancer.

One of the focus areas in the **Protein Biochemistry, Biophysics and Structural Biology** group is building protein interaction maps of proteases and associated chaperones involved in protein turnover in a bid to identify targets that can be manipulated to destabilize the network. Functional screens were developed to identify bottlenecks in cell growth, viability and invasive capacity of gankyrin-associated cancer cells, and some encouraging leads are being validated. The role of PSMD10 in pro-survival mechanisms when challenged with an apoptotic stimulus like TNF- $\alpha$  was examined, and

surface plasmon resonance studies to characterize the thermodynamic/kinetic basis of the interactions between PSMD9 and its interacting partners were initiated to help design of small molecule inhibitors of NFkB activity. The group also aims to understand the molecular mechanism of genetic alterations, and study the expression and 3D structure of proteins with the long-term mandate of translational research. Breast cancer-associated genetic mutations from Indian populations were screened, and pathogenicity of mutations in BRCA1 gene was identified. Identification of differentially expressed proteomic biomarkers was attempted to enable early detection of cancer. X-ray diffraction and isothermal titration calorimetry were used to characterize BRCA1, BRCA2, BARD1, MAPK, FANCI and FANCD2 proteins. Different domains of BRCA1/2 were purified, and BRCT domains of BRCA1 with cellular partners were crystallized. Also under investigation are the mechanisms underlying classical and non-classical programmed cell death through the study of proteins of the apoptotic pathway. A mechanism of HtrA2 substrate recognition and specificity was distinctly defined, the structural basis of HtrA2 mutations implicated in disease phenotypes was deciphered, and its novel binding partner DUSP9 was identified. The lesser known HtrA3 and HtrA4 and their interacting partners were characterized using multidisciplinary probes. The mechanism of interaction between human papillomavirus E2, and proteins of the extrinsic apoptotic pathway were deciphered.

The **Stem Cell Biology and Cell Signalling** group focussed on studying molecular signaling pathways regulating stem cell renewal (Wnt, Notch, Sonic-hedgehog, TGF- $\beta$ , EGFR, etc) whose deregulation is associated with cancer. In a first report, mice over expressing secretory phospholipase A2 (sPLA2-IIA) showed increased proliferation and differentiation, followed by depletion of

hair follicle stem cells, mediated through increased c-Jun activation. Down regulation of the Wnt inhibitor Sfrp1 is seen in human cancers; Sfrp1 (-/-) skin showed increased sensitivity towards chemical carcinogenesis on topical application of DMBA-TPA. Oral cancer stem cells (CD44+/ALDH+) isolated from cell lines showed deregulation of the Wnt pathway genes. Others in the group examined molecular mechanisms governing radiation/ chemo- resistance in cancer using glioblastoma and leukemia as model systems. *In vitro* primary cell lines from patient samples and *in vivo* pre-clinical orthotopic mouse models were developed to identify signals and pathways associated with resistance. Unique spectral marks identified on innately radiation-resistant glioma cells enabled their detection in a heterogeneous tumor population. The cells survived radiation by forming multinucleated giant cells (MNGCs); pharmacological/ genetic inhibition of this pathway caused apoptosis of resistant cells and prevented relapse. In another study, histone acetyltransferase GCN5 activation was identified as a biomarker of acquired resistance during leukemia treatment. Other areas under study include identifying transcriptional regulators of IGF-1R during acquirement of chemoresistance, understanding the differential potential of cellular adhesion, migration and metastatic properties of chemoresistant cells, and possible synthetic lethal effect of p53 mutations and PIK3CA upregulation in chemoresistant cells. The findings of a collaborative study with IIT-B revealed that thermo- and pH- labile magnetic nanoclusters effectively regressed chemoresistant tumors that stayed free of relapse for six months.

A prime focus of the **Hemato-Oncology** group was understanding leukemia biology in a bid to identify therapeutic targets during the blast crisis phase of chronic myeloid leukemia (CML). Proteomic analysis of cell lines representative of blast crisis phase

identified differentiators belonging to translational/ transcriptional machinery and proteins associated with key signaling pathways that could serve as therapeutic targets. In a complementary approach, comparative genomic hybridization of leukemic cells from patients in different phases of CML was initiated to identify genetic alterations associated with blast crisis that could serve as therapeutic targets. This group also aims to understand the biology of acute leukemia and triple negative breast carcinoma. The miRNA-mRNA regulatory network in acute myeloid leukemia (AML) and the influence of gene mutations on it were examined. The NPM1 mutation in AML cells was successfully silenced and material was prepared for mRNA and miRNA sequencing using Illumina HiSeq 2500 in 2x100 paired end sequencing. The effects of small molecule inhibitors on primary patient-derived AML blasts were evaluated, and their anti-tumor activity in patient-derived AML xenograft models was determined. AML cells carrying *NPM1* mutation were found to be more sensitive to arsenic than to conventional drugs.

The **Tumour Immunology** group aims at understanding the reasons for immune dysfunction in cancer patients and development of immunotherapy for cancer. Molecular mechanisms underlying the killing of bisphosphonate-treated breast/ oral tumor cells and leukemic blasts by  $\gamma\delta$ T cells, and their cross-talk with osteoclasts were investigated. HDAC inhibitors augmented the cytotoxic potential of  $\gamma\delta$ T cells by  $H_3K_9$ -acetylation in the promoter regions of perforin and granzymes - markers of cytotoxic potential. In gall bladder cancer,  $\gamma\delta 17$  was identified as a new subtype of  $\gamma$ T cells that contributed to angiogenesis and was associated with poor survival. Increased frequency of myeloid-derived suppressor cells and T-regulatory cells in the tumor microenvironment contributed to T-cell tolerance and chronic inflammation in oral cancer patients. Oral tumor-derived

mesenchymal stem cells (MSC) contributed to immune evasion. Acute myeloid leukemia MSC contributed to drug resistance in AML blasts, which was amenable to reversal with immunomodulators. Other projects within this group examined housekeeping genes in head and neck cancers, effect of progesterone on gene expression of the cytokine TGF $\beta$  in breast cancer cell lines, and expression of IL32 isoforms at the mRNA level in breast tumors. Paired breast-tumor and normal tissue specimens were procured for the analysis of IL17 gene associated single nucleotide polymorphisms and expression of relevant genes.

In keeping with its third mandate - Education, ACTREC has a strong focus on **Academics**. Its doctoral program is conducted under the aegis of the Homi Bhabha National Institute (HBNI) – a deemed university recognized by the University Grants Commission. Between January and December 2016, a total of 114 graduate students were working at ACTREC towards the Ph.D. degree in Life Sciences under the HBNI; these included 21 students of the JRF 2016 batch who joined in August 2016. As a part of the Centre's short term and summer training program, 306 trainees worked under the supervision of the Centre's faculty during 2016 - 257 as short term trainees of which 103 worked for their Master's dissertation and 154 on collaborative projects/ for experience; 23 as Observers; 24 as summer trainees and two as research associates. In all, 18 local, national or international conferences, symposia, workshops, training programs, etc. were organized at the Centre, beginning with the DBT-NER Hands on Training Workshop on 'Basic and Advanced Immunological Techniques' in January 2016, and ending with the 12<sup>th</sup> National Research Scholars Meet in December 2016. The Centre also hosted 23 national and international experts who delivered research seminars on varied topics in the life sciences and cancer. As its societal contribution, the Centre also conducted cancer awareness programs

for the general public, and cancer patient support and entertainment programs.

## ACTREC Annual Events & Distinguished Visitors

### 2<sup>nd</sup> International Peer Review

The 2<sup>nd</sup> International Peer Review of ACTREC, TMC was held on 1 March 2016. The review panel was chaired by Prof. Arnie Purushotham, Director, King's Health Partners Comprehensive Cancer Centre, London, UK. Other panel members were: Prof. Philippe Autier, Dr. Christopher Booth, Prof. Joy Burchell, Prof. Sanjeev Galande, Dr. Reena George, Dr. Shaleen Kumar, Prof. Peter Naredi, Prof. Tony Ng, Dr. Binay Panda, Dr. T. Rajkumar, Dr. Tapan Saikia, Prof. Richard Sullivan, Prof. Ian Tannock, Mr. R. Venkataramanan, Prof. M. Vijayakumar, and Prof. John Yarnold.



### MoU between BARC and ACTREC



A Memorandum of Understanding (MoU) to take up a collaborative project on the 'Development of new cancer chemotherapeutics' was signed on 3 October 2016 between the Bhabha Atomic Research Centre (BARC) a premier multidisciplinary R&D organization under the Department of Atomic Energy, Government of India, and the Advanced Centre for Treatment, Research and Education in Cancer (ACTREC) a state-of-the-art R&D satellite of the Tata Memorial Centre (TMC). The MoU was signed by Dr. KI Priyadarsini, RPCD on behalf of BARC and by Dr. Shubhada Chiplunkar, Director, ACTREC on behalf of ACTREC.

## Science and Society Oration 2016



*Felicitating of Dr. Anand Nadkarni*

ACTREC has, since the past few years, been organizing a Science and Society Oration series to recognize the seminal contributions made towards society by individuals or organizations linked closely to science. The fourth Science and Society Oration entitled 'Magic of

empathy' was delivered on 23 March 2016 by Dr. Anand Nadkarni, eminent psychologist and psychiatrist, guiding light and trustee of Mukhtangan Rehabilitation Centre, Pune, and founder of the Institute of Psychological Health, Thane. The program began with a welcome address by Dr. Shubhada Chiplunkar, Director, ACTREC, and an introduction of the distinguished guest by Dr. Ujjwala Warawdekar, Scientific Officer at the Centre. Dr. Nadkarni began his talk with an introduction to the terms psychology and psychiatry, and shared some childhood memories that had made a great impact on his understanding of human psychology and initiated him towards a career in mental health. He stressed on the

importance of sympathy and empathy in communication, and advised to act upon sympathetic feelings towards patients through empathetic actions. He highlighted the need for a change in behaviour of staff towards patients from a psychological point of view, and emphasized that doctors, nurses, hospital staff and relatives should be attentive towards a patient's emotional and psychological needs. The recounting of many touching experiences by the audience members too enabled a clearer understanding of the need for an empathetic nature, as going beyond mere expression of sympathy. Overall, the talk was very informative and interactive. The program concluded with Dr. Nadkarni's felicitation by the Director, ACTREC.

## ACTREC Annual Day Celebrations - 2016



The Centre celebrates its Annual Day every year. During 2016, it was decided to have a grand celebration during the Annual Day to make up for missed celebrations during the past two years. Accordingly, this event was celebrated at the Shanmukhananda Hall, Mumbai, on 30 March 2016. All the permanent staff with family, contract/ project staff, and students/ trainees of the Centre were invited. The program began with a welcome speech by the Director, ACTREC, Dr. Shubhada Chiplunkar, followed by felicitation of staff members who had completed 30 years of dedicated service to the Centre. ACTREC staff and students then presented songs, dances and skits bringing liveliness and fun to the event. The highlight was a variety entertainment program by the orchestra 'Zapata', which filled the atmosphere with melodious music. All those who were present enjoyed the program. Well-coordinated transport and food arrangements were appreciated by one and all.

## Vital Observances

The ACTREC family, which covers its staff, students, trainees, contract staff, patients and their caregivers, proactively observes important events at the Kharghar campus. Vital observances during 2016 encompassed: 67<sup>th</sup> Republic day celebrations (26 January), Birth anniversary of Chhatrapati Shivaji Maharaj and Dr. Babasaheb Ambedkar (27 April), Anti-Terrorism Day (20 May), International

Day of Yoga (21 June), Independence day (15 August), Sadbhavana Diwas (22 August), Hindi Diwas and Hindi Pakhwada (23 September), National Voluntary Blood Donation Day (21 October), and Vigilance awareness week (31 October).

In 2016, the Centre organized an 'Independence Day Festival' to highlight the role of 'Unsung heroes of India's

freedom struggle'. The festival encompassed an exhibition of posters, an audio-visual presentation, a skit, and a tableau on the patriots – presented by students and staff of ACTREC, and patriotic songs presented by patients. The festival began on 15 August and the poster exhibition was kept open to the public until the end of August.



*Independence Day Festival 2016 highlighting the role of unsung heroes of India's freedom struggle.*

## Patient Support Programs

During the year, the Centre in concert with various NGOs working for cancer patients and CSR initiative of industry partners also organized a number of cancer patient support and entertainment programs: 'Muskaan' entertainment program sponsored by Rotaract Club of Mulund South on 4 February; Monthly 'music and meditation' sessions conducted by VCARE from April to September; Thrice weekly yoga sessions conducted by Kaivalyadham, Lonavla from July to December; Story telling sessions for pediatric cancer patients conducted by Dr. Jayanti Bhawe on 17 August, 26 October and 30 November; Navratri Dandia & Garba program conducted by VCARE on 8 October; Dinner at The Village, Raghuleela Mall, Vashi sponsored by VCARE on 24 October; Magic show for pediatric cancer patients sponsored by M/S Morgan Stanley on 28 October 2016.

## Cancer Awareness Programs

During 2016, the Centre conducted four Cancer Awareness Programs. The first was a breast cancer awareness camp conducted for 70 staff of Saraswati College of Engineering, Kharghar, Navi Mumbai on the occasion of International Women's day on 8 March. Two special lectures – one on 'Breast cancer' by Dr. Vani Parmar, and the second on 'Cervical cancer' by Dr. Tabassum Wadasadawala, were arranged for the staff of ACTREC on International Women's Day in the afternoon of 8 March. On the special request of the Rajmata Ahilyadevi Holkar Women's Foundation, a lecture series on 'Common cancers in women, with a focus on breast cancer' was conducted at the Shetkari Samaj Hall, Koparkhairane, Navi Mumbai on 13 March 2016.

## AUGMENTATION OF RESOURCES



*A new PET-CT scanner was installed and its CT component was made operational in May.*

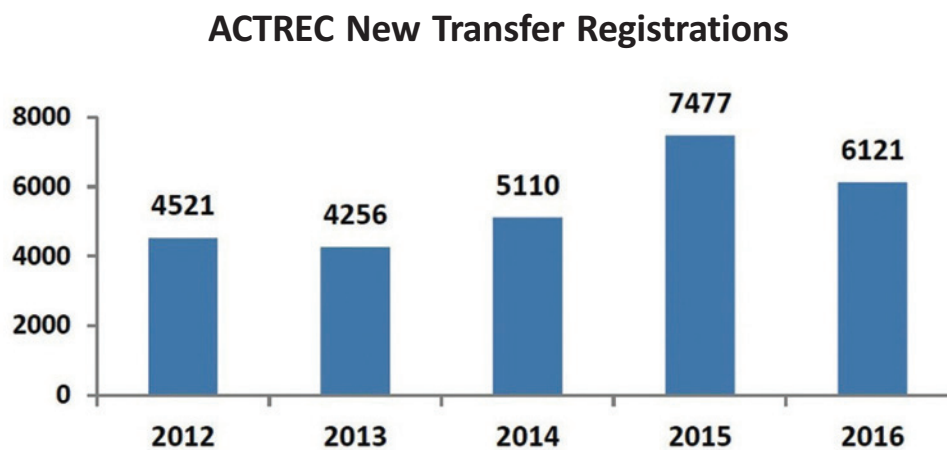
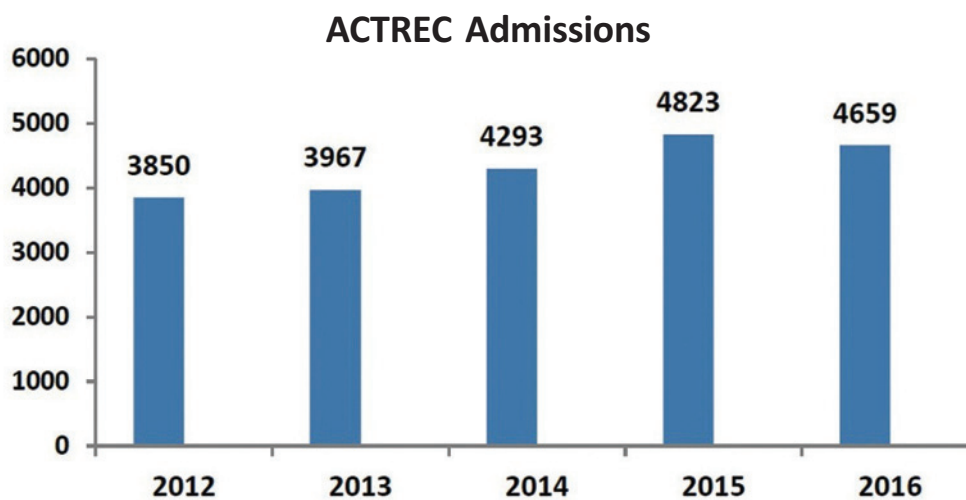
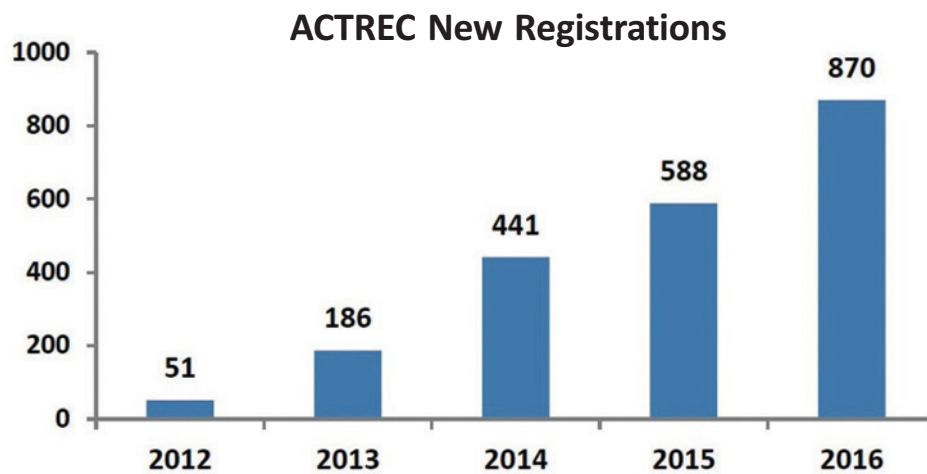


*A hypoxia workstation was installed in July.*



*An MiSeq Next Gen Sequencer platform was installed in November.*

## TRENDS – ACTREC



## PERFORMANCE STATISTICS - ACTREC

	2015	2016
Patient Chart Files- General	6101	4972
Patient Chart Files- Private	1395	1149
Patient Chart Files- Total (A)	7496	6121
Referrals for Investigations/Second Opinion (B)	202	516
Preventive Oncology (C)	SNA	SNA
Total Registrations (A+B+C)	7698	6637
<b>INPATIENT SERVICES</b>		
Admissions		
No. of Admissions	4823	4659
Average Length of stay (Days)	5.21	5.43
Bed Occupancy %	76	76
<b>SURGICAL ONCOLOGY</b>		
Major OT Procedures	2546	2333
Minor OT Procedures	1195	1093
<b>MEDICAL ONCOLOGY</b>		
Day Care		
Day Care- General	14328	15192
Day Care- Private	2070	2598
Bone Marrow Transplants at ACTREC	80	67
<b>DIGESTIVE DISEASES AND CLINICAL NUTRITION</b>		
Endoscopies (Minor O.T)	SNA	SNA
Nutrition Clinic	SNA	SNA
No. of ICU Admissions	351	284
Patients in Recovery Ward	2028	2067
Pain Clinic	224	225
<b>RADIATION ONCOLOGY</b>		
External Beam Therapy	709	901
Brachytherapy	626	362
Treatment Planning / Beam Modification	2179	1844
Special Radiotherapy Techniques (IGRT, IMRT, SRS, SRT, TSET etc.)	301	381
<b>IMAGING SERVICES</b>		
<b>Radiology</b>		
Conventional Radiography	1905	2121
Ultrasonography / colour Doppler	845	984
Mammography	SNA	499
C.T. Scan	2999	1947
M.R.I Scan	1930	3057
Interventional Radiology	1379	2043

	2015	2016
<b>NUCLEAR MEDICINE</b>		
PET-CT	626	30
SPECT-CT	SNA	SNA
C.T. Scan	SNA	SNA
<b>GENERAL MEDICINE</b>		
ECG	1411	1604
Echo Cardiography	543	755
Pulmonary Function Tests	SNA	SNA
<b>LABORATORY DIAGNOSTICS</b>		
Pathology	8617	9132
Haemato Pathology	41222	45394
Biochemistry	41050	45694
Cyto Pathology	367	334
Molecular Pathology	SNA	SNA
Microbiology	7951	9420
<b>TRANSFUSION MEDICINE</b>		
Blood and Platelet Units Collected	3036	3328
Other Services	22228	19856
<b>Cytogenetics</b>	SNA	DNA
<b>OTHER CLINICAL SERVICES</b>		
Stoma care	SNA	SNA
Occupational Therapy	SNA	SNA
Physiotherapy	4992	6627
Speech Therapy	SNA	SNA
Psychiatry and Clinical Psychology	SNA	SNA
<b>DENTAL SERVICES</b>		
Prosthetics Services	SNA	SNA
Other Services	1373	1542
<b>TISSUE BANK</b>		
Allografts Produced	SNA	SNA
<b>PALLIATIVE MEDICINE</b>		
No. of Patients	SNA	SNA
Home Care Visits	SNA	SNA
<b>MEDICAL SOCIAL WORK</b>		
Guidance	835	2935
Counselling	483	2317

	2015	2016
<b>EDUCATION</b>		
Residents & Others	40	27
Fellows	1	4
Medical Observers	20	0
Nursing Trainees	6	2
Paramedical Students	2	0
*MLT Trainees	2	2
<b>RESEARCH PROFILE</b>		
Extramural Projects	99	100
Institutional (Intramural/No Funding Required)	92	87
Intramural + Extramural Projects	2	1
P.G. Thesis (Dissertation)	13	0
<b>PUBLICATIONS</b>		
International	123	107
National	28	25
Book Chapters	12	11
Conferences / Workshops/ Seminars	48	41

SNA = Service Not Available

DNA = Data Not Available

Note: Pathology Included: IHC, Frozen & Main lab

	2015	2016
Patient Chart Files- General (TMH New Transfer)	5578	4203
Patient Chart Files- Private (TMH New Transfer)	1329	1048
Patient Chart Files- General (ACTREC New Registrations)	523	769
Patient Chart Files- Private (ACTREC New Registrations)	66	101

# CLINICAL RESEARCH CENTRE

Dr. Shubhada Chiplunkar (Director, ACTREC)

Dr. H. K. V. Narayan (Dy. Director, ACTREC)

Dr. Sudeep Gupta (Dy. Director, CRC-ACTREC)

## **Anaesthesiology, Critical Care & Pain**

Dr. Reshma Ambulkar (OIC)

Dr. Bhakti Trivedi

Dr. Amol Kothekar

Dr. Malini Joshi

Dr. Raghu Thota

## **Biomedical Engineering**

Dr. Amit Sengupta (Technical Consultant)@

## **Cancer Cytogenetics**

Dr. Dhanlaxmi Shetty (OIC)

Mrs. Sharayu Kabre

Ms. Hemani Jain

## **Cancer Genetics**

Dr. Rajiv Sarin

## **Chromatin Biology**

Dr. Indraneel Mittra (Dr. Ernest Borges Chair)

Dr. Ranjan Basak

Dr. Kavita Pal

## **Clinical Pharmacology**

Dr. Vikram Gota

Dr. NK Manjunath

## **Clinical Research Secretariat, ACTREC**

Dr. Tejpal Gupta

Mrs. Sadhana Kannan

## **General Medicine**

Dr. Prafulla Parikh

## **Hematopathology**

Dr. PG Subramanian (OIC)

Dr. Nikhil Patkar (Clinician Scientist)

Dr. Prashant Tembhare (Clinician Scientist)

Dr. Ashok Kumar

Mr. Y. Badrinath

Dr. Shruti Choudhary

## **Hypoxia & Clinical Genomics**

Dr. Sudeep Gupta

## **Medical Administration**

Dr. Prashant Bhat (Med. Suptdt)

Mrs. Chital Naresh

## **Medical Physics**

Ms. Jamema SV

Ms. Reena Phurailatpam

Mrs. Siji Paul

## **Medical Oncology**

Dr. Sudeep Gupta

Dr. Navin Khattry (OIC)

Dr. Manju Sengar

Dr. Amit Joshi

Dr. Jaya Ghosh

Dr. Tushar Vora

Dr. Hasmukh Jain

## **Microbiology & Composite Lab**

Dr. Vivek Bhat (OIC)

Dr. Preeti Chavan (OIC)

## **Nuclear Medicine**

Mrs. Sneha Mithun

## **Nursing**

Dr. Meera Achrekar (Asst. Nursing Suptdt)

## **Pathology**

Dr. Asawari Patil (OIC)

Dr. Epari Sridhar

Dr. Swapnil Rane

## **Radiation Oncology**

Dr. Tejpal Gupta (OIC)

Dr. Vedang Murthy

Dr. Supriya Sastri

Dr. Jayant Sastri Goda (Clinician Scientist)

Dr. Tabassum Wadasadawala

## **Radiodiagnosis**

Dr. Seema Kembhavi

Dr. Ashwin Polnaya

Dr. Amit Kumar Janu

## **Surgical Oncology**

Dr. Vani Parmar

Dr. MS Qureshi

Dr. Aliasgar Moiyadi (OIC)

Dr. Vinayak Shankhdhar

Dr. Sudhir Nair (Clinician Scientist)

Dr. Deepa Nair

Dr. Prakash Shetty

## **Transfusion Medicine**

Dr. Shashank Ojha (OIC)

Dr. Minal Poojary

Mrs. Manda Kamble

@ Term ended in March 2016

**Dr. Prashant Bhat**  
Medical Superintendent

## Medical Administration

**Quality Manager**  
Mrs. Chital Naresh

### Overview

Medical Administration oversees all the patient centered services at ACTREC, focussing on comprehensive, uninterrupted, high quality, collaborative management of cancer patients alongside oncology research and education. Medical administration encompasses out-patient, in-patient, diagnostic, clinical and support services as well as quality improvement functions. Currently the hospital at ACTREC has 88 functional ward beds, 10 ICU and Recovery beds, 6 Bone marrow transplant beds and 16 Day care beds, thus totaling to 120 beds. The Office of the Medical Superintendent (a) liaises with experts and their teams to ensure planned, collaborative patient care in various areas of ACTREC, (b) coordinates large turnkey projects for installation of equipment and evaluation of contracts for outsourced services, (c) oversees and coordinates major and minor infrastructure development projects, and (d) participates in the material management of drugs and surgicals as well as procurement of capital equipment.

### Service

During the year 2016, the Office of the Medical Superintendent took significant proactive measures to meet the growing needs of patients and facilities at ACTREC and to ensure continuation of quality patient care. The highlights are displayed below:

- A total of 6121 new cases were registered at the ACTREC hospital during 2016, of which 870 were direct registrations at ACTREC. The OPDs at ACTREC also experienced a significant increase in patient number, with an average of 322 out-patients/ day. The year saw 2333 admissions amounting to 25195 in-patient days. The overall in-patient bed occupancy was 75.3% and the average length of stay was 5 days. In all, 2333 major surgeries and 1093 minor procedures were performed. Interventional radiology procedures too showed a 48% increase compared to the previous year, with 2043 procedures being carried out in 2016.
- ACTREC diagnostic services - viz. Clinical Biochemistry, Hematopathology, Microbiology, Surgical Pathology, and Hematology - Molecular Division, underwent successful desktop surveillance by NABL in June 2016 and were granted continuation of accreditation in recognition of their technical competence and quality of testing.
- Relocation of the Hematology – Flow Cytometry laboratory from TMH to ACTREC in May 2016 expanded the scope of diagnostic services at ACTREC. In September 2016, this lab underwent post-relocation verification assessment by NABL and was granted accreditation. There was a further

expansion in the scope of diagnostics with the relocation of the Cancer Cytogenetics laboratory from TMH to ACTREC in October 2016. This laboratory is to undergo verification assessment, along with NABL reassessment of all the other diagnostic labs in March 2017.

- A new Mammography system was successfully installed and inaugurated as a turnkey project and opened for patient use on 24 January 2016. A new PET-CT machine was installed during 2016, and is being used for PET-CT imaging, diagnostic studies and radiotherapy planning. Imaging studies at ACTREC received a boost consequent to the restarting of MRI as well as interventional radiology procedures under anesthesia; the latter is especially useful for patients in the pediatric age group.
- Subsequent to the audit conducted by the Rajiv Gandhi Jeevandayi Arogya Yojana (RGJAY) assessors on 13 October 2016, ACTREC has been empaneled with 'A' grade for the RGJAY scheme.

The increase in the number of patients being referred to and registered at the ACTREC hospital threw several challenges for Medical Administration. To cater to the increasing patient load, improvements were brought about in patient management in the OPDs, Radiotherapy, Day Care, Interventional Radiology and Pharmacy. A proposal to

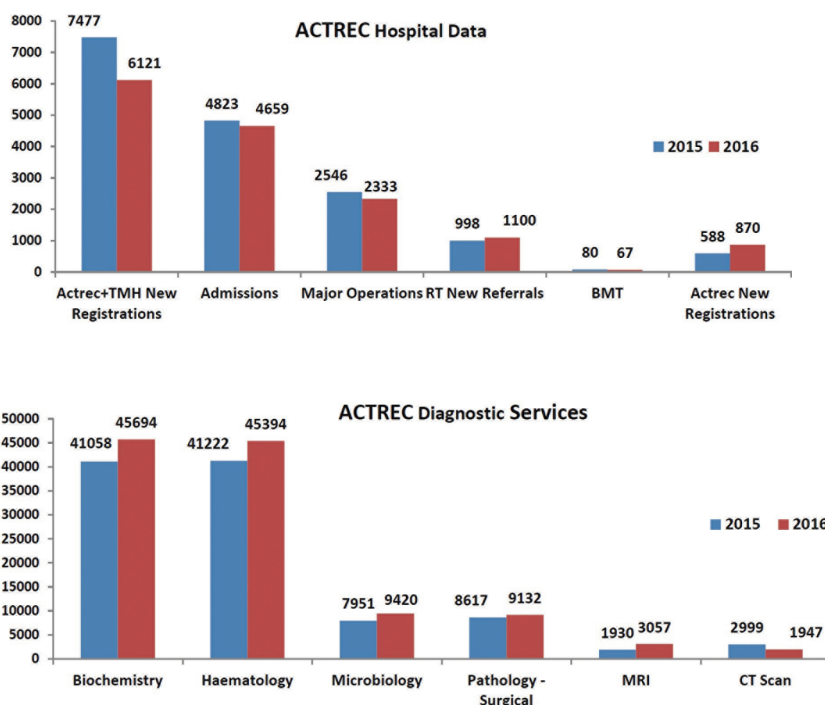
develop a waiting area for the patients with corporate support was fast tracked for implementation.

Medical Administration continued to proactively seek patient feedback through strategically located 'Patient Feedback Redressal' boxes that are freely accessible to patients on the ACTREC campus. During 2016, feedback was obtained from 137 patients. Medical Administration continued to maintain an Incident Reporting system, wherein 76 incidents were reported in 2016. Root cause analysis for these incidents was performed, and corrective/ preventive measures were initiated as appropriate. Specific critical incident report forms were introduced in the ICU and OT in April 2016 to report safety issues, and the reported incidents were reviewed on a monthly basis for corrective and preventive action.

Through the Infection Control Committee, the Office also oversees the compliance of biomedical waste management according to the regional requirements, and monitors infection control. The Office has assigned tasks to various stakeholders for the implementation of NABH 4<sup>th</sup> edition standards and further on initiate application for NABH accreditation. Medical administration also takes part and gives necessary inputs as and when required for TMC projects under various stages of implementation.

## Education

The MS, Dr. Prashant Bhat, is a visiting faculty for the MHA and Executive PGDHA programs of the Tata Institute of Social Sciences (TISS). During the year, he supervised MHA students of TISS for internship and was project guide for two students' dissertations. On behalf of NABH (National Accreditation Board for Hospitals & Healthcare Organizations), both the faculty of this department actively participated as NABH Assessors for the assessments of various hospitals in the country. They attended two international and one national conference during 2016.



As per the calendar plan for 2016, several training programs for general hospital staff as well as those for laboratory and nursing staff were conducted at ACTREC. Training programs covered basic safety in laboratories, orientation on the revised quality management system, infection control and safety practices, pre-analytical errors and trouble shooting, waste management - process of implementation of new BMW rules, and spill management. The 3<sup>rd</sup> National Quality Conclave of Diagnostic Laboratory and Transfusion Services was conducted on 19 March 2016; the meeting received over 300 registrations.

## Physiotherapy

This well equipped department is manned by qualified, skilled and experienced physiotherapists who provide physiotherapy to admitted and outdoor patients having disabilities and/or complications due to disease, surgery, radiation therapy and chemotherapy. The physiotherapists perform a thorough assessment, diagnose and design individualised treatment plans that include chest physiotherapy, manual therapy like exercises and mobilization, electro therapy, swallowing therapy, cognitive therapy, vaginal dilation, incontinence management, etc. They also oversee the work of certified lymphedema therapists, and provide orthotic appliances (crutch, walker, splints, etc) and external breast prostheses to patients. In 2016, 6627 patients availed physiotherapy services at ACTREC. The department also engages in research, and has successfully completed a randomized controlled trial.

## Nutrition & Dietetics

A trained dietician conducts nutritional screening and assessment of all new patients within 24 hrs of admission, and plans medical nutrition therapy after assessing the nutritional status of the patients referred by various disease management groups. The dietician studies the nutritional requirements and clinical profiles, prescribes therapeutic diets based on the patients' nutritional needs, monitors diet compliance of patients on medical nutrition therapy, and re-plans diets if necessary. Another vital function is to monitor food service management of the kitchen and assess hygiene, food handling and quality of the food, which involves food tasting before it is served to the patients.

## Medical Social Services

Trained medical social workers ensure the provision of emotional, psychological and financial support to cancer patients and their caregivers – factors that go a long way towards alleviation of suffering and improving the quality of life. Counselling to all the patients - including those who are unwilling to take treatment, ensures treatment completion and minimizes drop out. Patients are informed about treatment procedures, travel concession, and socioeconomically challenged patients are directed towards avenues of financial support and accommodation. Close liaison with the Blood Bank ensures that blood/ components are made available through voluntary donors, especially for

outstation patients. The social workers facilitate support for diagnosis and medicines through the Centre's supplementary funds, and make coordinated efforts towards obtaining donations in cash for the supplementary funds and in kind for the hospital. They organize the distribution of gifts and other material to the patients, liaise with NGOs who organize entertainment programs as a service to cancer patients, coordinate festival celebrations through the sponsorship of donors and NGOs, and conduct stress management workshops and Yoga classes for the patients.

## Patient Support Services

- **St. Jude Trust** provides pediatric patients a clean, hygienic and secure place to stay in while on treatment at the hospital, and also provides psycho-socio support, ration, nutritional supplements and clean water. It conducts educational and recreational activities like yoga, meditation, theatre, art therapy and music therapy.
- **VCARE** Foundation offers counseling services, distributes cancer information books, celebrates cancer survivor day, arranges programs on the occasion of festivals like Dassera/ Diwali, and also sponsors tailoring class for rehabilitation of cancer patients and their relatives.
- **JASCAP** donates to the Supplementary Fund which is used for poor patients, runs a book stall

at the hospital in which they provide books on cancer information in various languages, and makes CDs and DVDs available to cancer patients at a nominal cost.

- **Cancer Patients Aid Association** provides nutritional supplements to patients, celebrates National Cancer Rose Day, distributes gifts and arranges snacks/ lunch parties for patients staying in the hostel on the occasion of festivals.
- **Make a Wish Foundation** identifies and fulfills the wishes of pediatric patients taking treatment at the hospital. These involve gifting them toys to celebrity visits which are all time favorites of the children.
- **Mahindra Foundation** distributes kits to post-op breast cancer patients that are of great practical benefit of patients.
- **Sanjivani Trust** provides counseling and guidance to patients.
- **Vasantha Memorial Trust** provides counseling to cancer patients and also provides financial assistance to poor patients in case of emergency/ urgent need of medicines.
- **Madat Charitable Trust** provides counseling, gives financial assistance to breast cancer patients in case of emergency/ urgent need of medicines, distributes wigs to cancer patients, and assists in conducting breast cancer post surgery rehabilitation class.
- **Kaivalyadham, Lonavala** conducts Yoga classes for patients and their relatives thrice a week.

## Department of Medical Oncology

**Dr. Navin Khattry**  
Officer-in-Charge

### Overview

The department of Medical Oncology started its services in ACTREC in 2006. Initially it was restricted to administering concomitant chemotherapy with radiotherapy for head and neck cancers and cancer of the cervix. Since the past five years, chemotherapy is also being administered in neoadjuvant, adjuvant and palliative setting for solid tumours. The Bone Marrow Transplant unit shifted to ACTREC in November 2007 due to the rising incidence of life threatening infections in the unit at Tata Memorial Hospital, Mumbai. Since then, ~600 autologous/ allogeneic transplants have been performed with overall transplant related mortality of 9% (2% in autologous, 15% in allogeneic). Since October 2011, adult patients with hematolymphoid neoplasms not undergoing transplant are also being treated in ACTREC.

### Service

**Bone Marrow Transplantation Unit:** In 2016, 67 transplants were performed in ACTREC of which 33 were allogeneic and 34 were autologous. Close to 4,500 out-patient visits took place this year leading to an average of ~375 out-patient visits per month. The unit routinely performs matched unrelated

donor transplant using HLA matched stem cells from international unrelated donor registries, unrelated cord transplants, and the most challenging - haplo-identical transplants for patients who do not have a fully matched related/ unrelated donor. In fact, this hospital is one of the largest centres doing these transplants; around 45 transplants having been performed over the past 4 years, with an overall survival of ~55%. Since 2009, a funding mechanism has been in place to offer free or greatly subsidized BMT as a life saving measure for deserving poor patients. Under this scheme, over 110 autologous/ allogeneic transplants have been performed till date.

**Adult Hematolymphoid Unit:** A 17-bed leukemia/ lymphoma ward and adult hematolymphoid OPD was set up in 2011. Around 700 in-patients and ~7,500 out-patient visits took place during 2016.

**Adult Solid Tumor Unit:** In the year 2016, around 9,450 out-patient visits took place. Tumors of the head and neck region, breast, ovary, cervix and gastrointestinal region comprise the bulk of cancers treated by the unit at ACTREC. The five in-patient beds dedicated to solid tumors, in the second floor ward in Paymaster Shodhika, are always occupied.

### Medical Oncologists

Dr. Sudeep Gupta  
Dr. Kumar Prabhash  
Dr. Manju Sengar  
Dr. Amit Joshi  
Dr. Jaya Ghosh  
Dr. Bhausahab Bagal  
Dr. Tushar Vora  
Dr. Hasmukh Jain

**Pediatric Oncology Unit:** A pediatric oncology OPD and 5 bedded in-patient service also runs in ACTREC. Around 6,000 out-patient visits occurred in the year 2016, and the five in-patient beds are always occupied.

### Clinical Research

Faculty members of the department are involved in several investigator initiated and sponsored clinical trials and various collaborative research projects, both in the hematolymphoid and the solid tumor units. A phase I trial unit with two beds, that was commissioned a few years ago, has patients from the department at all times.

### Education

The department of Medical Oncology at ACTREC has an active educational program, which encompasses daily academic sessions pertaining to transplantation and hematolymphoid neoplasms for the DM students posted in ACTREC, and a monthly Journal Club that includes faculty and students from the departments of medical, radiation, surgical oncology and other allied branches. During 2016, both consultants and students from the hematolymphoid and solid tumor units presented their research at various major national and international meetings.

**Dr. Tejpal Gupta**  
Officer-in-Charge

## Department of Radiation Oncology

### Radiation Oncologists

Dr. Vedang Murthy  
Dr. Supriya Sastri  
Dr. Jayant Sastri Goda  
Dr. Tabassum Wadasadawala

### Medical Physicists

Dr. SV Jamema  
Ms. Reena Phurailatpam  
Ms. Siji Paul

### Overview

The department of Radiation Oncology at ACTREC continues to provide high-quality service, impart training and education, and conduct meaningful and ethical research in oncology in close collaboration with colleagues at TMH. The group also focusses on generating high-quality evidence for the use of advanced radiotherapy technology at various sites including brain, head & neck, cervix, bladder, and prostate cancers. With the clinical commissioning of a new Linear Accelerator (Varian TrueBeam), the Stereotactic Body Radiotherapy (SBRT) program has also been initiated at ACTREC - particularly for liver, prostate, and oligometastases. Respiratory motion management using deep-inspiratory breath hold (DIBH) has been standardized for breast cancers and mediastinal lymphomas. Commissioning and clinical implementation of total skin electron therapy (TSET) for cutaneous lymphomas was also achieved towards the latter part of 2016. A new improved version of indigenously developed multi-leaf collimator (MLC) system has now been installed on Bhabhatron-II telecobalt unit and is currently pending regulatory approval for clinical use.

### Service

Over 850 patients were treated with external beam radiotherapy and over 380 brachytherapy procedures were performed on 165 patients at ACTREC during 2016.

### Research

Faculty members of this department are engaged in 34 research projects and audits in collaboration with colleagues in ACTREC and TMH. Some of these include: (1) Image texture analysis in assessing tumor heterogeneity: a tool to predict, prognosticate cancers and individualize radiotherapy; (2) Oligodendroglial tumors: audit of 1p19q results; (3) A prospective study to evaluate the feasibility of hippocampal sparing intensity modulated radiotherapy in preserving neurocognitive functions in adults with pituitary adenoma (SHAPE study); (4) Integrated genomic and proteomic analysis of embryonal brain tumors and delineation of the functional role of genetic alterations in medulloblastomas, the most common embryonal brain tumors (COMET study); (5) An audit of demographics, clinical features, pathological parameters, molecular profiling and their impact on outcomes in adult patients with medulloblastoma (adult medulloblastoma).

### Education

Faculty members of the department organized the Bhabhatron Users Meeting at ACTREC in April 2016, and the Lymphoma Practicum at TMH in October 2016. Departmental faculty members participated in 10 international meetings and a large number of national and local meetings either as faculty, invited speaker, panelist or delegate with oral/ poster presentation. One of the faculty (SS) took up a visiting professorship in USA from October 2016 onwards. The department accepted two trainees to work on their Master's dissertation during 2016.

# Department of Surgical Oncology

**Dr. Aliasgar Moiyadi**  
Officer-in-Charge

## Surgical Oncologists

Dr. Vani Parmar  
Dr. MS Qureshi  
Dr. Vinay Shankhdhar  
Dr. Deepa Nair  
Dr. Sudhir Nair  
Dr. Prakash Shetty

## Overview

The department of Surgical Oncology provides surgical services and in-patient care, and conducts outpatient OPDs for newly registered cases as well as pre- and post-operative care and follow-up clinics for a wide range of cancer patients. The services run four regular operating theatres, five days a week. The core surgical oncologists at ACTREC are fully supported by the staff of the department of Surgical Oncology, TMH, and seven surgical oncology residents.

## Service

Around 2300 major surgical procedures in pediatrics, head & neck (HN), breast, gastro-intestinal, gynecology, urology

and neurosurgery were performed in the report year 2016 (figure). While a majority of the patients operated at ACTREC include those on clinical/translational studies referred from TMH, a growing number of patients are registered directly at ACTREC.

**Specialty Services:** The neurosurgical services offer intra-operative neurophysiologic monitoring, which enables performance of safer surgeries in patients with tumors in eloquent areas. This is in addition to image guided surgery already being performed routinely at ACTREC. Minimally invasive laparoscopic GI surgery has also been consolidated during the year and is being implemented regularly with plans

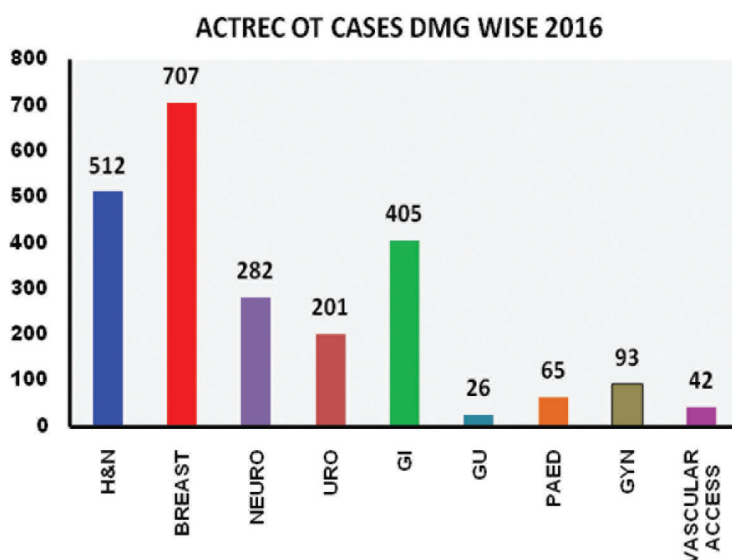
for further expansion. Microvascular reconstructive procedures are also being performed by the HN services for complex HN malignancies.

## Research

Faculty members of the department at ACTREC are involved in several DMG coordinated research projects alongside their counterparts at TMH and with collaborators in other institutes such as IIT and BARC. The neurosurgical services have also secured a long-term grant from DAE (Dr. Moiyadi, PI) for development of an advanced brain-mapping program.

## Education

The neurosurgery services conducted a Live Surgery Workshop on 'Intraoperative mapping techniques' in September 2016 – a first for ACTREC. Departmental faculty members are actively involved in various capacities in national and international bodies/associations, and presented their clinical research findings at over 30 national and international conferences and workshops during the year. A live global webcast on 'Chest wall tumors in children' was conducted by Dr. Sajid Qureshi on the WOFAPS website in November 2016.



**Dr. Reshma Ambulkar**  
Officer-in-Charge

## Department of Anesthesiology, Critical Care and Pain

### Anesthesiologists

Dr. Raghu Thota  
Dr. Bhakti Trivedi  
Dr. Malini Joshi

### Intensivist

Dr. Amol Kothekar

### Overview

The department provides Anesthesia services at seven locations and conducts a Pre-Anesthesia Check-up Clinic; Critical Care services at the 10-bedded intensive care unit cum PACU, encompassing the CPR team; and Acute pain management services to the patients at ACTREC. Eight senior residents are posted at ACTREC, and full time consultants and residents from TMH support the ACTREC department.

### Service

During 2016, the department provided Anesthesia services for: 2333 major OT procedures, 547 GA + local procedures in the Radiotherapy OT, 272 MRI, 384 Interventional Radiology procedures and 1492 new + follow-up Pre-anesthesia check-ups; Critical Care services for 2067 Recovery room admissions, 284 ICU admissions (116 of which were ventilated) and 36 ICU admissions for procedures; as well as 225 Acute Pain services.

Significant quality achievements: Besides the pre-existing specialty groups for pediatric anesthesia, critical care and pain, two additional specialty groups - thoracic, and hepatobiliary/pancreatic, were created within the Anesthesia division in July 2016 to provide better service to patients, promote professional development and streamline work patterns, protocols and research. Quality indicators for these groups are as follows:

Critical care group: APACHE IV, SAPS 3, ICMM and MPM0 II had moderate discrimination and good calibration in adult patients with malignancy. None of the mortality prediction models could accurately discriminate between survivors and non-survivors in the patient population. Specifically designed model like ICMM did not have any advantage over other ICU mortality prediction models.

Pediatric anesthesia group: Good compliance with pre-operative fasting guidelines was noted in pediatric patients. Intra-operative endotracheal cuff pressures were maintained within acceptable range in >92% patients. Post-operative pain relief was adequate in >98% children.

Thoracic anesthesia group: Adequate lung isolation with good to excellent lung collapse was achieved in >95% of cases needing lung separation and one-lung ventilation.

Hepato-biliary/ pancreatic specialty group: In all, 154 patients were seen in the high-risk joint clinic; 98 of them underwent surgery. Compliance was 94% with thromboprophylaxis and 81% with pre-operative carbohydrate drink. A formal physiotherapy referral and pulmonary rehabilitation class was initiated for patients in November 2016.

Pain group: There was 76.6% adherence to laid down Acute Pain Service (APS) protocols. The group is moving towards procedure-specific pain protocols (pediatric, thoracic, GI). Neuropathic

pain scale and pediatric (FLACC) scale were incorporated in the APS assessment form. In chronic pain, 36% reduction in pain severity was noted at first follow up. Adherence to WHO pain ladder improved significantly during 2016.

### Research

Over 40 clinical studies were on-going/ completed in 2016. These included a prospective study to evaluate the ability of anesthetists to give effective cricoid pressure using a McGrath Mac video laryngoscope (PI, Dr. Ambulkar) and acute kidney injury in post hepatectomy patients in tertiary cancer hospital (PI, Dr. Joshi). Departmental meetings were held to discuss planned projects before submission to the IRB.

### Education

The departments at ACTREC and TMH organized several academic programs during 2016: annual 3-day Anesthesia Review Course; 'National Airway' conference in December 2016; an annual 2-day workshop on Hemodynamic Monitoring; annual 2-day conference on Education in Cancer Pain; 1-year ICU technicians' course; hospital CPR course for nurses and doctors at TMC; and orientation lecture series on 'Pain Management' for hospital nurses. Members of the department participated as faculty at several national/ international conferences in 2016.

## Department of Radiodiagnosis

**Dr. Ashwin Polnaya**  
Officer-in-charge

### Medical Officers

Dr. Seema Kembhavi  
Dr. Amit Kumar Janu

### Overview

The department is well equipped to provide diagnostic imaging services of conventional radiography, sonography (transabdominal, endocavitary and small parts), Doppler, diagnostic and planning computed tomography (CT) and magnetic resonance imaging (MRI) scans with/ without intravenous contrast, mammography and interventional procedures like image-guided FNACs, biopsies, embolizations and drainage procedures. In addition, the department caters to bedside as also intra operative USG and Doppler as a commitment to clinical services. Emergency services such as urgent x-rays, sonography, Doppler studies, and CT and MRI scans are available 24 x 7. A new PET-CT scanner was installed in 2016 to replace the old PET-CT scan machine that had been decommissioned in September 2015. The CT component of the PET-CT equipment started functioning from 3 May 2016 and is available for clinical use 24 x 7. A new mammography machine was installed and started functioning with effect from 10 February 2016, and caters to breast DMG and preventive oncology services. CT and MRI was also conducted on animals as a part of animal research projects in ACTREC. The department has two senior and two junior registrars posted on monthly rotation from TMH; the senior registrar functions as the resident.

### Service

The department performs conventional radiological investigations, CT scans of the brain, peripheral nervous system, neck, thorax, abdomen, pelvis and

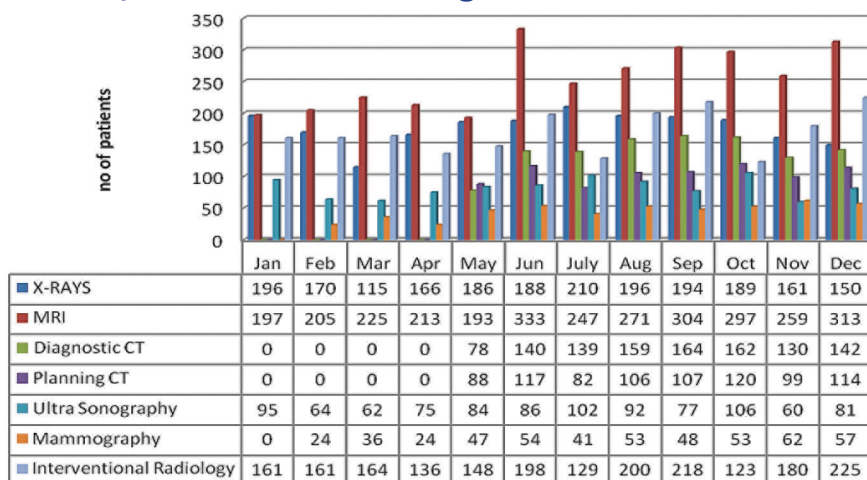
extremities, CT angiography procedures and CT scans for RT planning, routine MR imaging of the brain, paranasal sinuses, neck, whole spine, abdomen, pelvis, all joints and extremities as well as MRI scans for RT planning. Advanced MR imaging including perfusion imaging, diffusion weighted imaging, MR angiography, and diffusion tractography (diffusion tensor imaging) and functional MR imaging are also performed. During the report period, a total of 2121 conventional x-ray investigations were performed of which 1587 were routine and 534 portable; the average was 177 x-rays/ month. In all, 984 USG/ color Dopplers were performed, averaging to 82 scans/ month. A total of 1114 diagnostic CT scans were performed, at an average of 139 patients/ month. A total of 833 radiotherapy planning CT scans were performed, leading to an average of 104 patients/ month. In all, 3057 MRI scans were performed, at an average of 255 patients/ month. A total of 2043 interventional radiology procedures

were performed, leading to an average of 170 procedures/ month. In all, 499 mammography scans were performed, averaging at 45 patients/ month in 2016. Various interventional radiology procedures (vascular and non-vascular) were initiated and streamlined with a steadily increasing spectrum and number of cases in 2016 at the ACTREC Interventional Radiology Suite, enabling the department to cater to the need of cancer patients and reducing the waiting list of cases in TMH. Patient flow and procedures in the MRI section were also streamlined.

### Education

The OIC of the department conducted a live workshop and training session in Intervention Radiology, 4<sup>th</sup> Asia, Middle East and Africa Interventional Oncology Basic Course at TMC in July 2016, and a faculty of the department participated in a training session in September 2016. Technical staff members of the department participated in one international and four national meetings.

### ACTREC/CRC: 2016 - Radiodiagnosis



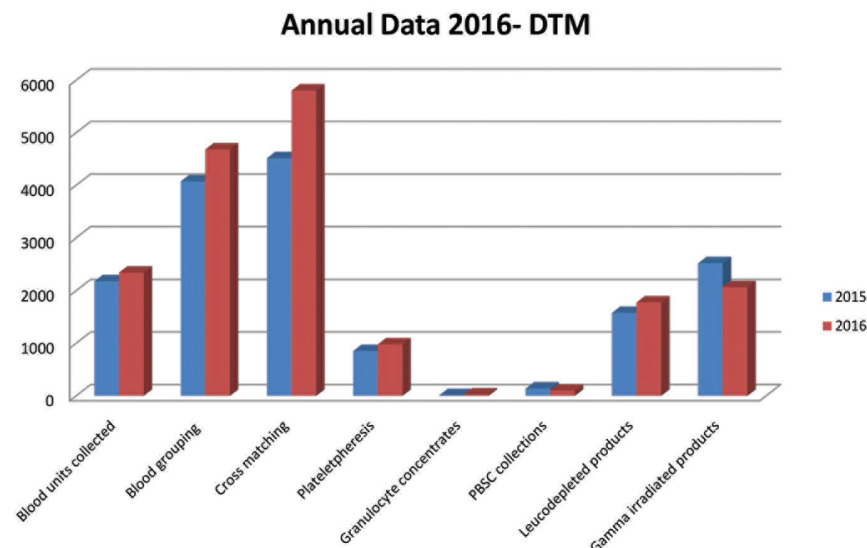
**Scientific Officer**  
Mrs. Manda Kamble  
**Blood Bank Officer**  
Dr. Minal Poojary

### Overview

The department of Transfusion Medicine (DTM) provides safe and adequate supply of blood/ blood components round the clock to meet the needs of patients admitted at ACTREC. Services include blood donation and apheresis, blood donation camps, red cell serology, blood component preparation, testing, storage and issue. Specialized services include peripheral blood stem cell (PBSC) harvest, cryopreservation and storage, leukodepletion and gamma irradiation of blood for bone marrow transplantation (BMT) patients. DTM also caters to the blood component requirements of patients admitted in other hospitals in Navi Mumbai. DTM's license to operate has been successfully renewed after a joint CDSCO and state FDA inspection, and has been granted blood irradiator license by AERB.

### Service

During the year 2016, DTM collected a total of 2347 blood units, prepared 4413 blood components, and issued 3837 blood components (figure). In addition, 981 plateletpheresis and 126 leukapheresis (102 PBSC and 24 granulocyte concentrates) procedures were performed. Under specialized blood components requirement, 1779 units were leukodepleted and 2069 gamma irradiated. Blood grouping and cross-matching was done on 4684 and



5804 samples respectively (figure). The department also organized 38 outdoor blood donation camps and three platelet donation awareness camps to meet the requirements of in-house patients.

### Research

Departmental faculty members are involved in three projects in collaboration with other departments in ACTREC and TMH. A project on 'Determination of select biochemical reference intervals in Indian voluntary blood donors' is on-going. Two completed projects include: (1) 'Flow cytometric platelet cross-matching approach for selection of platelets in hematopoietic stem cell transplant patients', which concluded that flow cytometrically cross-matched platelets had no benefit over uncross-matched platelets in HSCT patients due to immunosuppression of the study population and absence of pre-existing

alloimmunization in the majority of the transfused patients; (2) 'A study of hemolysis in red cell concentrates during transportation', which concluded that proper maintenance of cold chain during transportation is very crucial and can prevent hemolysis.

### Education

DTM and diagnostic laboratories, ACTREC jointly organized a CME on 'III<sup>rd</sup> Quality Conclave of Laboratory and Transfusion Services' on 19 March 2016. DTM was closely involved in the conduct of the AMLT course in which two students were accepted this year. Three MDs and two technologists from other hospitals were accepted in DTM for training in PBSC harvest, plateletpheresis and other transplant-related activities during 2016. Faculty and staff members presented scientific papers at eight national/ international conferences, and underwent training to keep abreast with the latest developments.

### Overview

The Nursing department of ACTREC provides comprehensive, quality nursing care to cancer patients undergoing various treatment modalities, and encompasses assessment, care and constant monitoring. Due attention is also given to the implementation of patient safety goals, continuing education, and nursing research. New initiatives taken up during 2016 included initiation of day care patient assessment, and peripheral insertion of central catheter by staff nurses.

### Service

Quality care with a focus on patient safety was put on priority, and patient safety goals were reinforced to ensure a safe environment for the patient. In 2016, there were 241 new admissions to day care with a total of 17624 sittings. Around 1093 patients underwent minor procedures and 2333 underwent major

surgeries. Nurses provided evidence based holistic care to the patients. Specialized nursing care was provided to 67 patients who underwent bone hematopoietic stem cell transplant – 34 autologous and 33 allogeneic, of which seven were haplo-identical and four were matched unrelated donor transplants. Complications like graft versus host disease, hemorrhagic cystitis and cytomegalovirus infection were handled with expert nursing care, leading to recovery. There was no incidence of methicillin-resistant *Staphylococcus aureus* (MRSA) infection in the bone marrow transplant unit. Nurses from the medical oncology department received appreciation letters from patients. Initial assessment was initiated for all day care patients. Double verification of all high risk medications was initiated to prevent medication errors. Nurses also underwent training for insertion of PICC line.

### Research

A series of audits was conducted on medication safety, patient identification, catheter-associated urinary tract infections, ventilator associated pneumonia, and thrombophlebitis; a decreasing trend was noted in complications associated with them. Nurses were encouraged to conduct small research studies that focused on improving patient care.

### Education

The department conducted a one year fellowship program in Bone Marrow Transplant Nursing in July, an intensive CPR training program in August, and a two-day BMT national training program for BMT nurses in December - in which over 200 nurses from 12 Indian states participated. The ANS and two nurses attended an international conference; the faculty also participated in five national conferences this year.

**Dr. Asawari Patil**  
Officer-in-Charge

## Pathology Laboratory

### Staff Pathologists

Dr. Epari Sridhar  
Dr. Swapnil Rane

### Overview

The Pathology laboratory at ACTREC is a part of the department of Pathology, TMC, and the pathology consultants and resident doctors work on rotation at TMH as well as ACTREC. At any given time, the ACTREC lab has one consultant pathologist, two senior residents, and one junior resident.

### Service

The lab provides in-house diagnostic services of histopathology, frozen section, immunohistochemistry and cytology for patients treated at ACTREC as well as for referral cases from outside hospitals. The lab is accredited by NABL for all services except cytology and participates in EQAS (External Quality Assessment Scheme) offered by national and international agencies. During the year 2016, the lab processed around 2900 histopathology specimens, 2300 frozen sections, and 350 cytopathology specimens. The lab has over 37 antibodies standardized for use in IHC experiments, and performed around 3600 IHC tests on automated immunostainer this year.

### Research

The lab archives all the slides and blocks of the patient's samples and, when required, retrieves and issues them for IEC-approved projects of pathologists, clinicians, and scientists. The pathologists are involved as principal or co-investigators in many IEC approved DMG projects, junior resident's thesis projects, and collaborative projects with scientists in ACTREC.

### Education

The pathologists participate in national/international conferences as faculty as well as for oral or poster presentations. Resident doctors and technical staff are encouraged to participate in conferences and continuing medical education (CME) programs. The technical staff members are also encouraged to participate in internal audit course for NABL.

# Hematopathology Laboratory (ACTREC)

**Dr. P.G. Subramanian**  
Officer-in-Charge

## Haematopathologist

Dr. Sumeet Gujral  
(deputed from TMH)

## Clinician Scientists

Dr. Nikhil Patkar  
Dr. Prashant Tembhare

## Scientific Officers

Dr. Ashok Kumar  
Mr. Y. Badrinath  
Dr. Shruti Choudhary

## Overview

This lab focusses on the diagnosis of hematological malignancies, monitoring of patients while on therapy for malignancies and pre-/post-operative hematological work-up of surgical patients. The lab's molecular section, set up at ACTREC in 2013, undertakes molecular testing for diagnosis, subtyping, risk stratification, disease monitoring, and identification of targets for therapy. This section probably has the largest hemato-oncology molecular diagnostics workload in the country, and receives referral samples from across India. Next Gen sequencing facility for research started functioning this year. The flow cytometry section moved from TMH to ACTREC in May 2016. The lab carries out flow cytometric immunophenotyping of blood, bone marrow and body fluids for hematolymphoid malignancies. The lab also undertakes post-allogeneic stem cell transplant monitoring using chimerism analysis.

## Service

During the report period, the lab at ACTREC performed a total of 21121 specialized tests for hemato-oncology, which included 7429 bone marrow aspirate morphology, 6364 flow cytometric immunophenotyping, and 7328 molecular tests. Flow cytometry tests included diagnosis and classification of acute leukemia (2338), non-Hodgkin's lymphoma (1410), multiple myeloma (467), myelodysplastic syndrome (180), stem cell enumeration for bone marrow transplant (183), acute leukemia minimal residual disease (MRD) monitoring (1754) and T-cell clonality testing (32). The molecular tests encompassed RQ-PCR for BCR-ABL (4132), BCR-ABL transcript identification (201), ABL kinase domain mutation for chronic myeloid leukemia (344), RQ-PCR for PML RARA (515), JAK2 mutation V617F, exon 12 and CALR mutation (311), acute myeloid leukemia (AML) gene mutation detection (514), chronic lymphocytic leukemia (CLL) IGVH mutation detection (37), hairy cell leukemia mutation BRAF V600E (12), lymphoplasmacytic leukemia/Waldenstroms macroglobulinemia mutation MYD88 L265P detection (6), TPMT/ PGDFR/ MLPA testing (18), and chimerism studies (1256).

## Research

Faculty members of the lab are engaged in several research projects involving the monitoring of MRD in B cell and T cell acute lymphoblastic leukemia, AML, immunogenetics of CLL, study of gene mutations in AML, detection and monitoring of MRD by Next Gen sequencing, monitoring minimal disseminated disease in pediatric round cell tumors by flow cytometric immunophenotyping, and examination of circulating plasma cells and serum miRNA levels in multiple myeloma.

## Education

The lab conducts of basic and advanced courses including: annual Immunophenotyping - Bench to Clinic course for technicians; annual Immunophenotyping - Bench to Clinic course for pathologists; 2-year post-MD Hematopathology Fellowship Program; 6-month Advanced Training Program for pathologists in oncology (two trainees); Advanced Training Courses for Technologists in Flow Cytometry (three trainees) and Molecular Hematology (three trainees). In 2016, 35 MD pathologists from across the country were accepted as observers to learn morphology, cytochemistry and flow cytometry. The lab initiated a course for training technicians in molecular diagnostics; four trainees were accepted in this course. As a part of ACTREC's training program, the lab accepted nine trainees - seven for Master's dissertation, one for experience and one as observer during 2016.

**Dr. Pratibha Kadam-Amare**  
(till Jul 2016)

**Dr. Dhanlaxmi Shetty**  
(from Aug 2016)

Officer-in-Charge

## Cancer Cytogenetics Laboratory

### Scientific Officers

Mrs. Sharayu Kabre

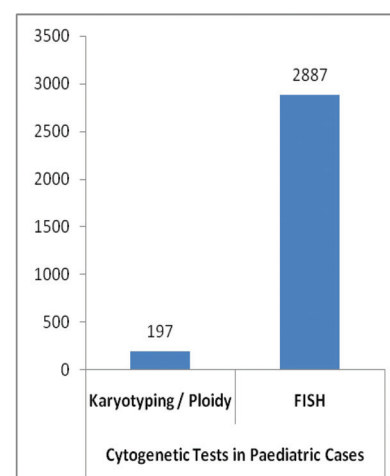
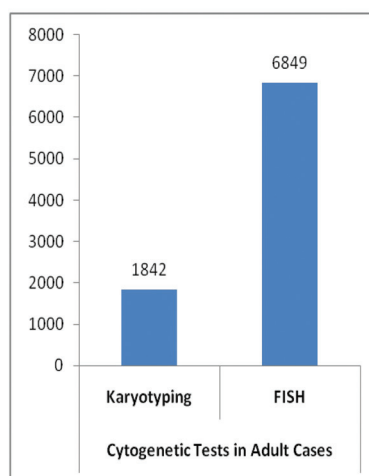
Ms. Hemani Jain

### Overview

The Cancer Cytogenetics lab has been mandated to provide diagnostic services that encompass molecular cytogenetics and conventional karyotyping, which form an integral part of diagnosis, prognostication and risk stratification in hematolymphoid malignancies and their management. During the year 2016, the lab performed a total of 11775 diagnostic tests. In July 2016, the lab shifted to the ACTREC campus, and patient services were resumed within a week. All the support staff in the OPDs, minor OT, RF counter and wards have now been trained in sample transportation and requisitions for this lab. The lab is NABL compliant and the CAP proficiency program for quality control has been continued at its new site. The desktop audit performed by NABL in March 2016 reported good performance of the CAP proficiency program. An internal audit was conducted in December 2016.

### Service

The Cancer Cytogenetics lab focusses on diagnostic services in hematolymphoid malignancies. These include molecular cytogenetics, i.e. fluorescence in situ hybridization (FISH) in CML, ALL, AML, myelodysplastic syndrome (MDS), lymphoma, and multiple myeloma; conventional karyotyping in CML, AML, MDS, and ploidy analysis in ALL cases. During the year, cytogenetic analysis was performed for 8691 adult hematolymphoid cases and 3084



*Cytogenetic tests performed in (a) adult and (b) pediatric hematolymphoid cases*

pediatric hematolymphoid cases (figure). An overall increase of 7.5% cases was noted for myeloid and lymphoid malignancies.

### Research

During 2016, the lab was engaged in the following four extramurally funded and one additional research project with Dr. Kadam Amare as co-principal investigator/ co-investigator: (1) Development of a registry to assess the demography, cytogenetic profile and treatment outcomes of patients with multiple myeloma (myeloma registry program); (2) Evaluation of various molecular prognostic markers and minimal residual disease to potentiate therapy for acute myeloid leukemia patients: a two step molecular-clinical investigation; (3) Indian childhood collaborative leukemia group (ICICLE-2014) - a multicentre trial for newly

diagnosed patients with acute lymphoblastic leukaemia; (4) Acute myeloid leukemia and the dynamics of relapse; (5) Investigating value of circulating tumor microRNA and clonal plasma cells in prediction of therapeutic outcome and prognostication of multiple myeloma.

### Education

As a part of the DM Medical Oncology program, the lab provided orientation in 'Cytogenetics in hematolymphoid malignancies' to new consultants, registrars and fellows from the Medical Oncology department. Four candidates were appointed as trainee technologists in the Advanced Cancer Cytogenetics training program, and the lab accepted two observers this year. During 2016, faculty and staff participated in two workshops, three conferences and an EBM.

# Microbiology Laboratory

**Dr. Vivek Bhat**  
Officer-in-Charge

## Overview

The Microbiology laboratory at ACTREC provides patient and hospital related services towards bacteriology, serology, mycology, clinical microbiology, infection control, and sterility testing. Quality systems in the lab are compliant with the ISO 15189 standard guidelines. The lab is accredited by the National Accreditation Board for Laboratories (NABL) and participates in External Quality Assessment program (EQAS) with the Indian Association of Medical Microbiologists. The lab provides services on all days of the week, and emergency services at night and on holidays. Lab technologists and staff are trained to work independently, to ensure smooth functioning and compliance with the quality systems. The lab staff also includes a scientific officer.

## Service

The Microbiology lab provided various patient related and hospital services at ACTREC during 2016. In all, 13103 samples were processed in the lab, including bacteriology cultures for blood (3403), CSF (113), body fluids (189), pus (47), urine (653), feces (612), swabs (649), respiratory samples (179) and others (98); Serology: HBsAg (801), HIV (790), HCV (781), PCT (189), malarial antigen detection (552), dengue NS1/ IgG/ IgM (528); Clinical microbiology testing for urine (1009), feces (240); *Clostridium difficile* antigen testing (53) and Adeno/ Noro/ Astro/ Rota virus antigen detection (29); Mycology (114); Sterility testing for Blood Bank services: PBSC (250), SDP (1013), RDP (45), PCS (531), FFP (36), WB (47) and Environmental surveillance cultures for OT/ ICU/ Brachytherapy/ BMT units and Water testing. Infection control services and waste management support was also provided by the lab.

## Research

The lab is engaged in five on-going research projects, two of which are IEC approved. One project focuses on the microorganisms isolated from the oral cavities and saliva protein and immunoglobulin levels of post operative patients on chemoradiotherapy (CTRT), and is on the verge of completion. The other project studies the reference ranges of select biochemical parameters in the Indian voluntary blood donors. Research from this lab resulted in five national/international publications in the year 2016.

## Education

The faculty is involved in teaching students of MD microbiology, JRFs, nursing and laboratory staff at TMC and other institutions, and accepts MSc students from colleges/universities to work on dissertation projects; one trainee worked in the lab during 2016. He is involved in conduct of the Advanced Training Course in Medical Laboratory Technology (AMLT; two students were accepted in the 2016 batch). The laboratory also helped organize the 3<sup>rd</sup> National Quality Control Conclave. Lab staff made presentations in four National/ International conferences in 2016.

### Overview

The Composite Lab is NABL accredited and provides 24 hour services to the hospital at ACTREC. The laboratory consists of four sections: sample collection area, hematology, biochemistry (routine biochemistry and immunoassay), and cytology (slide preparation and staining). The lab also processes murine and canine blood samples for research purposes. The lab is involved in four IEC approved projects and two audits. An advanced training course for MLT students was initiated during 2016.

### Service

The lab provides the following patient related and hospital services at ACTREC: routine hematology (CBC, coagulation and peripheral blood smear examination) and biochemistry (LFT, RFT, electrolytes, cardiac enzymes, osmolality, immunoglobulins, ferritin, tumor markers; assays for vitamin B12, D and folate; thyroid function tests, drug assays for cyclosporine, tacrolimus and methotrexate; immunoassay for TFT). During the report year 2016, the total number of investigations/ tests performed in the lab under the following heads were: 306103 routine biochemistry, 6567 immunoassays, 44517 hematology, 200 cytology and 125 FNAC.

### Research

Two IEC approved research studies are presently on-going in the lab: (1) Determination of select biochemical reference intervals in Indian voluntary blood donors, and (2) Oral cavity flora in patients receiving chemo-radiotherapy for head & neck cancer. The lab is also involved in three audits. The audit on 'Evaluation of hematological and biochemical parameters in cancer patients' concluded that the incidence of hyponatremia and SIADH was lower in post-hematopoietic stem cell transplant (HSCT) patients as compared to the published studies. Syndrome of inappropriate anti-diuretic hormone (SIADH) secretion was more commonly seen in allogeneic rather than autologous transplant setting. Analysis of post-operative neuro-oncology patients with hyponatremia revealed that a significant decrease in serum potassium, serum uric acid, serum urea/ creatinine ratio, albumin and hematocrit levels. The second on-going audit on 'Evaluation of quality indicators in hematology and biochemistry' will help formulate ways to improve quality in the lab, while the third on-going audit on 'Analysis of laboratory sample rejections in the pre-analytical stage at an oncology center' will help formulate ways to improve quality in the lab.

### Education

The faculty organized a CME '3<sup>rd</sup> Quality Conclave of Laboratory and Transfusion Services' in March 2016 and is conducting an advanced training course in Medical Laboratory Technology since November 2016. Participants of the 2015 batch completed their training in November 2016 and are currently serving their bond period. Two students joined the 2016 batch and started their course in December 2016. In-house training sessions on sample collection and interpretation of laboratory values were conducted for ACTREC nurses. The lab also participated in the training program of the Centre and accepted two students as trainees to work on their M.Sc. dissertation projects.

# Clinical Pharmacology Group

**Dr. Vikram Gota**  
Officer-in-Charge

**Scientific Officer 'E**  
Dr. NK Manjunath

## Overview

The Clinical Pharmacology group at ACTREC is actively engaged in developing novel approaches of drug development, relying on collaborative research to foster innovation. Notable achievements in the year 2016 include the development and validation of animal models of graft versus host disease (GvHD) and radiation-induced pneumonitis, followed by programs to develop novel agents to treat these indications. Preclinical evaluation of a lead candidate as a novel chemotherapeutic agent is underway. An investigational new drug (IND) application has been submitted to the Drug Controller General of India (DCGI) for a drug candidate that is in the clinical development pipeline.

## Service

The group routinely provides therapeutic drug monitoring (TDM) services of voriconazole and posaconazole used for fungal prophylaxis to the department of medical oncology including the bone marrow transplant unit. Efforts are underway to develop TDM strategies for colistin, sunitinib, mycophenolate mofetil and sorafenib.

## Research

The major research areas of the group are drug development and pharmacokinetics-guided dose optimization. The drug development pipeline includes drugs in preclinical and clinical stages of development. Animal models of GvHD and radiation-induced pneumonitis were developed and validated in the lab. Research has progressed up to the preclinical evaluation of withaferin-A for prophylaxis against GVHD and diseleno-dipropionic acid for radiation-induced pneumonitis. The clinical development pipeline comprises of chlorophyllin as a radioprotective agent - in collaboration with BARC, for which an IND application has been submitted to the DCGI. The lab is also involved in two pharma-sponsored early phase clinical trials. Pharmacokinetics-guided dose optimization strategies are being developed for paclitaxel in breast cancer, sunitinib in renal cell carcinoma, and sorafenib in hepatocellular and renal cell carcinoma. The group is also committed to identifying good quality generics and biosimilars that could be substituted for high priced innovator molecules. Bioequivalence studies of drugs such as erlotinib and gefitinib were initiated this year. Significant findings were made on the comparability of reditux (a biosimilar rituximab) with MabThera, and of

Pemgem (a generic pemetrexed) with Alimta; these drugs can be used interchangeably with the innovators at substantial cost saving.

## Education

The faculty was recognized as a guide for the Ph.D. (Life Sciences) program of the Homi Bhabha National Institute, and enrolled his first Ph.D. student – Ms. Divya Gohil during 2016. The Tata Memorial Centre one-year fellowship in Oncotherapeutics was initiated by the group in August 2016. The group accepted sixteen trainees during the year - eight for Master's dissertation, seven for research experience, and one as research associate. The group conducted the 4<sup>th</sup> ACTREC symposium in clinical pharmacology and the 8<sup>th</sup> PAGIN workshop at ACTREC during 1-3 August 2016. The faculty participated in two international and six national meetings.

# Hypoxia & Clinical Genomics Group

## Clinician Scientists

Dr. Sudeep Gupta  
Dr. Rajendra Badwe  
Dr. Kumar Prabhash  
Dr. Anuradha Chougule  
Dr. Shalaka Joshi.

## Overview

The group, established in 2014, focuses on the effects of acute hypoxia on tumor biology and clinical genomics. The theme of the group is 'Translational research - turning discoveries into practice'. In 2016, a series of experiments utilizing the newly installed hypoxia workstation were completed, and provided evidence that acute hypoxic exposure results in modulation of gene expression in cancer cells. Another milestone for the group was installation of the MiSeq NGS platform that will enable clinician researchers to design and conduct experiments involving targeted sets of genes.

## Research

The group is presently evaluating the effects of acute, peri-operative hypoxia on breast cancer biology. The study aims to experimentally test the genotypic and phenotypic effects of surgically induced acute hypoxia (resulting from vasculature cut-off during surgery) in breast tumor samples and cell lines. Preliminary data indicates that acute intra-operative hypoxia up-regulates expression of genes related to cell survival, invasiveness, inflammation and angiogenesis in breast tumors. Breast cancer cells exposed to acute severe hypoxia followed by normoxia show increased proliferation. These effects may have implications for tumor cells that disseminate during surgery. Another project involves evaluation of the clonality of breast tumors by sequencing triple negative tumors in the same patient over time; the first set of tumors has been sent for sequencing. The group is also investigating circulating cell-free DNA as a biomarker in patients receiving neoadjuvant chemotherapy for breast cancer.

## Education

Dr. Gupta is a recognized guide for Ph.D. in Health Sciences under the Homi Bhabha National Institute. At present, the lab has three research fellows – Mr. Rohan Chaubal, Mr. Nilesh Gardi and Ms. Vaishakhi Trivedi, working towards the Ph.D. (Health Sciences) degree. The group also provides the opportunity for post-MBBS/ MD/ MS students to get a flavour of basic research and for training post-graduates/ graduates in life sciences/ other scientific areas. During 2016, the group accepted three trainees – one for the Master's dissertation and two for research experience. Group members presented the findings of their work as poster presentations at one international and one national meeting.

# Chromatin Biology Group

**Dr. Indraneel Mittra**  
Dr. Ernest Borges Chair

## Scientific Officers

Dr. Ranjan Basak  
Dr. Kavita Pal

## Overview

The group investigates the role of circulating chromatin in cancer and chronic degenerative diseases. During 2016, the group substantiated its seminal finding that chromatin emanating from dying cells (cell-free chromatin, cfCh) contains biologically active molecules that can lead to DNA damage, inflammation and apoptosis in healthy cells. The group has made these novel observations: (a) radiation-induced bystander effect is induced by cfCh released from dying irradiated cells leading to DNA damage, apoptosis and inflammation in bystander cells *in vitro* and *in vivo*, (b) toxicity of chemotherapy is primarily caused by cfCh released from dying cells and is largely preventable, and (c) cfCh emanating from dying cancer cells can transform healthy bystander cells. Based on this, the group has proposed a novel theory of cancer metastasis whereby circulating tumor cells undergo apoptosis on reaching target organs, and cfCh emanating from them oncogenically transform the resident cells inducing new cancers that appear as metastasis. Fluorescence *in situ* hybridization, confirming that the metastasis arises from cells of the target organs, has substantiated this theory.

## Research

The group has discovered that cell-free chromatin (cfCh) fragments derived from dying cells that circulate in blood are biologically active molecules that can readily enter into healthy cells and activate DNA damage and apoptotic responses in the recipients. When cfCh isolated from blood of cancer patients and healthy volunteers was added to cells in culture, it was spontaneously taken up by the recipients to accumulate in the nuclei. The internalized DNA associated itself with the host cell chromosomes and triggered a DNA damage repair response (DDR) which facilitated its integration into the host cell genomes. Damage to DNA also activated an apoptotic response resulting in the death of some cells. The group has further demonstrated that when dying cancerous cells are co-cultivated with living cells, cfCh that is released from dying cells freely enters healthy cells and accumulates in their nuclei. This is followed by activation of DDR facilitating the incorporation of cfCh into the host cell genomes. Cellular entry and genomic integration of cfCh also activates inflammatory cytokines in the recipient healthy cells. Intravenous injection of dying cells leads to release of cfCh in distant organs which is taken

up by target cells leading to DDR and inflammation. The group has further shown that cfCh isolated from cancer patients can cause oncogenic transformation of NIH3T3 cells which are tumorigenic in immune-deficient mice. Similarly, co-culturing dying cancerous cells can cause oncogenic transformation and/or senescence of NIH3T3 cells via cfCh that is released from the dead cells. The group has discovered a novel DNA degrading agent namely, a combination of resveratrol and copper (R-Cu), which can degrade cfCh both *in vitro* and *in vivo*, prevent the spread of cancer in animal model systems and enhance the effectiveness of cancer chemotherapy. R-Cu can also prevent many of the toxic effects of cancer-killing drugs that would be a great boon for cancer patients receiving chemo- or radiotherapy.

## Education

The faculty participated in three national and two international conferences during 2016 wherein he presented the group's findings to peer groups. Group members, including one more scientific officer, participated in regular in-house academic sessions, and were encouraged to attend scientific meetings and workshops.

# CANCER RESEARCH INSTITUTE

Dr. Shubhada Chiplunkar (Director, ACTREC)

## Basic Research Team

- **Dr. Dibyendu Bhattacharyya**
- **Dr. Kakoli Bose**
- Dr. Pradip Chaudhari
- **Dr. Murali Krishna Chilakapati**
- **Dr. Shubhada Chiplunkar**
- **Dr. Sorab Dalal**
- **Dr. Abhijit De**
- **Dr. Amit Dutt**
- **Dr. Shilpee Dutt**
- Mr. Nikhil Gadewal
- Dr. Poonam Gera
- **Dr. Rukmini Govekar**
- **Dr. Sanjay Gupta**
- Dr. Syed Hasan
- Dr. Arvind Ingle
- Dr. Narendra Joshi
- Dr. Jyoti Kode
- Dr. Pradnya Kowtal
- **Dr. Manoj Mahimkar**
- Dr. Sonam Mehrotra (*DBT Wellcome Fellow*)
- **Dr. Pritha Ray**
- **Dr. Rajiv Sarin**
- Mrs. Sharada Sawant
- **Dr. Neelam Shirsat**
- **Dr. Tanuja Teni**
- Dr. Rahul Thorat
- **Dr. Milind Vaidya**
- **Dr. Ashok Varma**
- **Dr. Prasanna Venkatraman**
- **Dr. Sanjeev Waghmare**
- Dr. Ujjwala Warawdekar

*Principal Investigators (PIs) are shown in bold*

## Cancer Cell Biology Group

**Dr. Tanuja Teni**  
Principal Investigator

### Overview

The research focus of this group is on gaining insights into the molecular basis of oral and cervical tumorigenesis, with the ultimate aim of identifying molecular targets. Projects in oral cancer encompass studies on: (a) the deubiquitinase USP9X - the stability conferring binding partner of Mcl-1 and its targeting using its inhibitor WP1130; (b) *in silico* analysis of survivin isoforms and regulation of activin A by  $\Delta$ Np63; (c) the functional relevance of down regulated secretory clusterin (CLU) and its novel nucleolar localization; (d) the association of human papillomavirus (HPV) p16 with outcome in head and neck squamous cell carcinomas (HNSCC) treated with radiotherapy with/ without chemotherapy; and (e) the role of translationally controlled tumor protein (TCTP) and moesin that were identified in established radioresistant oral cancer cell lines. The cervical cancer project explores the utility of high risk HPV viral load in predicting radiation response, and that of HPV E6/E7 mRNA as a secondary screening test.

### Research

Studies revealed that USP9X-mediated stabilization of Mcl-1 majorly caused its over expression in oral cancers, and down regulation/ inhibition of USP9X caused cell death via reduction in Mcl-1 levels *in vitro* and *in vivo*. Docking studies suggested that survivin 2B and survivin 3B isoforms may heterodimerize with survivin wt via the L98 residue, possibly competing with survivin wt homodimerization. Studies to decipher the functional relevance of the novel nucleolar localization of CLU and its over expression in oral cancer cells is on-going. The decreased migration of oral cancer cells post p63 knockdown, rescued by activin A treatment, was also revealed. The low prevalence of p16 positivity and no significant correlation with HPV in HNSCC patients indicated the low utility of p16 as a surrogate marker in the presence of high tobacco burden. TCTP was upregulated in radioresistant oral cancer sublines, and increased  $\gamma$ H2AX foci post TCTP knockdown indicated its possible role in DNA repair. In cervical cancer screening, the HPV E6/E7 mRNA detection test exhibited 93% specificity with 44% positive predictive value (PPV) while HPV DNA by HCII exhibited 86% specificity and 36% PPV. In cervical cancer patients, the HPV viral load reduced significantly two and five months after completion of treatment in complete responders ( $p < 0.05$ ) versus non-responders.

### Education

The Principal Investigator is a recognized guide for the Ph.D. degree in Life Sciences of the Homi Bhabha National Institute. Of the seven doctoral students – Mr. Prasad Sulkshane submitted his thesis in 2016, while Ms. Rajashree Kadam, Ms. Dhanashree Mundhe, Mr. Abhay Uthale, Ms. Dipti Sharma, Mr. Swapnil Oak and Ms. Alekhya Kilambe are working on their dissertation. The group accepted eight trainees this year – three for the Masters dissertation and five for research experience. Besides these, students from two dental colleges were assigned as observers in the lab. Group members also participated in an in-house weekly program of data presentations and journal club every week. Faculty and students of the group attended four local/ national conferences and presented their research findings as oral or poster presentations.

### Overview

The group demonstrated that disruption of the cdc25C 14-3-3 complex leads to a decrease in tumor progression and that loss of 14-3-3 $\sigma$  leads to the induction of EMT due an increase in the levels of c-Jun. Another focus of the group is to understand the biogenesis of the cell-cell adhesion junction, the desmosome and to determine the consequences of desmosome dysfunction on development, tumor progression and metastasis. Loss of the desmosomal plaque protein - plakophilin3, leads to increased expression of LCN2. Data indicated that LCN2 is required for radio and chemo resistance upon plakophilin3 loss suggesting that it might be a target for therapeutic intervention in radio/ chemo resistant neoplastic disease.

### Research

Previous work of this group demonstrated that loss of 14-3-3 $\epsilon$  and 14-3-3 $\gamma$  resulted in override of both the S-phase and G2 DNA damage checkpoints leading to cell death. A conserved structural fold present in these two 14-3-3 proteins allows them to form a specific complex with and inhibit cdc25C function *in vivo*. The group has also demonstrated that disruption of the 14-3-3 - cdc25C complex leads to decreased tumor formation *in vivo* due to a disruption of centrosome clustering. Research now focuses on how the 14-3-3 proteins regulate centrosome duplication, and on devising a screening strategy for compounds that might disrupt the 14-3-3 - cdc25C complex.

Epithelial cells contain multiple cell-cell junctions that regulate tissue morphogenesis and also allow communication between different cells in a tissue. One major junction that is required for epithelial cell function is the desmosome and loss of desmosomal proteins is often observed in metastasizing tumor cells. The group has demonstrated that initiation of desmosome formation is dependent on the plaque protein, plakophilin3 and that loss of 14-3-3 $\gamma$  leads to disruption of desmosome formation *in vitro* and *in vivo*. Loss of plakophilin3 leads to increased neoplastic progression and metastasis and interestingly to chemo and radio resistance. The mechanisms downstream of plakophilin3 loss that are required for the increase in resistance and metastasis are currently being investigated; the lab has evidence to suggest that the same pathways are required for both phenotypes. While loss of 14-3-3 $\sigma$  leads to an EMT, it is also associated with decreased tumor progression and increased radio sensitivity suggesting that inhibiting 14-3-3 $\sigma$  function might sensitize radio-resistant tumors.

The group has started building mouse models to study the effect of plakophilin3 loss on the development of colon cancer, and determine the consequences of the loss of 14-3-3 $\epsilon$  and 14-3-3 $\gamma$  in the epidermis. Work on the mechanics of desmosome formation is also continuing.

### Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute, and presently has five students (Ms. Sonali Vishal, Ms. Arunabha Bose, Mr. Akash Dubey, Ms. Sarika Tilwani, Ms. Nazia Chaudhary) working on their doctoral thesis under his guidance. Eight trainees worked in the group during 2016, six for Master's dissertation, one for experience and one on a Bachelors project. Group members participated in weekly in-house seminars and journal club, and presented their research findings at three conferences/ meetings during the year.

# Cancer Cell Biology Group

**Dr. Milind Vaidya**  
Principal Investigator

**Mrs. Sharada Sawant**  
Co-Investigator

## Overview

The research focus of this group is to investigate the functions of keratin, vimentin and their associated proteins in epithelial homeostasis and cancer, and further to use them as biomarkers of oral cancer. The lab has successfully generated transgenic mice that express K8 wild type and K8 serine 73/ serine 433 mutants in the epidermis. The group has also developed a nomogram for the prediction of nodal metastasis in node negative OSCC patients.

## Research

Recent data from the group reveals that up regulated vimentin and K5/14, and down regulated K1 expression together correlate inversely with survival in oral squamous cell carcinoma (OSCC) patients. TMT-based global quantitative phosphoproteomic analysis of K8 wild type and its site-specific phosphodead and phosphomimic mutants expressed in skin SCC-derived cells reveal differential expression of many phospho proteins. The validation of differentially phosphorylated peptides suggests a potent new mechanism

related to K8 phosphorylation-mediated regulation of transforming potential of skin SCC-derived cells. Data shows that plectin and BPAG1e regulate the tumorigenic potential of OSCC cells, possibly through the tumor suppressor gene NDRG1. Further, down regulation of TAp63 in both immortalized and transformed squamous epithelial cells leads to a less differentiated phenotype. 3D co-cultures reveal the role of stromal fibroblasts in the formation of hemidesmosomes. Sequential alterations observed during proteomic analysis of tongue cancer (stages I to IV) have been validated using immunohistochemistry. A new study investigates the prognostic value of keratins, vimentin and their associated proteins; it also evaluates post-surgery tissue polypeptide antigen (TPA) levels as a prognostic indicator. In all, 190 patients and 50 normal volunteers have been enrolled, and TPA analysis has been completed in 110 patients and all 50 volunteers. TPA levels are being correlated with clinicopathological parameters in oral cancer patients.

## Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences of the Homi Bhabha National Institute. Of the four graduate students in the lab, Ms. Poonam Kakade obtained the Ph.D. degree in 2016, Ms. Crismita D'Mello submitted the thesis, while Ms. Richa Tiwari and Mr. Pratik Chaudhari are nearing completion of their doctoral research. The group provided training to 25 students this year – four for dissertation, 19 for experience (one was Norwegian), one as a research associate and one as a summer trainee. Besides these, students from two dental colleges were assigned as observers in the lab. Group members met regularly for data presentation and journal club. The faculty and a student attended an international conference.

# Cancer Cell Biology Group

**Dr. Ujjwala Warawdekar**  
Scientific Officer 'F'

## Overview

The research focus of this investigator is to understand minimal residual disease (MRD) in solid tumours, to assist in evaluating the efficacy of therapy and disease prognosis. Assessment of circulating tumor cells (CTCs) from the peripheral blood of patients diagnosed with cancer is emerging as a valuable biomarker for prognostication and tailoring therapy. The accuracy of predicting disease prognosis can be facilitated with robust markers, and numerous clinical studies provide evidence that the presence of circulating tumor cells in peripheral blood is an important prognostic marker for cancer. Some of these studies have contributed to the demonstration of the presence of CTC, in the peripheral blood of patients and their association with tumor progression and metastasis development; others have shown that a change in CTC number predicts response to therapy and evaluates residual disease.

## Research

The prognosis of cancer patients is largely determined by the blood borne dissemination of CTCs from the primary site to distant organs like bone and lung, and their subsequent proliferation in the new microenvironment. The lab has established a protocol for the isolation and enumeration of CTCs from the peripheral blood of patients with breast cancer, and validated the method with breast cancer cell lines and cell spiking experiments where tumor cells are added to lymphocytes/ cell lines. Characterization of the isolated CTCs for the expression of epithelial as well as tumor over-expressed markers for protein and RNA has been done. Studies in breast cancer involve the analysis of variation in the levels of CTCs in circulation during surgery - with progesterone as an intervention prior to surgery, molecular characterization of CTCs from metastatic patients, and attempts at establishing primary cultures.

## Education

Two trainees were accepted in the lab in 2016 – one for Master's dissertation and the other for research experience. The faculty participated in one international and one national conference, and two local meetings this year.

# Cancer Genetics, Epigenetics & Genomics Group

**Dr. Neelam Shirsat**  
Principal Investigator

## Overview

The group has developed a microRNA based assay for molecular classification of medulloblastomas. This assay is particularly useful for formalin fixed paraffin embedded tissues, has an accuracy of over 97% and has now been introduced into routine clinical practice at TMH. Medulloblastoma is the single most common, highly malignant brain tumor in children. Earlier findings of this lab and three other studies have identified four distinct molecular subgroups of medulloblastomas - WNT, SHH, group 3 and group 4, that differ in their expression profiles and have distinct clinical characteristics including survival. Molecular classification of medulloblastomas is now recommended in the 2016 revision to the WHO classification of the CNS tumors. The group has carried out molecular classification of 220 medulloblastomas so far. The most notable characteristics of the Indian cohort is higher (23%) representation of the WNT subgroup tumors among adults, as compared to that reported in the western cohorts, and a high gender bias (92% male) in group 4 medulloblastomas. The group has also identified miR-204 as a prognostic marker in non-WNT non-SHH medulloblastomas, and has investigated the functional role of several miRNAs in medulloblastoma pathogenesis.

## Research

Correlation of the molecular classification of 220 medulloblastomas from the Indian cohort with their clinical characteristics revealed higher incidence of metastasis in group 3 medulloblastomas accompanied by poor (< 50%) five year survival, as against best survival rate in over 95% for the WNT subgroup patients. MiR-204 expression was identified as a marker for good prognosis in the group 3/ group 4 patients. Metastasis at diagnosis in combination with low miR-204 expression identified a subset of these patients with the worst prognosis. These molecular markers can thus be used for risk stratification of medulloblastomas.

The group is also investigating the functional role of several microRNAs including miR-193a, miR-204, miR-30a and miR-592 in medulloblastoma pathogenesis. Restoration of expression of miR-30a and miR-204 significantly inhibited anchorage-independent growth in all medulloblastoma cell lines studied. Restoration of miR-204 expression in SHH and group 3 medulloblastoma cell lines inhibited their invasive potential and tumorigenicity. MiR-30a expression down regulated the expression of Beclin1, while miR-204 targetted LC3B. Since both Beclin 1 and LC3B are positive regulators of autophagy, the

likely mechanism underlying growth inhibitory effect of these microRNAs could be autophagy inhibition. MiR-204 expression resulted in down regulation of the genes involved in metastasis (Ezrin), autophagy (LC3B) and intracellular protein trafficking including *RAB22A*, *AP1S2*, *EDEM1*, *M6PR* as well as *RAB10*, a novel miR-204 target identified in the present study.

Exome sequencing of 11 WNT subgroup medulloblastomas identified mutations in a number of chromatin modifying genes including *ARID1B*, *SMARCA4*, *MLL3* as well as in *DDX3X*, a RNA helicase. Experiments are in progress to understand the role of these genes in medulloblastoma pathogenesis.

## Education

The Principal Investigator is a recognized guide for the Ph.D. degree in Life Sciences under the Homi Bhabha National Institute. During 2016, her doctoral student Mr. Kedar Yogi was awarded the Ph.D. degree, while seven students – Mr. Satishkumar Singh, Mr. Vijay Padul, Ms. Shalaka Masurkar, Ms. Raikamal Paul, Mr. Harish Barambe, Ms. Purna Bapat and Ms. Shweta Gopalakrishnan, are presently working on their Ph.D. dissertation. The group accepted one trainee for Master's dissertation and two for research experience.

### Overview

The group focusses on understanding the genetic basis of tobacco-related cancers by studying genomic alterations at the level of copy number across the genome, and identifying genes/ gene clusters underlying the altered genomic loci. Signatures associated with the progression of pre-invasive lesions to invasive oral squamous cell carcinoma (OSCC) have been identified, and candidate driver alterations unique to primary tumors with lymph node metastasis and related to patient survival have been found. In parallel studies, the chemopreventive efficacy of polymeric black tea polyphenols (PBPs), abundantly found in black tea, are being tested for their inhibitory effect on the carcinogens benzo(a)pyrene [B(a)P] and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)-induced lung adenomas in A/J mice. The group has for the first time demonstrated that administration of PBPs in drinking water throughout the carcinogen treatment period significantly decreases the multiplicity of surface tumors and microscopic lung lesions, including adenomas.

### Research

Cancer progresses through the accumulation of genetic and epigenetic changes, ultimately resulting in gross genomic instability. The genomic alterations result in change in gene expression pattern; hence, the group is focusing on two major aspects of oral cancer biology: genomic alterations at the level of copy number across the genome and identification of genes/ gene clusters underlying these altered

genomic loci. The group has identified signatures associated with the progression of pre-invasive lesions to invasive OSCC and found candidate driver alterations unique to primary tumors with lymph node metastasis and related to patient survival. Array CGH analysis of oral cancers has revealed that chromosomal gain at locus 1p36.33 and 11q22 is associated with loco-regional recurrence and shorter survival. The group has validated these observations by FISH, and the data indicate that amplification of these loci is associated with nodal metastasis. Genomic analysis of oral precancerous lesions revealed that 8q24.3 gain is an early potential change in oral carcinogenesis. Functional analysis of genes underlying 11q22 locus is ongoing.

The group is also examining the chemopreventive efficacy of polymeric black tea polyphenols (PBPs), abundantly found in black tea, in inhibiting BaP and NNK induced lung adenomas in A/J mice. The group has for the first time demonstrated that administration of 1.5% and 3% PBPs in drinking water throughout the treatment period significantly decreases the multiplicity of surface tumors as well as microscopic lung lesions, including adenomas. The chemopreventive activity of PBPs is through modulation of xenobiotic metabolizing enzymes, decreasing BPDE-DNA adducts (anti-initiation) and inhibition of carcinogen induced inflammation, cellular proliferation and induction of apoptosis - possibly via modulation of signaling kinases (anti-promotion).

### Education

The Principal Investigator is a recognized guide for the Ph.D. (Life Sciences) degree of Homi Bhabha National Institute. Four research scholars – Ms. Priyanka Bhosale, Ms. Rasika Hudlikar, Ms. Usha Patel and Ms. Mayuri Inchanalkar, are presently working on their doctoral thesis. The group accepted seven trainees to work on their Master's dissertation and two for research experience. Besides these, students from two dental colleges were assigned as observers in the lab.

## Overview

Epigenetic mechanisms help to coordinate change in gene expression during transition from undifferentiated embryonic cells to terminally differentiated tissue, and ensure cellular homeostasis. A broad array of environmental factors such as diet, stress, toxins and even emotions influence the epigenetic landscape, and alter cell physiology and disease susceptibility. Over the past few years, the research focus of this group has been on understanding the importance of histone variants and their isoforms with specific post-translational modifications (PTMs) via chromatin modifiers, in altering nucleosome architecture and chromatin properties in cancer, and resistance to chemotherapeutic drugs or radiation.

## Research

Work from this group has demonstrated that histone isoform H2A.1 and variant H3.2 increase in hepatocellular carcinoma and also in various human cancer cell lines compared to normal counterparts having H2A.2 and H3.3; they function by conferring characteristic properties to chromatin. Biophysical and biochemical experiments along with *in silico* molecular simulation studies have shown that H2A.1 containing nucleosomes are more stable and are associated with increase in cellular proliferation. The differential incorporation of H3 variants is directly correlated with levels of variant-specific chaperones. Interestingly, there exists a hierarchy amongst the nucleosomes in the context of their stability, with H2A.1/H3.2 variant being the most stable and H2A.2/H3.3 the least stable.

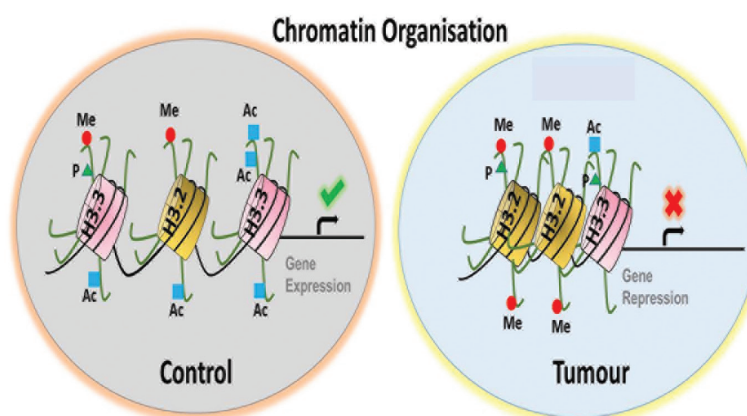
Also, the cancer epigenome has condensed chromatin organization with decrease of activating and increase in repressive histone PTMs. This leads to decrease in the rate of global transcription and aberrant expression of various genes including tumor suppressors compared to normal counterparts.

On-going research of the group has also shown that phosphorylation of histone H3 Serine10 in human gastric cancer and acquired radio-resistance of breast cancer cells is in connotation with neighbouring histone acetylation on H3 Lysine9 and H3 Lysine14. In support, combined treatments with HDAC inhibitor and irradiation or chemotherapeutic drugs are shown to increase cell death in gastric cancer and radio-resistant breast cancer cells. Additionally, the group has developed a new, cost-effective and time-efficient protocol for isolation of circulating histones from the serum. Furthermore, histone PTMs, HAT and HDAC activity in the serum directly correlated with the observed modifications and activity in

paired solid tumours. This method will be helpful in liquid biopsy based 'real time' monitoring for sub-grouping of the patients for HDAC inhibitor treatment, predict-response to therapy, early relapse and prognosis.

## Education

The Principal Investigator is recognized as a guide for Ph.D. in Life Sciences of the Homi Bhabha National Institute. Mr. Saikat Bhattacharya was awarded the Ph.D. degree in 2016, and seven students – Ms. Divya Reddy, Ms. Asmita Sharda, Mr. Ramchandra Amnekar, Mr. Sanket Shah, Mr. Mudasir Rashid, Ms. Tripti Verma and Mr. Abhiram Natu, are presently working on their doctoral thesis. In 2016, the group trained four students for their Master's dissertation and seven for work experience. Group members meet regularly for data presentation and journal club, and participate in national/ international conferences to present their research findings through invited, oral or poster presentations.



**Proposed model depicting alteration in chromatin organisation in cancer.** Increased expression of H3.2 and its incorporation in chromatin in place of H3.3 leads to increase in heterochromatin histone 'marks' favoring condensation with global suppression of gene expression including tumor suppressor genes.

## Overview

The goal of this group is to develop a next generation of effective targeted therapies to improve treatment of cancer. Efforts involve genomic approaches using advanced sequencing methodologies to interrogate somatic alterations in clinical cancer specimens, with an emphasis on carcinomas of the breast, lung and the head and neck. Three major aspects of research of this group include: (a) Cancer genomics: Using computational genomic approaches to uncover somatic genetic alterations in cancers, and develop computational tools such as HPVDetector, TMC-SNPdb, as a resource for the community; (b) Functional genomics: The genome-discovery efforts are paired with biochemical and molecular experimental approaches using tumor-derived cell lines and transgenic mouse models. The group has recently discovered and characterized *NOTCH1* and *FGFR3* as potential therapeutic candidate targets in tongue and lung cancer patients of Indian origin, respectively, and *MyoD1* mutations to enable adoption of appropriate therapeutic regimen in rhabdomyosarcoma; and (c) Pathogen discovery: The group has developed a computational pipeline to detect pathogens in cancer.

## Research

The group has established the first landscape of actionable mutations beyond *EGFR* and *KRAS* in Indian lung cancer patients. This study forms a

crucial basis to rationalize targeted therapy in India. Additionally, genetic, biochemical and mouse-xenograft based mechanistic characterization has led to the discovery of *FGFR3* activating mutations in lung adenocarcinoma patients of Indian origin. Beyond lung cancer, the group's work demonstrates that a considerable fraction of node-positive tongue cancers in non-smoking patients of Indian origin are driven by upregulation of Notch pathway. This result underscores *NOTCH1* as a therapeutic target in these tongue cancer patients. Similarly, the group has recently published the first report of *MYOD1* (L122R) mutation in a large cohort of 49 rhabdomyosarcomas (RMS) reported as a single study, to identify an aggressive subset of spindle cell/ sclerosing RMS patients to enable the adoption of appropriate therapeutic regimen. Other significant contributions made this year are towards filling the

and upgradable SNP database from whole exome data of 62 normal tissues. This has been incorporated into dbSNP149 and accepted for hosting at ANNOVAR.

## Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute. Presently eight research scholars – Mr. Pawan Upadhyay, Mr. Prajish Iyer, Mr. Mukul Godbole, Ms. Trupti Togar, Mr. Sanket Desai, Mr. Asim Joshi, Mr. Bhaskar Dharavath and Ms. Neelima Yadav, are working on their doctoral thesis. During 2016, the faculty and group members presented their research findings as invited oral presentations at three international and 15 national meetings and, over 10 poster presentations at national/ international conferences.

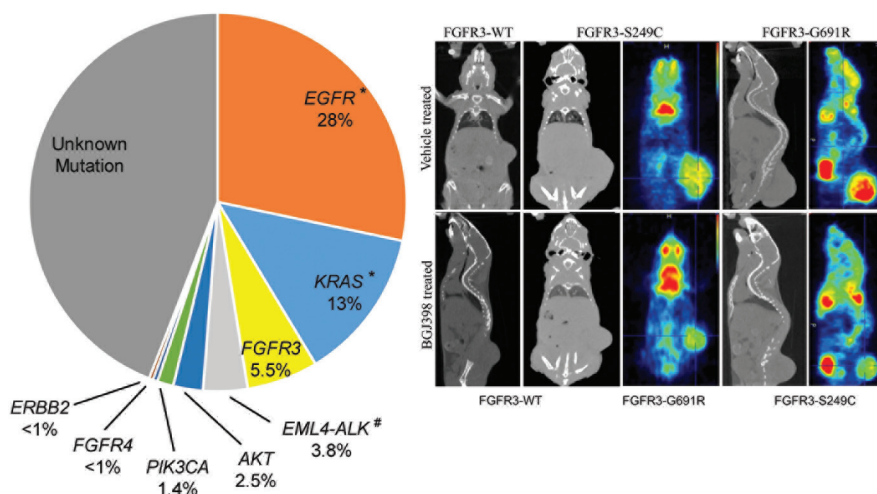


Figure Legend: Left panel represents a comprehensive spectrum of mutations (mostly druggable) in Indian lung cancer patients (n=363) that was previously unknown. Right panel: PET scan to show the novel *FGFR3* mutation found in patients forms tumors in mice that responds to FGFR inhibitor.

# Cancer Genetics, Epigenetics & Genomics Group

**Dr. Rajiv Sarin**  
Principal Investigator

**Dr. Pradnya Kowtal**  
Co-Investigator

## Overview

This group aims to understand the molecular basis of inherited and somatic cancers, and develop translational algorithms through molecular biology and functional genomics. The group addresses these queries through: (a) a large cohort of 4600 families with inherited cancer syndromes, using banked DNA and lymphoblastoid cell lines; (b) BRCA-GEL case control study encompassing 2800 breast cancer cases/ matched healthy controls; (c) TMC International Sarcoma Kindred Study - a case control study of 360 osteosarcoma cases/ matched controls; (d) International Cancer Genome Consortium project covering 350 gingivo-buccal SCC patients with full clinico-pathological annotation, follow up, somatic/ germline NGS analysis and functional studies.

## Service

The group runs a Cancer Genetics Clinic to provide genetic counselling to the families enrolled at ACTREC and TMH. During 2016, the clinic conducted DNA banking and genetic analysis for 1530 newly/ previously enrolled families, and provided follow up counselling and risk management guidance to ~3000 newly/ previously enrolled families.

## Research

In inherited cancer syndromes, the group performed genetic analyses of the mutational hotspot/ entire gene using Sanger sequencing or NGS and multiplex ligation-dependent probe amplification, followed by haplotyping of recurrent mutation carriers. Two new Indian BRCA1 founder and recurrent mutations were identified this year, bringing the total of BRCA1/2 founder mutations identified by the group to 12. Three founder mutations in mismatch repair genes were identified in Lynch syndrome families; the age of a novel, recurrent founder MLH1 mutation was determined as 550 years. Whole exome and transcriptome sequencing of matched tumor and blood samples from medullary thyroid cancer was done to understand the mutational landscape and possible targets in RET-driven medullary thyroid cancer. Frequent occurrence of RET allele dropout for a high penetrance mutation allele, not detected earlier by Sanger sequencing, was uncovered through NGS. The first few Indian families with constitutional mismatch repair deficiency syndrome were found to have a bi-allelic mutation in the PMS2 gene. Under the ICGC project, four new oral cancer cell lines were established and characterized. They are being used

for functional studies with stable knockouts that inhibit the arachidonic acid pathway, whose role in head and neck cancers had earlier been identified through whole exome analysis. In the ICGC project, targeted sequencing of oral tumors and adjacent normal tissues is under way to understand molecular signatures of field cancerization. The tumor microenvironment immune signature is also being studied.

## Education

The Principal Investigator is a recognised guide for Ph.D. in Life Sciences under the Homi Bhabha National Institute. Four doctoral students - Ms. Nikhat Khan, Mr. Mohd Moquitul Haque, Ms. Vasudha Mishra and Ms. Anuja Lipsa, are presently working on their thesis. In 2016, the group provided training for 21 students - three for Master's dissertation, nine for research experience, five as summer trainees, and four in genetic counselling. Group members participated in weekly data presentation and journal club, and also presented their findings at four local/ national conferences. The faculty organized the 3<sup>rd</sup> Indian Cancer Genetics Conference and Workshop in December 2016, encompassing workshops on Genetic counselling, Molecular genetic analysis, and NGS.

### Overview

Imaging of molecular functions provides real-time visualization and quantitative measurement of cellular or physiological processes and adds great value towards understanding normal or disease conditions. The mandate of this group is to develop and utilize molecular imaging methodologies for testing diverse experimental therapeutics in live cells and small animal models, and ultimately translating the technologies for patient benefit.

### Research

A major focus of this group is on understanding the therapeutic potential of human sodium iodide symporter (hNIS) gene that is found to be over expressed in a majority of breast cancers. The group's novel finding was p53 mediated transcriptional repression of hNIS function. The drug doxorubicin, a known activator of wild type p53 protein, caused a marked reduction in NIS expression and reducing radioiodine uptake of breast cancer cells. Further *in vivo* imaging experiments demonstrated that p53 mutant cells have higher susceptibility for NIS mediated radioiodine therapy. Therefore, the group has proposed profiling of patients for p53 status while selecting for targeted therapy procedure. In another promising line of collaborative research having a high

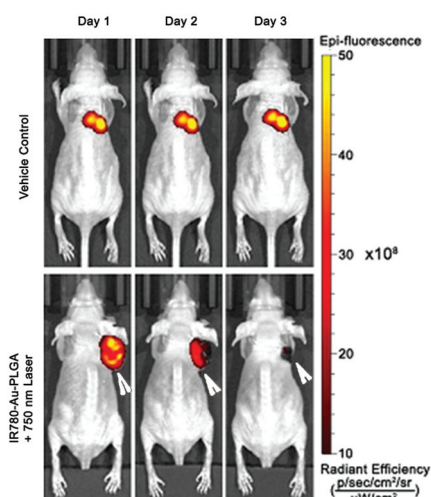
potential for clinical application, the group is engaged in developing synthetic, biocompatible gold nanospheres for photothermal therapy. Localized treatment of palpable tumors with accumulated nano-sized particles when exposed to a brief NIR laser irradiation confers excellent tumor tissue ablation while keeping the surrounding tissue safe. Along with collaborators from IIT-B, the group has filed a final Indian patent application and a trademark petition on 'Toco-Photoxil' for approval.

The group is also developing molecular imaging sensors for STAT3 activation, which regulates important disease cell signaling in breast cancer cells, and has made significant progress in validating a molecular sensor which is based on

optical reporter imaging satisfying resonance energy transfer principle. The group has also initiated characterization of patient tumor tissues revealing the importance of phosphoserine post-translational modification as a measure of STAT3 activation in neoadjuvant chemotherapy patients. Through an international collaboration, the group is examining the role of EpCAM biomarker protein, which triggers important signaling cascades in radioresistant breast cancer cells after being cleaved by the membrane protease, called gamma secretase.

### Education

The Principal Investigator is a recognized guide for the Ph.D. degree in Life Sciences under the Homi Bhabha National Institute. Of his seven doctoral students, Ms. Sushmita Chatterjee was awarded Ph.D. in 2016 and Ms. Madhura Kelkar submitted her thesis, while Ms. Shalini Dimri, Mr. Arijit Mal, Ms. Maitreyi Rathod, Ms. Sukanya and Mr. Sumit Mishra, are working on their dissertation. The group accepted seven trainees - four for their Master's dissertation, one for experience, and one each as summer trainee and observer. The faculty and students presented their work at six national and one international workshop/conference.



Imaging guided monitoring of Photothermal treatment efficacy after systemic delivery of Au-PLGA, which accumulates well in the tumor. In this case the tumor is placed on right shoulder of mice.

## Overview

The research focus of this group is on intracellular organelle biogenesis and dynamics, primarily on the size control mechanism of such compartments. The size and shape of organelles are greatly altered in cancer, and such alterations are a hallmark of cancer cells. Using a basic cell biology approach and advanced microscopy techniques, attempts are being made to understand the mechanisms underlying size control of the Golgi and nucleus. Yeast, cell lines and cultured neurons are being used as model systems. The group also aims to develop novel tools for microscopy.

## Research

On-going studies encompass various organelles including Golgi, endoplasmic reticulum (ER), nucleus, nucleolus and mitochondria. Previous findings from the group indicate that the GTPase ARF1 is capable of controlling Golgi size by altering cisternal maturation kinetics. Recently several other factors including the oncogene homolog VPs74 have also been implicated in such regulation. Furthermore, the group has used computational methods for simulation of Golgi size regulation. The important role of nuclear import for size control of nucleus and nucleolus of human cells has also been elucidated. The group has discovered a novel site on ER that is vital for ER import, and has deciphered an unknown mechanism of Golgi stacking. Besides these investigations, the group is also working on exosome uptake in human cells, organelle dynamics and inter-organelle contact sites in neurons. Research is also on towards the development and optimization of photo changeable fluorescent proteins such as mEOS3, which are essential for super resolution microscopy.

## Education

The Principal Investigator is a recognized guide for Ph.D. in the Life Sciences of Homi Bhabha National Institute. Of the seven graduate students presently in the group, Ms. Abira Ganguly submitted her doctoral thesis in 2016, while Ms. Prasanna Iyer, Mr. Bhawik Jain, Mr. Pravin Marathe, Ms. Sudeshna Roychowdhury, Ms. Naini Chakraborty and Ms. Shreosi Chatterjee are working towards the Ph.D. degree. Group members meet regularly for data presentation and journal club. During 2016, the faculty and students presented their research findings at four local/ national conferences.

### Overview

Cancer is a leading cause of death accounting for around eight million cases worldwide. The high mortality rate, mainly due to late detection and recurrence, is ascribed to limitations of conventional diagnostic methodologies. Screening for early detection is a vital tool to achieve decreased morbidity and better disease-free survival rates. Current diagnostic approaches involving invasive procedures are prone to subjective errors. It is therefore crucial to develop sensitive, non-invasive diagnostic methods. Optical spectroscopic methods such as infrared, Raman, and fluorescence spectroscopy are being investigated as candidate adjunct/alternative approaches. Due to associated advantages, Raman is found to be more suited for non-invasive, online clinical applications. The group is actively pursuing the development of Raman based methods for: (a) development of *in vivo/in situ* methods for routine screening and diagnosis; (b) development of minimally invasive microspectroscopy methods using body fluids and cell smears; (c) synthesis, optical and photothermal characterization of metallic nanoparticles for biomedical applications; (d) exploring <sup>1</sup>H NMR, Raman and infrared spectroscopy for oral cancer diagnosis using saliva; and (e) investigating experimental carcinogenesis in animal models.

### Research

The group has been actively pursuing non-invasive (*in vivo*) and less/minimally invasive (body fluids/exfoliated cells) approaches for application of Raman spectroscopy in cancer.

*In vivo* applications: Raman studies in oral cancer involving >340 subjects could classify normal, premalignant and malignant changes as well as early modifications including cancer field effect and malignancy-effected changes. Raman spectroscopy could also identify ageing-related physiological changes in the buccal mucosa; however this has no bearing on cancer-diagnostic ability. Site-wise (tongue, buccal and lip) exploration in healthy volunteers and cancer subjects demonstrated that variations seen in healthy cases were lost in pathological conditions. These findings suggest that site-wise algorithms are not necessary for screening. The utility of Raman spectroscopy in early identification of recurrences/ second primaries is presently being explored.

Minimally-invasive applications: Classification into healthy, premalignant, and oral cancers was possible using serum samples from ~330 subjects. Studies on exfoliated cells in a cohort of > 100 healthy subjects, habitual tobacco users, premalignant and malignant cases indicated the possibility of classification using brush-biopsy approach. In both the cases, a comparison of patient-wise analysis (the average of several spectra recorded for a given sample) vs spectrum wise analysis (treating each spectrum as an independent entity) suggested that patient-wise approach is better.

Animal models: Experimental carcinogenesis studies could detect micro tumors in control hamster buccal pouch mucosa arising from repeated mechanical irritation. This is an important observation towards universal applicability of Raman screening methods unlike visual examination which is beneficial only for high risk populations.

### Education

The Principal Investigator is a recognized guide for the Ph.D. Life Sciences program of Homi Bhabha National Institute. In 2016, Ms. Rubina Shaikh and Ms. Aditi Sahu were awarded the Ph.D. degree, and presently Mr. Piyush Kumar, Ms Bhagya Shree and Mr Siddhartha Barua are pursuing doctoral research. The group also participates in the Centre's training program; six trainees – four for research experience and two on collaborative projects worked in the group in 2016. Group members presented their research findings at seven national/ international conferences this year.

# Protein Biochemistry, Biophysics & Structural Biology Group

Dr. Prasanna Venkatraman  
Principal Investigator

## Overview

The group aims to draft the differential physical, genetic, structural and functional interaction map of select, biologically important enzymes in health and disease. These maps will be used to recognize novel and vulnerable targets that can be intervened. Extensive characterization of the structural stability of PSMD9, a PDZ domain containing proteasomal assembly chaperone, revealed an unexpected plasticity in structure. Strong inter domain communication seems critical for stability and function of PSMD9. Network topology based analysis and proteomics uncovered the unprecedented role for PSMD9 and PSMD10 chaperones in neurogenesis, cell morphology, migration and immune modulation. The blinded case control study on evaluating the role of matriptase as a reporter of breast disease relapse continued to show a sharp demarcation at the level of primary tumor, and awaits clinical confirmation.

## Research

The research focus of this group during 2016 was on PSMD9, PSMD10 and matriptase.

PSMD9 project: Domain architecture and inter domain interactions are critical for protein interaction and interaction dependent functions.

Denaturation and refolding studies were performed to reveal minute details. PSMD9 was found to be extremely plastic, evident from its ability to completely regain its structure when refolded from harsh denaturation conditions. While the N domain of the protein reflected the same adaptability, the PDZ domain was found to be dynamic, less structured and unstable. These findings indicate that inter domain communication is central to the structure of the PDZ domain and its stability.

PSMD10 project: Initial label free quantitative proteomics using SWATH acquisition reported 264 and 316 differentially expressed proteins in PSMD9 and PSMD10<sup>Gankyrin</sup> over expressing cells. Manual curation of these proteins resulted in high confident identification of ~80 proteins in each case, with superb spectral qualities and peptide coverage. These nodes were found to be central to the ubiquitin proteasome pathway, signalling, translational, and post-transcriptional homeostatic regulation of cellular functions. Validation by independent methods is now being attempted to cover a larger landscape of the proteome and functional studies. In parallel studies, a sub-network created from the differentially expressed genes upon PSMD10<sup>Gankyrin</sup> over expression coupled with topology matrices and pathway analysis

suggested a strong role for PSMD10<sup>Gankyrin</sup> in neuronal differentiation. Interestingly, there is preliminary but compelling evidence for the role of PSMD10<sup>Gankyrin</sup> in neurogenesis possibly via the  $\beta$ -catenin NGn1 axis. The topology matrix analysis helped to consolidate the experimental observation.

Matriptase project: Blinded matriptase analysis was completed in 67 high quality primary breast cancer tissue samples this year. The ratio of matriptase signal intensity between paired tumor and normal samples is either  $>1$  (predictive of recurrence) or  $\leq 1$  (predictive of non-recurrence), with no anomalous results seen so far.

## Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences of the Homi Bhabha National Institute. The lab presently has five doctoral students - Mr. Sheikh Burhan ud din Farooqee, Ms. Mahalaksmi Harish, Mr. Saim Mulla, Mr. Mukund Sudharsan, and Mr. Joel Christie, working towards their dissertation. During the year, the group accepted ten trainees – one for Master's dissertation, seven for research experience, and one each as summer trainee and research associate. The PI and her students presented their findings at many local/national conferences and one international conference this year.

### Overview

The research goal of this group is to unravel the structure based functional activity of proteins in different kinase pathways, using an integrated multidisciplinary approach of genomics, proteomics, structural biology, bioinformatics and biophysics and the tools of molecular biology, protein biochemistry, macromolecular and x-ray crystallography. *In silico* and *in vitro* approaches could help understand the pathogenicity of mutations identified in BRCA1 gene using data from Indian families and also from the global database. BRCA1 and its mutant protein along with other cellular partners have been evaluated for the pathogenicity of mutations. The group has studied protein-protein interactions between different MAPK proteins, and has standardized protein purification protocols for these proteins. The group is also trying to find a set of predictive and prognostic protein biomarkers in head and neck squamous cell carcinoma treated with radiotherapy. In this connection, the group has generated mass spectrometry based proteomics data for identification of protein biomarkers.

### Research

The group has succeeded in crystallizing the complex functional domains of BRCA1 and BRCT and their cellular partners. Furthermore, efforts have been directed at finding novel, small molecule BRCA1 inhibitors. A number of mutations present in BRCA1 genes have been evaluated for their pathogenicity. The purified domains of BRCA1/2, MAPK, BARD1, CtTF, ZBRK1, FANCI and FANCD2 have been characterized for their folding pattern and protein-protein interactions. The pathogenicity of mutations identified in BRCA1 has been correlated with those of its cellular partners like MERIT-40 and RAP80. Enormous amount of data have been generated from the proteomics project, and the group is now aiming to mine this data for clinical management and translational research.

### Education

The Principal Investigator is a recognized guide for Ph.D. (Life Sciences) of the Homi Bhabha National Institute. Three of his graduate students – Ms. Lumbini Yadav, Mr. Bhanu Prakash Jagilinki and Mr. Rajan Kumar Choudhary were awarded Ph.D. degree in 2016, while six students – Mr. Mohd. Quadir Siddiqui, Mr. Pankaj Thapa, Ms. Suchita Dubey, Ms. Lipi Das, Ms. Kuheli Banerjee and Mr. Mudassar Ali Khan, are working on their thesis. During 2016, 15 students were accepted as trainees in the lab – four for dissertation, nine for research experience and two on collaborative projects. Since the past few years, the group has been conducting training programs for faculty and research scholars from the North-East Region of India in skill development. In July 2016, a training program on ‘Gene cloning, protein biochemistry, structural biology and bioinformatics’ was organized for faculty and research scholars of the North East region.

# Protein Biochemistry, Biophysics & Structural Biology Group

**Dr. Kakoli Bose**  
Principal Investigator

## Overview

The long-term objective of this group is to achieve a broad understanding of structure, function and specificity of proapoptotic proteins involved in the classical as well as alternate apoptotic pathways, and their role in pathogenesis of cancer. Research currently focuses on proteins of the apoptotic pathway - the HtrA family of proteases, anti-apoptotic proteins Pea-15, Hax-1, Bcl2-family members, etc. Using a multidisciplinary approach, the group has distinctly defined a mechanism of HtrA2 substrate recognition and specificity using Pea-15, and has deciphered the structural basis of the inactivating HtrA2 mutations that are implicated in disease phenotypes. Further, the group has studied the interaction between HtrA2 and its novel binding partner DUSP9 previously identified by the group. This information has shed light on its biological role and provided a means to manipulate HtrA2 with desired characteristics. Additionally, the group has characterized the lesser known HtrA-3 and HtrA-4, and their novel binding partners. Research from the group also encompasses understanding the mechanism of interaction between human papillomavirus (HPV) E2 protein and proteins of the extrinsic apoptotic pathway.

## Research

Highlights of the research findings of this group include establishment of the model of HtrA2 activation via its N-terminal domain. The dual regulatory switch for HtrA2 activation has also been identified. Crystals at 2.0 Å resolution of a few pathological mutants of HtrA2 have been obtained, and one of the structures has been deposited in the Protein Data Bank (PDB ID: 5WYN). The group is working on obtaining the substrate-bound structure of HtrA2. The interaction of HtrA2 with two of its known binding partners has been characterized and its interaction with a putative ligand has been established. DUSP-9 has been identified and characterized as an HtrA2 binding partner. The group has established the mechanism of human papillomavirus HPV E2 mediated activation of the extrinsic apoptotic pathway, compared it with the classical pathway of cell death especially procaspase-8 activation, and has for the first time unraveled the mechanism of death effector domain (DED) chain assembly.

## Education

The Principal Investigator is a recognized guide for the Ph.D. (Life Sciences) degree of the Homi Bhabha National Institute. Of the seven graduate students, Mr. Lalith K. Chaganti and Mr. Raja Reddy Kuppli completed their Ph.D. in 2016, while Ms. Saujanya Acharya, Mr. Ajay Wagh, Mr. K. Raghupathi, Ms. Rashmi Puja, and Ms. Aasna Parui are presently working on their doctoral thesis. Ten trainees worked in the group during 2016 – seven for the Master's dissertation and three for research experience. Group members participated in weekly in-house data presentation and journal club. Faculty and students presented their research findings as poster or oral presentations in five local/ national/ international conferences and workshops during the year.

### Overview

The group's focus is on delineating the molecular and cellular mechanisms that control adult stem cell regulation, and examining how perturbation in these mechanisms leads to cancer. Developmental signaling pathways such as Wnt, Notch, Sonic-hedgehog, etc. regulate stem cell renewal and differentiation; deregulation in these pathways can lead to cancer. Therefore, the prime need is to unravel the genes involved in signaling pathways that tightly control self-renewal and differentiation of normal and cancer stem cells. Mouse skin model and human epithelial cancers such as head and neck cancer are being used as experimental models. The study hopes to identify genes involved in stem cell regulation and cancer, and shed light on how these genes work at the cellular level to maintain tissue homeostasis. The findings of this study could also have future clinical implications.

### Research

Secretory phospholipase A<sub>2</sub> group-IIA (sPLA<sub>2</sub>-IIA), which catalyzes the sn-2 position of glycerophospholipids to yield fatty acids and lysophospholipids, is deregulated in various human cancers; however its role in stem cell regulation is obscure. Mice over expressing K14-sPLA2-IIA show enlargement of interfollicular epidermis and sebaceous gland. Increased proliferation and differentiation has also been noted. Data from the group has for the first time shown depletion of the hair follicle stem cell pool with increasing age in K14-sPLA2-IIA mice, which could be mediated through enhanced activation of c-Jun.

Wnt pathway is involved in embryonic development, stem cell self-renewal and proliferation. The Wnt inhibitor SFRP1 acts as a tumor suppressor; its down regulation is seen in various human cancers such as breast, cervical, etc. Sfrp1 is also involved in the maintenance of tissue-specific stem cells. Data from this group reveals increased sensitivity of Sfrp1 knock-out mouse skin to chemical carcinogenesis; there is increased formation of DMBA-TPA induced tumors at the two week time point in Sfrp1 knock-out mice as compared to the wild type.

Another major goal of this group is to isolate oral cancer stem cells and unravel the molecular signaling involved in the regulation and maintenance of cancer stem cells. In this study, the group has isolated cancer stem cells (CD44+/ALDH+) from oral cancer cell lines, and has shown that there is deregulation in the Wnt signalling pathway. Further studies would unravel the molecular mechanism underlying the maintenance of cancer stem cells, and the molecular signatures obtained would be used to stratify responders and non-responders to chemotherapy.

### Education

The Principal Investigator is recognized as a guide for the Ph.D. degree in Life Sciences of Homi Bhabha National Institute. At present, five graduate students – Mr. Rahul Sarate, Mr. Gopal Chovatiya, Mr. Raghava Reddy Sunkara, Mr. Sushant Navarange and Ms. Sayoni Roy, are working on their doctoral thesis. In 2016, five trainees were accepted in the lab, one for dissertation and four for research experience. The group participates in weekly in-house lab presentation and journal club. Group members also presented posters in national and international meetings.

## Overview

The group is working towards understanding the molecular mechanisms that govern radiation and chemo resistance in cancer using glioblastoma and leukemia as model systems. The group has developed *in vitro* cellular models from primary patient samples and *in vivo* pre-clinical orthotopic mouse models that allow for systematic identification of signals and pathways relevant to resistance. Furthermore, these models help provide critical information necessary for therapeutic intervention.

## Research

In the glioblastoma study that utilizes *in vitro* models and an *in vivo* pre-clinical orthotopic mouse model developed in-house, the group has demonstrated that there exist, within the tumor, a small percentage of cells that have the innate capacity to survive radiation and cause cancer recurrence. These cells can be discerned from the parent population by Raman microscopy, providing vital information for glioblastoma prognosis. This is the first study to show that radiation-resistant

glioma cells acquire a reversible, non-proliferative phenotype and undergo cell-cell fusion to form multinucleated giant cells (MNGCs) - a rare event in cancer cells. Radiation-induced homotypic cell fusion of resistant glioma cells is a novel non-genetic mechanism that helps sustain survival and relapse. Data reveal that relapse can be prevented by disrupting the non-proliferative state of radiation resistant glioma cells using a mitotic inducer (MK1775) as well as by selectively ablating growth of MNGCs using a cytokinesis inhibitor. The group's findings provide novel insights into an unexplored multi-step process of radiation survival and relapse in glioblastoma that can be exploited to generate rationales for novel combinational targeted therapies.

The leukemia study reveals the dependency of early drug-resistant cells on DNA double strand break repair (DSBR), the first drug resistance mechanism acquired during the onset of resistance. Mechanistically, this is achieved by modulation of ATM activity by GCN5, which is up-regulated in MRD-positive AML patients. Interestingly,

GCN5 over expression correlates significantly with poor patient survival. However, during later stages of resistance, these cells evolve to acquire multiple, bonafide mechanisms of drug resistance. Findings suggest that the clinical utility of ATM kinase and GCN5 inhibitors in effectively eliminating resistant leukemia cells is confined only to their usage during early stages of drug resistance.

## Education

The Principal Investigator is recognized as a Ph.D. (Life Sciences) guide by the Homi Bhabha National Institute. Seven graduate students - Ms. Ekjot Kaur, Mr. Sameer Salunkhe, Ms. Jacinth Rajendra, Ms. Jyothi Nair, Ms. Anagha Acharekar, Mr. Saket Mishra and Ms. Poorvaja Muley, are working towards their doctoral degree. During 2016, eleven trainees were accepted in the lab – seven for their Master's dissertation and four for research experience. Group members met regularly for data presentation and journal club. Faculty and students made six oral and four poster presentations at local and national conferences this year.

### Overview

This group's research has progressed significantly in 2016 towards identifying various transcriptional regulators of PIK3CA during the acquirement of chemoresistance, understanding the differential potential of cellular adhesion, migration and metastatic properties of chemoresistant cells, and construction of high throughput sensors to detect protein-protein interaction in IGF1R-PIK3CA/ Akt-MAPK/ ERK pathways.

### Research

A unique finding of this group was how loss of a post translational modification results in abrogation of p53-PIK3CA promoter interaction and thereby promotes cell survival in chemoresistant cells. The group also demonstrated that active IGF-1R signaling imparts differential tumorigenic potential in cancer stem cells. The collaborative study with IIT-B on the therapeutic effect of magnetic nanocluster in chemoresistant tumors too has yielded exciting findings. The group has also identified a novel peptide binder to cisplatin resistant cells by screening phage peptide display library. Other ongoing projects examine p53 associated synthetic lethality, identification of novel PIK3CA and IGF-1R regulators, assess *in vivo* metastatic potential of chemoresistant cells, construction of high throughput sensors to detect protein-protein interaction in IGF1R-PIK3CA/ AKT-MAPK/ Erk axis, understanding role of Notch 3 in chemoresistance and other aspects of drug resistant ovarian cancer.

### Education

The Principal Investigator is a recognized guide for Ph.D. in Life Sciences of the Homi Bhabha National Institute. One graduate student - Mr. Ram Kumar Singh was awarded the Ph.D. degree in 2016, and five students - Mr. Bhushan Thakur, Mr. Ajit Dhadve, Mr. Aniketh Bishnu, Mr. Abhilash Deo and Mr. Souvik Mukherjee are working on their doctoral degree. Nine students underwent training in the lab in 2016, two for their dissertation, three for experience, three as summer trainees and one as an observer. The group has an active in-house data presentation program. Group members also attended national/ international conferences this year.

## Overview

The group is interested in understanding diverse aspects of leukemia biology, and currently focuses on identifying therapeutic targets for the blast crisis phase of chronic myeloid leukemia (CML). In the chronic phase of the disease, inhibition of tyrosine kinase activity of the transforming gene BCR/ABL brings about cytogenetic remission in a majority of the patients. In blast phase, patients do not respond to tyrosine kinase inhibitors either due to BCR/ABL related mechanisms such as kinase domain mutations or because the disease is driven by BCR/ABL independent pathways. Identification of members of these pathways could provide alternate therapeutic targets. Proteomic and phosphoproteomic analysis of cell lines representative of blast crisis phase is being studied in a bid to identify potential therapeutic targets for blast phase CML. Comparative genomic analysis of leukemic cells from patients in different phases of CML has been initiated as a complementary approach for identifying genetic alterations associated with the blast crisis, which could provide clues to therapeutic targets.

## Research

Three cell lines with their sensitive and resistant counterparts, namely K562/SR (erythroleukemic), KU812/SR (basophilic) and KCL22 (myeloid), have been chosen for the study in order to represent the heterogeneity in CML. Proteomic analysis of K562 sensitive to imatinib was carried out in the presence and absence of imatinib. Since imatinib inhibits kinase activity of BCR/ABL, only those proteins whose expression is altered due to the activity of BCR/ABL would show differential expression. K562 cells with and without imatinib treatment were subjected to label-free proteomic analysis (SWATH) and 123 differentiators were identified, of which 63 were up regulated and 60 down regulated. String analysis was carried out to identify the association among the differentiators. Data revealed that the differentiators belong to the machinery of transcription, post-transcriptional processing, import/export of RNA, ribosome assembly as well as a family of cell signaling molecules. These will be evaluated for their ability to restrict proliferation or induce apoptosis in K562 cells. Insights into molecular alterations in blast crisis

phase of CML will also be obtained by analyzing the genomic alterations with a special emphasis on chromosomal aberrations associated with progressive phases of CML. In a preliminary study, the array CGH comparison between K-562 sensitive and resistant cell line showed amplification at 3p26.3 - p21.31, 10q11.21 - q23.1 and 15q21.2 - q26.3 in the resistant cell line. Taken together, the genomic and proteomic profiles would highlight the aberrations associated with progression of CML to blast crisis and those associated with drug resistance in this phase.

## Education

The Principal Investigator is a recognized guide for the Ph.D. Life Sciences program of the Homi Bhabha National Institute, and presently has three students - Ms. Mythreyi Narasimhan, Mr. Rahul Mojidra and Ms. Aneri Parekh, working towards the doctoral degree. During 2016, as a part of the Centre's training program, the group accepted two trainees to work towards their Master's dissertation and 11 trainees for research experience. In addition, one M.Ch. student from TMH was sent as an observer to the lab for a month.

# Hemato-Oncology Group

**Dr. Syed Hasan**  
Scientific Officer 'D'

## Overview

This investigator focusses on understanding the biology of acute leukemia and triple negative breast carcinoma. Acute myeloid leukemia (AML), a disease showing increased incidence in adults, involves uncontrolled proliferation of functionally immature hematopoietic cells. The majority of AMLs are genetically diverse and present a challenge to develop targeted therapies; no available single therapy can treat the majority of AML patients. Therefore there is a critical need to develop robust *in vitro* and animal models to study the complex biological processes associated with developing leukemia. Despite improvements in combination chemotherapy regimens and supportive care, most AML patients die from the disease. Advances in the understanding of molecular pathogenetic mechanisms of hematologic malignancy have fuelled a drive to develop targeted therapeutic approaches that would improve disease remission rates without increasing treatment-related toxicity. These issues are being addressed through collaboration with Aurigene Pharma for the evaluation of *in vitro* effects of novel Aurigene CDK7 inhibitors on primary patient-derived AML blasts and determination of anti-tumor activity in patient-derived AML xenograft models. Another on-going project involves examination of the miRNA-mRNA regulatory network in AML and how this network is influenced by gene mutations.

## Research

The investigator has successfully silenced the NPM1 mutation in AML cells, and prepared material for mRNA and microRNA sequencing using Illumina HiSeq 2500 in 2x100 paired end sequencing. The effects of small molecule inhibitors on primary patient-derived AML blasts, and the anti-tumor activity in patient-derived AML xenograft models (with Aurigene Pharma) are also being evaluated. Data indicate that AML cells carrying NPM1 mutation are more sensitive to arsenic as compared to conventional drugs for AML.

## Education

The faculty participates in joint weekly journal club and data presentation with the BMT and Hematopathology groups. Five trainees worked in the group in 2016 – three for dissertation, one for experience and one as a summer trainee.

# Tumor Immunology Group

**Dr. Shubhada Chiplunkar**  
Principal Investigator

**Dr. Jyoti Kode**  
Co-Investigator

## Overview

The focus of research of this group is on understanding the immune scenario and reasons for immune dysfunction in cancer patients. The projects undertaken include: (i) Understanding the cross talk between bisphosphonate-stimulated tumor cells /  $\gamma\delta$  T cells and osteoclasts; (ii) Epigenetic regulation and anti-tumor effector functions of  $\gamma\delta$  T cells; (iii) Unravelling the immunosuppressive networks contributed by Th17 and Treg cells in gall bladder cancer; (iv) Role of TCR  $\gamma\delta$  T cells in ALL patients receiving allogeneic bone marrow transplantation; (v) Cellular programming using bioactive scaffolds for immunotherapy (in collaboration with IIT); (vi) Understanding the crosstalk of tumor-derived mesenchymal stem cells (MSC) and immune cells in hypoxic tumor microenvironment; (vii) Study of interaction of leukemic stem cells with MSC in acute myeloid leukemia (AML); and (viii) Investigate role of myeloid derived suppressor cells (MDSC) and regulatory T cells in immune evasion of tumors.

## Research

The group focuses on understanding the reasons for immune dysfunction in cancer patients and development of immunotherapy for cancer. Research examines the molecular mechanisms underlying killing of bisphosphonate-treated breast/ oral tumor cells and leukemic blasts by  $\gamma\delta$  T cells and their cross-talk with osteoclasts. It was demonstrated that STAT3 played an important role in MDSC activation and accumulation in oral cancer patients. HDAC inhibitors augmented cytotoxic potential of  $\gamma\delta$  T cells by H3K9-acetylation in the promoter regions of perforin and granzymes, mediators of cytotoxicity. In gall bladder cancer patients, T $\gamma\delta$ 17 was identified as a new subtype of  $\gamma\delta$  cells that contributes to angiogenesis and is associated with poor survival. Increased frequency of myeloid-derived suppressor cells and T-regulatory cells observed in the tumor microenvironment contributed to T-cell tolerance and chronic inflammation in oral cancer patients. T-regulatory cells were found to be increased in hypoxia;  $\gamma\delta$  T cells endured the hypoxic microenvironment better than CD8+ T cells. Oral tumor-derived MSC were found to contribute to immune evasion. AML bone marrow cells were analyzed for expression of Toll-like receptors (TLR) 3/4/9, CXCR4/7, PDL1 and TIM3 in leukemic stem cells and cultured MSC.

AML MSC contributed to drug (lenalidomide/ azacytidine) resistance of AML blasts, which could be reversed with the immunomodulators - TLR4 ligand, TLR-3 antibody and CXCR4 antagonist.

## Education

The Principal Investigator is a recognized Ph.D. (Life Sciences) guide under the Homi Bhabha National Institute, a deemed university. Of her seven graduate students, Ms. Swati Phalke, Ms. Aparna Chaudhari, Mr. Asif Amin Dar and Mr. Rushikesh Patil obtained their Ph.D. degree during 2016, while Ms. Gauri Mirji, Mr. Sajad Bhat and Ms. Shalini KS are working towards their Ph.D. dissertation. The Co-Investigator received recognition as a Ph.D. guide this year, and accepted Ms. Shruti Kandekar as her Ph.D. student. The group accepted 18 students for training in 2016 – four for Master's dissertation, five for research experience, and nine as observers. Besides these, students from two dental colleges were assigned to the lab as observers. Weekly data presentations form a part of the in-house academic activity of the group. Group members participated in three international and 16 national conferences during 2016.

# Tumor Immunology Group

**Dr. Narendra Joshi**  
Scientific Officer 'F'

## Overview

The goal of this Investigator's research programs has been to elucidate the relevance of inflammation associated markers on the risk for breast cancer and on the immune parameters in the tumor microenvironment. The focus is on the study of immunogenetic aspects of breast cancers and immune-gene expression in breast tumors.

## Service

STR-based chimerism analysis for BMT patients was performed by this group until April 2016, after which this work was transferred to the Hematopathology lab.

## Research

Work was initiated on a new project aimed at examining correlation between IL17 expression in breast tumors and the cytokine expression-associated SNPs in relevant genes. Paired, breast-tumor and normal tissue specimens were procured from the Tumor Tissue Repository, TMH. DNA was extracted from the normal tissue specimens for genotyping while IL17A / IL17F mRNA levels were analysed in the tumor specimens. In another study, analysis of data on the expression of 10 housekeeping genes in cancers of buccal mucosa and tongue was completed. The study examining the influence of progesterone on immunomodulatory phenotypes of breast cancer cell lines was extended to examine the effect of progesterone on TGF beta expression. Expression of IL32 isoforms (mRNA) was studied in breast tumors to complement earlier studies of immune response genes and the effect of IL17A on immune parameters in breast tumors.

## Education

Two trainees worked with the faculty this year - one for Master's dissertation and the other for experience.

## Anti-Cancer Drug Screening Facility

**Dr. Jyoti Kode**  
Officer-in-Charge

The Anti-Cancer Drug Screening facility (ACDSF) supports the efforts of anti-cancer drug development in India, with *in vitro* and *in vivo* anti-cancer drug screening assays that have been developed in-house. ACDSF has over 53 human tumor cell lines, 10 murine tumor models and 36 xenograft models for carrying out drug screening. During 2016, 1644 compounds were received from 215 clients including six corporate R&D organizations across India, and

1527 compounds were tested for their *in vitro* activity. In all, 44 compounds were examined for MTD (n=10) and *in vivo* efficacy assays (n= 34). Two cell lines were tested for tumorigenic potential in immunodeficient NOD-SCID mice. Acute toxicity testing of nine compounds was carried out in normal mouse strains. Under the CSIR-funded project on 'Affordable cancer therapeutics', pre-clinical screening of 306 compounds against 10 cancer cell

lines yielded some interesting leads. Oral cancer spheroids (CSC) were developed and characterized by immunophenotyping and drug uptake, and oral CSC drug testing assay was standardized to evaluate active leads in this population. Three of the 11 active compounds found to be effective against oral CSC are now being tested for their *in vivo* efficacy against oral cancer xenograft.

## Bioinformatics (BTIS)

**Dr. Ashok Varma**  
Officer-in-Charge

ACTREC has a Biotechnology Information System Network (BTISnet) supported sub-DIC centre funded by the Department of Biotechnology, Government of India. Under this scheme, BTIS receives funding support for hardware, software and also to hire scientists/ trainees for on-going research projects. The Bioinformatics facility at ACTREC is equipped with high-end computational systems and supports the data analysis needs of the Centre's scientists, Ph.D. scholars, and

even dissertation trainees. Scientists in the facility have the expertise to handle the bioinformatics needs of projects involving basic and translational research in cancer biology, cancer genomics and proteomics, structural bioinformatics, microarrays, and NextGen sequencing. Using the software available in this facility, various groups of the Centre perform scientific analysis to fulfill their proposed objectives. The facility also trains scientists of the Centre in molecular

modeling, microarray expression analysis, proteomics, and structure-guided inhibitor design. The facility has its own dedicated website: <http://www.actrec.gov.in/bioinformatics/index.htm>. Every year, the facility conducts a two-day workshop targeting college teachers and research scholars of Mumbai region. This year's workshop was held on March 17-18, 2016, during which 15 faculty and research scholars received training on the applications of bioinformatics.

**Mr. Nikhil Gadewal**  
Scientific Officer 'E'

**Dr. Poonam Gera**  
Officer-in-Charge

## Biorepository

The Biorepository at ACTREC is the custodian of biological samples obtained from surgeries at the Centre, and ensures provision of requisite samples to researchers under specified protocols for duly approved research projects addressing issues about the biology of cancer or seeking biomarkers to achieve more refined molecular classification and targeted therapy. The facility has accrued 540 tissue samples during 2016, the majority being tumors

of the head and neck, followed by breast; other tumor types included neurological, gastrointestinal, genitourinary, gynecologic, etc. Cryopreserved tissue samples were provided to eight Principal Investigators with approved projects. The facility has also collected whole blood and provided samples to three Principal Investigators with approved projects. The Biorepository has extended its histopathologic expertise in

hematoxylin and eosin staining and evaluation of immunohistochemistry slides for nine projects. In the International Cancer Genome Consortium (ICGC) project, the facility has collected tumor and blood samples of gingivo buccal mucosa from 33 newly accrued cases. Whole blood, urine and mouth wash samples have also been collected, annotated and cryopreserved on serial follow ups for all the ICGC cases.

**Dr Sanjay Gupta**  
Officer-in-Charge

## Common Facilities

The Common Facilities (CF) provide supportive services for the operation and maintenance of several commonly required equipment including X-ray developing machine, ultra-pure water purification system, bacteriology culture hoods, ice making machines, and cold rooms. CF also cover vital radioisotope research facilities and equipment including radioactivity

handling room for isotopes such as  $^{32}\text{P}$ , biohazard hoods, radioactivity monitors, incubators, centrifuges, gamma counter, beta counter, etc. The high-end research equipment/ facilities are located on different floors and wings of Khanolkar Shodhika and are used by all. The autoclaves and ovens belonging to the different research groups are also maintained by the CF technicians. The

major equipments under CF are covered under annual maintenance contracts to ensure safe, sustainable, efficient, and reliable facilities. Recently, a new water purification system (Thermo model Genepure), two bacterial culture hoods (Imset) and a developing machine (Promax ADC model) have been inducted into the CF.

## Common Instruments Room

**Mr. Uday Dandekar**  
Officer-in-Charge

Over the past 39 years, the Centre has maintained a Common Instruments Room (CIR) - a facility which houses routinely required, vital scientific equipment, with a view to optimize their utilization and to make them available for use to the staff and students, round the clock on all days including holidays. The OIC of this facility also provides technical support

to other research laboratories in the procurement and maintenance of capital equipment. The technical officer and qualified technical staff attached to the facility handle routine maintenance of all the equipment and render help to the end users, thus ensuring proper use of the equipment. With a view to reduce breakdown and subsequent downtime of the instruments, requisite

spares for centrifuges, low temperature freezers, CO<sub>2</sub> incubators, etc. and other consumables like centrifuge tubes, thermal paper rolls, etc. are procured on a regular basis and kept in stock in the CIR. In all, 92 equipments are currently housed in this facility. During 2016, ultracentrifuge and microplate reader were procured and installed in the CIR.

## Digital Imaging Facility

**Dr. Dibyendu Bhattacharyya**  
Officer-in-Charge

ACTREC's Digital Imaging facility (ADIF) houses several advanced imaging instruments including multiphoton confocal LSM780 microscope, 3i Mariana spinning disk confocal microscope, Leica SP8 confocal microscope with STED super resolution

system, Leica DMI600B microscope (Bhattacharyya lab), Axio Imager Z1 and Axio Vert 200M. The facility provides microscopic image acquisition services for wide-field and confocal platforms to users in ACTREC as well as outside institutions. Some of the microscope

acquisitions include live cell imaging, super resolution imaging, deep tissue imaging, and fixed tissue imaging techniques such as fluorescence recovery after photobleaching (FRAP) and fluorescence resonance energy transfer (FRET).

**Dr. Pradnya Kowtal**  
Office-in-Charge

## DNA Sequencing Facility

The DNA sequencing facility has two automated DNA sequencers - an eight capillary Genetic analyzer 3500 and a 48 capillary Genetic analyzer 3730 from Applied Biosystems/ Thermofisher, both of which are used for DNA sequencing, fragment analysis and

single nucleotide polymorphism analysis. The machines are operated six days a week. The average turn-around time to give out data is one working day after receiving samples. During the year 2016, the facility carried out 29,500 sequencing and fragment analysis

reactions. The facility was used by researchers from ACTREC, BARC and IIT-B. Investigators used the facility to analyze sequences of genes implicated in sporadic and inherited cancers for research and diagnosis.

**Mrs. Sharada Sawant**  
Officer-in-Charge

## Electron Microscopy Facility

This facility supports and initiates research and training in the applications of transmission electron microscopy (TEM). The facility has a JEOL JEM 1400Plus TEM that works at 80-120KV with 0.2 nm resolution and magnification up to x12,00,000, which is suitable for biological, polymer, nanogold and material science applications. This system has been commissioned along with 3-D Tomography, energy dispersive spectroscopy (EDS) and scanning transmission electron microscopy (STEM). The facility carries out TEM sample preparation including fixation,

resin block making (solid tissues, monolayer cell cultures, single cell suspension etc), semi-thin sectioning followed by ultrathin sectioning, staining, scanning and imaging. During 2016, the facility processed EM samples for ten working groups from ACTREC and five working groups from BARC. A total of 220 tissue and monolayer cell culture specimens were prepared for araldite/epon block making, 205 specimens for semi-thin sectioning, followed by ultrathin sectioning and all the grids were contrasted with uranyl acetate and lead citrate. All the grids were scanned under EM and the images

were captured at 120 KV. The facility also processed 15 samples for negative staining and 12 samples for 3-D tomography. Further quantitative analysis of EM images was done using iTEM software for four working groups. Interpretation of results on the basis of ultrastructural observations and quantitative analysis was done for all the users. The EM facility organized a Workshop on Transmission Electron Microscopy on 6-7 October 2016 to train in house users for routine electron microscopy.

## Flow Cytometry Facility

**Dr. Shubhada Chiplunkar**  
Officer-in-Charge

The Flow Cytometry (FCM) facility is a centralized facility having two flow cytometers - FACS Aria which is equipped with 3 lasers (407 nm, 488 nm, 633 nm) and can perform 11-color analysis and 4 way-sorting, and FACSCalibur which is equipped with one laser (488 nm) and can perform 3-color analysis. The software used for data analysis include FACSDiva, CellQuest Pro, FlowJo, FCAP Array and Modfit. The facility is used by the Centre's scientists and clinicians for a wide range of research applications including immunophenotyping, multicolor

analysis, DNA content and cell cycle analysis, apoptosis and proliferation studies, detection of mitochondrial membrane potential, stem cell analysis - side cell population, dermal stem cell analysis, detection of circulating tumor cells, functional assays like intracellular calcium influx, oxidative burst analysis, intracellular cytokine analysis, cytometric bead array assay for detection of cytokines, 4-way live cell and single cell sorting. The facility provides technical expertise in experiment designing and data interpretation to researchers, whenever

required, and trains users in data analysis. The facility also offers its services to outside investigators on payment basis. During 2016, 78 users worked on FACSCalibur and 52 on FACS Aria. Demonstrations and training were conducted for visiting clinicians, scientists and students on request. In 2016, the facility and Chiplunkar lab were involved in the conduct of two DBT/NER hands on training workshop sessions on 'Basic and Advanced Immunological techniques' 18-22 January and 1-5 March, and a one-day Cell Sorting workshop on 10 March 2016.

## Histology Facility

**Dr. Arvind Ingle**  
Officer-in-Charge

Histology is a service facility that provides slides of unstained/haematoxylin and eosin (H&E) stained histology sections of animal tissues including bone/ tumor samples, logistic support for frozen sectioning of human/

animal tissues, and blocks of multiple tissues by pecking method using a microarray machine. During 2016, the facility received 4647 tissue samples in fixative and, after processing, supplied 3637 stained and 15154 unstained

slides to 16 research labs. Besides this, 2775 tissues were processed for cryo-sectioning while 2549 H&E stained and 3441 unstained slides were supplied to eight research labs.

**Dr. Arvind Ingle**  
Officer-in-Charge

## Laboratory Animal Facility

**Dr. Rahul Thorat**  
Scientific Officer 'D'

The main objective of the Laboratory Animal Facility (LAF) is to breed, maintain and supply laboratory animals to the Centre's scientists. During the year 2016, LAF undertook planned breeding of 27 strains of mice, one strain of rat and two hamster strains, and supplied 4597 normal mice, 184 Nude mice, 1523 NOD SCID mice, 104 rats, four hamsters and one rabbit to 22 researchers against 72 IAEC-sanctioned research proposals. Towards quality control, LAF examined 57 stool/ animal samples and 161 food, water, bedding material and room air samples for routine microbiological testing, 209 hair/ stool/ cellophane samples for clinico-pathology, 62 samples for

serological detection of four rodent pathogens from 17 strains, and carried out PCR-based tests for 11 infectious agents using 34 random samples from these 17 strains. For checking genetic purity, LAF undertook skin grafting of 36 mice and four rats, biochemical marker testing of 52 mice from seven strains, and PCR based tests for 19 microsatellite markers on 26 DNA samples from 13 mouse strains. LAF examined the genotypes of 46 *ptch* KO mice, and used flow cytometry to assess the T- and B-cell profile in 30 blood samples of Nude/ SCID mice, as also control BALB/c and Swiss mice. As a part of its embryo freezing program, LAF collected 820 embryos at the 8-cell to

morula stage from 133 mice of seven strains and froze the embryos in 43 cryo-vials under liquid nitrogen. During the report period, LAF also supplied 7869 normal mice, 70 nude mice and 140 SCID mice as breeding nuclei/ experimental animals to 13 CPCSEA registered Indian organizations, and provided genetic and microbiological status testing services to other organizations. The senior faculty participated in six local and national conferences/meetings to deliver invited talks in their area of expertise. In 2016, two trainees for M.Sc. dissertation projects and one observer were accepted in the facility.

**Dr. Ashok Varma**  
Officer-in-Charge

## Macromolecular Crystallography & X-ray Diffraction Facility

Since its inception, the facility has been supporting data collection of protein crystals grown by scientists of the Centre and those from other institutions in and around Mumbai. The facility is equipped with a crystallization unit, crystal mounting devices, microscope to visualize the crystals, Microstar microfocus rotating anode x-

ray generator, integrated computer controller motorized image plate detector and computers. The facility also provides training in protein crystallization, crystal picking, and mounting on the X-ray diffractometer to scientists and research scholars of the Centre and from other parts of the country, and helps them to understand

macromolecular crystallography and structure biology. Three groups having a focus on structural biology are the active in-house users; one of them collected high resolution data this year. Scientists from BARC also utilized this facility to check the diffraction pattern of their crystals. In 2016, 19 crystals of different proteins were mounted for x-ray diffraction analysis.

## Mass Spectrometry Facility

**Dr. Rukmini Govekar**  
Officer-in-Charge

This facility houses two state-of-the-art mass spectrometry platforms connected to high performance liquid chromatographic and robotic systems: (1) MALDI-TOF/TOF (Bruker Daltonics, Ultraflex II), a liquid chromatography system (Agilent 1200 series micro LC) and a spotter (Bruker Daltonics, Proteineer); and (2) Nano-LC (ABSCIEX, Eksigent)-ESI-Q-TOF (ABSCIEX, Triple

TOF 5600 plus). As in previous years, the MALDI-TOF-TOF platform was used by in-house and outside users, and a total of 500 samples were analyzed. Further, the mass spectrometry team carried out trials and trouble shooting in sample preparation, sample purification, method development techniques, data analysis parameter settings on the new nano LC-ESI-Q-TOF, and initiated sample

analysis for users. Apart from profiling of 128 complex protein mixtures, the facility was also successful in performing label free quantification (SWATH analysis) of 15 complex protein samples, while 16 samples were analyzed for determination of PTMs. Besides the OIC, the facility includes one more scientific officer.

## Molecular Imaging Facility

**Dr. Abhijit De**  
Officer-in-Charge

This facility was established in 2013 to provide preclinical *in vivo* molecular imaging research support to ACTREC faculty. Molecular imaging provides real-time visualization and quantitative measurement ability of cellular processes at the molecular or genetic level, and can add high value for translating basic research findings to the

clinic. The facility has IVIS Lumina II and IVIS Spectrum imaging systems, data back-up storage server, and gas anesthesia systems. The installed systems offer planner scanning of multiple mice, rats or other small animals, and uses probes with optical signatures such as bioluminescence, near-infrared fluorescence as well as

Cerenkov luminescence signal. During 2016, the facility was used for various cancer therapeutic applications by the faculty and research scholars from eight laboratories. It also supported researchers from institutes like IIT-B, Bombay College of Pharmacy, etc.

## Small Animal Imaging Facility

**Dr. Pradip Chaudhari**

Scientific Officer 'F'

The major focus of the facility is on preclinical animal imaging and research on radiopharmaceuticals. Diagnostic radionuclides such as technetium-99m and fluorine-18 complexes are being evaluated for their utility in imaging and for monitoring cancer xenografts in various mouse models. The facility is utilized for preclinical PET, SPECT and CT imaging involving rodents for basic and translational research projects of in-house scientists, other DAE units, academic institutes and pharmaceutical industries. This year the facility undertook 13 studies including proof-of-concept studies, normal tracer uptake studies and *in vivo* tumor uptake studies. In this activity, the facility is designing imaging protocols, development of animal models, data

quantitation and analysis. The facility also conducted a major imaging study for pharmaceutical industry and signed a confidentiality disclosure agreement during 2016. The research component of preclinical imaging involves validation of liver and brain xenograft and orthotopic models using preclinical imaging modalities, PET and CT respectively. This year, the group also developed imaging protocols for *ex vivo* bone imaging and analysis utilizing high resolution microCT. The second focus involves an animal oncology clinic for the diagnosis and treatment of pet animals suffering from spontaneous cancer, and also examines comparative aspects of animal and human cancers. During 2016, 92 referral cases underwent major/minor surgery, single

or combination drug chemotherapy and radiation therapy or a combination, as per the clinical requirement. The animal cancer biorepository maintains biological specimens such as blood, fresh-frozen or formalin-fixed or formalin fixed paraffin embedded tissues collected during diagnosis/treatment, and uses it for comparative oncology research. The senior faculty of this facility organized a CME on 'Preclinical imaging and drug discovery' at ACTREC during 7-9 September 2016, and participated in two international and six national conferences/ training courses. During 2016, five trainees were accepted in the facility – three for their master's dissertation and two for research experience. The facility also includes another scientific officer.

## General Administration

**Mr. Umesh Kumar Mote**  
Sr. Admin. Officer

### Administration

Mr. Mushtaq Shaikh  
Admin. Officer (EM)  
Mrs. Malti Sharma  
Dy. Admin. Officer (HRD)  
Mr. Vilas Pimpalkhare  
Dy. Admin. Officer (EM)

### Accounts

Mrs. P. Kamala  
DCA, ACTREC  
Mrs. Sandhya Patil  
Accounts Officer II

### Engineering

Mr. P.B. Baburaj  
OIC (ES)

### Purchase

Mr. Sharad Kirkase  
Purchase Officer

### Stores

Mrs. Premalata Kotenkar  
Dy. Stores Officer

### Security

Mr. Rajan Chavan  
Dy. C.S.O. (Gr. I), ACTREC

## Administration

### Human Resource Development

manages the functions of manpower planning, performance management, recruitment of staff (regular as well as temporary), training and development of employees, maintenance of discipline, etc. Eight regular staff members were appointed in different grades in Medical, Scientific, Technical and Administrative cadres, adhering to the reservation policies of the Government of India. Twenty-one junior research fellows were selected for Ph.D. studies. Staff members on contract were appointed under technical, non-technical and nursing category to handle the increased work load caused by greater inflow of cancer patients at ACTREC. Presently, 29 technical, 59 non-technical and 68 nursing staff members are working under an outsourced contractor. In all, 127 staff members were recruited on various projects to assist in research work. Consequent to the administrative shifting of the Centre for Cancer Epidemiology (CCE) from TMH to ACTREC, around 143 project staff were also shifted to ACTREC. The department also handles career planning through merit-based review and promotion of employees by holding yearly DPC. Day

to day administrative functions encompass e-attendance control, maintenance of leave record, updating of staff records with regard to pay fixation/ re-fixation matters, settlement of personal claims, release of retirement/terminal benefits becoming due on superannuation/ death cases, and timely payment of staff, time to time performance appraisal/ monthly attendance reports, proper follow-up of matters/ decisions taken during various meetings, amicable handling and settling of inquiry matters, etc. It has provided timely welfare measures and facilities necessary for maintaining an excellent working atmosphere, imparted training by deputing eight staff within and outside Mumbai. A computer programmer was deployed to develop the HRD software/ programs such as retirement benefits, children education allowance, etc.; the in-house developed software/ programs include online gate pass, leave travel concession, national/ international deputation, etc. Timely payment of PRIS, update allowance to eligible employees, providing duplicate service book to staff, service verification of staff who have completed 18 years of service, etc are other activities carried out by HRD. Implementation of the

reservation policy of the Govt. of India duly adopted by TMC in respect of SC/ ST/ OBC/ PWD/ ex-Serviceman is undertaken regularly and systematically, and all efforts are made to achieve and ensure the prescribed percentage of reserved posts. TMC merit scholarships were awarded to five children of ACTREC staff. During 2016, three staff members superannuated and one took voluntary retirement.

**Estate Management** controls and manages all the outsourced activities aimed at the effective functioning of systems such as hostels, guest house and faculty club, staff and patient canteens, Retreat cafeteria, transportation, horticulture, pest control services, photocopier machines, courier/ Post & Telegraph services, clearing of service bills, as well as refilling of gas cylinders in laboratories, BMT, patient hostels and guest house at the faculty club. Disposal of biodegradable/ bio-medical waste was done in compliance with highest standards set as per the government norms. Arrangement of accommodation for patients' families at Lords & Melbourne hostel, and smooth functioning of railway reservation system are effectively handled by the department.

**Housekeeping services** for all the buildings on the campus such as Khanolkar Shodhika, Paymaster Shodhika, Jussawalla Shodhika, Vasundhara patients hostel, three students hostels, Retreat, faculty club guest house as well as the newly started departments of Biomedical Records, Cancer Cytogenetics and Cancer Epidemiology in CCE are all managed by General Administration. Housekeeping services ensure and maintain cleanliness, good sanitation and hygienic conditions on the campus. During the year 2016, a number of training sessions were organized for housekeeping and horticulture workers.

The Centre takes pride in the large variety of flora on its campus. A garden covering an area of ~1500 sq. mtrs, a plant nursery for in-house needs, and lawns at different locations on the campus are well maintained by a professionally trained horticulturist and a team of gardeners. A separate garden was developed at the newly constructed CCE. Drip irrigation and sprinkler systems are being installed on the campus for watering the gardens and trees. In 2016, the Centre received a bus and an ambulance as donation from M/s. Morgan Stanley and one more ambulance from M/s. ALKEM. A 'Nisarg-Runa Biogas Plant' has been running successfully at ACTREC since the past few years, and ensures the disposal of organic/ kitchen waste in an eco-friendly manner. Through consistent follow-up with concerned departments in CIDCO, collection of dry waste from the campus is organized very effectively, thereby maintaining pollution-free atmosphere on the campus.

## Accounts Department

The main focus of the **Finance and Accounts Department** has been funds flow management by prudential and judicious budgetary controls, and review of financial outflow. Maintenance of requisite documentation and other relevant

records in conformity with the instructions issued by the Department of Atomic Energy, Govt. of India was ensured. The procurement of various supplies, materials and equipments required for the Centre was undertaken by following prescribed purchase procedure. A new Payroll system for JRF/ SRF/ Project staff, Asset Management System and Project Management System (PMS) were implemented in 2016. During the year, hospital and other income to the extent of Rs.19.12 crore was generated. In all, there were a total of 191 on-going projects at ACTREC during the year. A sum of Rs. 10.08 crore was received from governmental agencies such as DBT, DST, ICMR, etc., to meet the expenditure on 90 of the on-going projects. In addition, 15 new extramurally funded projects to the tune of Rs. 10.00 crore for a three year period were sanctioned by the above-mentioned funding agencies, of which Rs.3.91 crore were received during the calendar year.

## Engineering Services

The Engineering services at ACTREC, encompassing a strong team of trained electrical, mechanical, civil engineers and supervisors along with technicians and other support staff, are responsible for the operation and maintenance of various critical engineering systems on a round-the-clock basis, to create a sound, safe and smoothly functioning work environment that supports patient treatment, research and educational activities of the Centre. Key engineering works include: (1) Air conditioning system with chilling plants, cooling towers, package units, water coolers, refrigerators, deep freezers, medical oxygen system, LPG distribution network, mechanical and fabrication works, etc; (2) In-house repair and maintenance of close to 500 window/ split air conditioners; (3) 33 KV high tension switch gears, transformers, LT panels, lighting and power distribution, DG sets, cabling, lifts, communication and PA system, patient

calling system, etc; (4) Maintenance of water supply and fire hydrant systems, as well as sanitary and drainage systems; (5) Civil works including alterations, additions, masonry, plumbing, painting, carpentry, maintenance of buildings, roads, and compound wall of the 60 acre campus; (6) Co-ordination with Architects/ Planners for construction of new buildings on the campus; (7) Liaison work with local bodies for obtaining various NOCs and permissions; (8) Distribution of liquid nitrogen on a regular basis to research labs; (9) Maintenance of laboratory equipment, furniture and various hospital utilities; (10) Planning and implementation of the up-gradation/ replacement of facilities, carrying out preventive, corrective and deferred maintenance of the buildings, and making short-term and long-term recommendations for financial allocation.

## Purchase Department

Purchase department aims to provide efficient services to the entire Centre by way of arranging the procurement and delivery of goods as per the approved quality, and minimizing the supply time. Processing indents, enquiries, comparative statements, purchase orders and reminders are executed through a Material Management System (MMS) developed in house by the Information Technology department. Implementation of MMS has greatly assisted in the efficient functioning of procurement activities and obtaining the materials with ease. During the report year, the department floated 39 e-tenders with the help of tenderwizards.com/ DAE; the response from the vendors was satisfactory. These are important and requisite protocols as per DAE and CVC norms. During the year, goods and equipment worth Rs. 305 crore, consumables worth Rs. 25 crore and contract for the supply of spares/AMC worth Rs. 19.50 crore were delivered by the department.

## Stores Department

The Stores department handles routine receipt of stock, non-stock items and capital indents, issues stock and non-stock material, maintains a proper record of assets, conducts stock verification, and provides support for asset verification and audits.

The receipt of stock / non-stock items and capital indents is done as per the Purchase Order after checking item codes. Work involves coding of chemicals/ reagents, follow-up with TMH for coding/ updating codes for certain items, generating PSNs once a week after Accounts confirms fund availability, forwarding indent files to Purchase for further action, handling return/ reject transactions, accepting delivery of perishable/ non-perishable items 24x7, and collecting material against purchase orders raised by TMH. The issue of stock and non-stock material is handled daily. Regular inventory checks of stock items help avoid shortages/ discrepancies, GRINs are generated after confirming proper receipt of material, discrepancies in material if any are brought to the notice of vendors, discrepancy notes are prepared if complaints are received after issue of material and are dispatched to Purchase for follow-up on return/ replacement. During 2016, a total of 7002 GRINs were generated.

A physical asset register is maintained and updated regularly to record all assets received in ACTREC in parallel with the online equipment program. All new assets are numbered on receipt. An up-to-date soft copy of the asset list is maintained to provide lists to users and internal/ external auditors for physical asset verification, audit inspection,

insurance purpose, etc. In all, 927 major/ minor equipment including laptops, computers, printers, ACs, office equipment, furniture, etc were acquired during 2016. Physical stock verification was carried out twice a year and showed minimal discrepancy/ variation. Asset verification carried out in March was also successful. Physical asset verification for 2012-13 carried out by the external auditors – M/s. Karamsey & Co. was completed satisfactorily. Verification of pre-2012 assets is underway and ~30 departments have an all clear status. Audit queries relating to consumables and assets were cleared. Eleven discrepancies relating to consumables and five cases of uninstalled equipments raised by the DAE audit were cleared. Details of all assets purchased between 2012 and 2017 sought by the Indian Audit and Accounts department were provided on priority.

**Highlights of 2016:** The equipment program, GRIN, stock and non-stock indents were made online in a bid to fulfil the Centre's paperless mandate. Controls were put in place for direct supplies made by vendors. Stagnation and loss of capital was avoided through strict inventory control with an emphasis on the safety and security of all material in Stores.

## Security Section

The prime responsibility of this section is ensuring round the clock safety and security of ACTREC property, personnel, students and patients. Strict access control measures have been adopted to regulate the entry of people, material and vehicles inside the campus. During

2016, due attention was given to enhance and improve peripheral security measures and on-the-job training was imparted to security staff to combat any unforeseen situations/ threats. Surveillance cameras were inducted into the system. In the first phase, cameras were installed at the entrance, lobbies, all the floors of the buildings and vital areas of ACTREC. Implementation of an improved fire alarm and detection system is in progress; these would help tackle any kind of fire exigencies.

Ceremonial parades were performed by the security staff of ACTREC on Republic Day and Independence Day. Close liaison was maintained with the local police, RTO, CIDCO, municipal authorities and other outside agencies. Security section also efficiently managed the Centre's transport activities encompassing the efficient running of the shuttle services, vehicles for doctors, patient transport facilities, condemnation of old vehicles, and obtaining RTO permits/ licenses for newly procured vehicles. The department also coordinated the visits of officials from DAE, AERB and other agencies, and handled security arrangements for all the conferences held at ACTREC.

Vigilance Awareness Week was observed at ACTREC from 31 October to 5 November 2016. Shri Hemant Nagrale, IPS, Commissioner of Police, Navi Mumbai, was the Chief Guest at a function held on the inaugural day of Vigilance Awareness Week. In his talk, Shri Nagrale shared his thoughts on 'Public participation in promoting integrity and eradicating corruption'.

**Officers:**

Mr. Padmakar Nagle  
Mr. M. Sriram  
Mr. Anand Jadhav

In fulfillment of its mandate, IT department provides computational facility, infrastructure and support for information access, processing, printing, archiving, dissemination, etc to the Centre. ACTREC has a campus wide 1 Gbps LAN with copper/ fiber cable, embellished with ~600 LAN nodes, eight servers and is equipped with secured wifi network. The campus is connected to the Internet through a 50 Mbps NKN information gateway with redundant 20 Mbps Reliance connectivity. The Centre has a live mail server that holds over 350 email accounts of staff and students. ACTREC website is also hosted on an in-house server. Redundant/ fail safe configuration on the firewall ensures 99% uptime of internet and mail facilities. A dedicated point to point leased circuit of 12 Mbps between ACTREC and TMH facilitates sharing of patient information, PACS images, etc. Under the National Knowledge Network (NKN) project, the Centre has successfully established seamless connectivity to the NKN grid at gigabit per second speed. Under ANUNET network, the Centre has established successful voice connectivity with TMH and other DAE units. ANUNET network is also used to access UTKARSH - a high

end cluster of servers for bioinformatics data processing. The hospital information system (HIS) is maintained on a state of the art, enterprise class IBM power6 -520 server class machine that runs on 24x7 mode and provides information processing facility to various user departments.

A summation of the activities of IT department during 2016 is provided below.

Networking: The vital networking activities include day-to-day support, upkeep, administration and maintenance of passive and active network components. The Centre has scaled up the network backbone connectivity on 10 Gbps. Multiple buildings on the campus are now connected via a mesh topology through optical fiber for redundancy and zero downtime purposes. Accordingly, all the networking devices including firewall, switches and routers are configured with redundancy protocols. The Centre has also acquired latest state of art, wireless network devices on new standards with 600 Mbps bandwidth with high availability configuration of wireless controller ensuring 99.9% uptime of the network. The department

has also extended gigabit wired network connectivity and wireless network to the newly constructed CCE building.

Hardware: The major activity during 2016 was procurement of new IBM I-series power 7 server for HIS, the existing power 6 server will be configured in high availability mode. Four laptops, 15 laser printers, smart card system for patients, barcode printers, AV for board room, etc., are the other procurements this year. The department is also planning to upgrade its email server set up.

Software: Patient information processing at the Centre is essentially online, multi-location and round-the-clock. In 2016, updates were made available for PABR, DIS, RIS, ROIS, OT, Accounts and Pharmacy, which enabled the end users to make seamless transactions on the remote server of TMH for patient services. Gate pass software, online indent system, PMS system to track real time expenses and income booked against particular project fund, engineering work orders, etc., are the major achievements under the software category.

The ACTREC library proactively acquires, organizes and delivers scientific and clinical information resources and provides varied services to its users to support and enhance research, quality patient care, and educational programs of the Centre. The library subscribes to over 90 journals in cancer and allied areas, and has a collection of 5873 books, 12595 bound volumes of journals, 595 theses, 3218 staff publications, 392 reports and 20 videos. The library maintains a record of staff publications, and circulates weekly updates of the Centre's publications through 'Science Sparks @ ACTREC'. Services such as publication statistics, citations to papers, h-index, impact factor, authenticity of journals, and bibliographic services were provided in anticipation and on demand throughout the year. During 2016, 'article on request' was one of the most availed services wherein the library

provided 821 articles against 924 requests (83% success rate). The library also provided 98 documents to government affiliated libraries and individual visitors. Besides library orientation to new users, one-on-one information literacy program on the use of online resources and databases was conducted; 46 individuals benefited from this program.

The ACTREC library also gives due attention to upgradation of its equipment, infrastructure and software applications. New software KOHA (Library Management System) and DSpace (Institutional Repository) have been installed, and the library data has been migrated and integrated successfully on the new server on the Ubuntu platform during 2016. The remote access system - EzProxy has been revamped with more features. Unlimited access to ScienceDirect under the DAE - Elsevier consortium covers over 2350 scientific, technical and

medical journals. Clinical Key and UpToDate - two clinical resources activated through the National Cancer Grid program, encompass information on clinical trials, drug monographs, guidelines, patient education material, multimedia resources, etc. Many print journal subscriptions have been converted to online subscriptions to provide seamless access within the campus and off campus by remote access. The library also enabled trial access to 'Immunology & Cell Biology' and select titles of 'Nature Publishing Group' during the report year. During 2016, the bibliographic management software EndNote X7 was updated and access was extended to users. A talk on 'Advantage Mendeley' was organised to educate library users about this new bibliographical management tool. The library home page facilitates quick access to the entire library collection through links and search options on a single platform.

The Photography section of ACTREC provides support to the scientific and medical staff and students towards photo-recording of their experimental results including gels, animal experiments, patient material, etc. Using advanced computing and desktop publishing equipment and software, this section handles design, printing and display of announcement brochures, fliers, banners, programs, letterheads, invitation cards, envelopes, badges, certificates, posters, workshop protocols and abstract books for the

scientific meetings, conferences, workshops, as well as cultural events organized at ACTREC. The section also assists in the preparation of posters or slide presentations for users, and handles printing of identity cards on the data card printer for the security and administrative services. The section takes photographs of the campus, functional groups and infrastructure of the Centre, carefully archives all the images, and provides them for use in the Centre's print publications, audiovisual presentations, website, etc.

The section is responsible for the care of the audiovisual presentation equipment at the following venues of the Centre - seminar, conference, meeting and board rooms and the mini auditorium, and assists users in handling the equipment. During 2016, the facility provided photographic support for 28 events held at the Centre, including 21 national and seven international meetings, and provided ~7000 digital photographs and ~8000 colour laser prints to in-house users/groups, and also undertook lamination, scanning, art work and photo printing.

## Science Communication and Professional Education (SCOPE) Cell

**Dr. Aparna Bagwe**  
Officer-in-Charge

The SCOPE Cell was set up in 2005 with the specific mandate of managing two vital programs of the Centre, namely, science communication and professional education.

**Science Communication:** During the report period, the OIC of the Cell responsibly handled the editing, compilation, and proof reading of ACTREC's 2015 annual report, the Centre's executive summary for the 2016 DAE report, provided material and assistance during the Centre's Peer Review in March 2016, ensured the timely provision of vital reports about the Centre to governmental and other agencies - as and when required, edited manuscripts for in-house faculty on request, and assisted in the editing and compilation of material for in-house scientific meetings and other major events. The Cell maintained close liaison with core infrastructure groups of the Centre towards support for scientific and other meetings at ACTREC, and supervised over the Steno Pool's handling of venue bookings and dissemination of information about in-

house seminars and meetings through emails/ circulars. Staff of the Cell handled routine maintenance and updates of the ACTREC website including PI webpages, scientific meeting webpages, JRF intake related uploads and routine uploads of tenders and advertisements on to the Centre's website.

**Professional Education:** The Centre's doctoral program is its prime academic responsibility. The Cell capably handled the intake of JRF 2016 doctoral students which involved advertisement drafting, call for projects, pre-screening of applications (1029 applications against 21 projects) with support from the Steno Pool, conduct of written entrance exam and interviews, up to JRF selection. The Cell also ensured the smooth conduct of the year long academic coursework for the newly recruited JRFs, which included timetable preparation, conduct of orientation, lab visits, PI lab choices, core course/ elective lectures and exams, elective choices and DC formation, first year seminar

presentation, correcting papers, collating marks and preparing mark sheets/ transcripts. The Cell also handled the Centre's Training program which encompassed trainee intake and provision of selection/ appointment/ extension letters and identity cards, and kept a track of trainee payments and numbers. During 2016, 306 trainees were allocated to senior/ mid-level faculty and staff of the Centre; of these 103 were for Master's dissertation, 154 for research experience or on collaborative projects, two research associates, 24 summer trainees and 23 observers. As a part of her academic responsibilities, the OIC delivered lectures on 'Laboratory Safety at ACTREC' to new trainees at quarterly intervals during the year. The Cell also provided logistic support for four educational visits in 2016, including that of the finalists of DAE's All India Essay Contest. The Cell also coordinated the conduct of the Centre's Open Day on 1-2 December 2016, wherein it received support from the Events Committee members.

## Core Committees in ACTREC

### ACTREC Apex Committee for Research and Academics (AACRA)

AACRA, which was established in April 2006, acts as the apex research and academics committee to: carry out the mandate given to ACTREC by the Scientific Advisory Committee, promote basic, interdisciplinary, translational and disease oriented research, recommend and coordinate measures for achieving excellence in research and academics.

<b>Chairperson</b>	Dr. Shubhada Chiplunkar, Director, ACTREC
<b>Members</b>	Dr. HKV Narayan, Dy. Director, ACTREC Dr. Sudeep Gupta, Dy. Director, CRC-ACTREC Dr. Rajiv Sarin, SO 'H' Dr. Neelam Shirsat, SO 'G'

### Basic Sciences Research Group (BSRG)

BSRG is a forum of basic scientists at ACTREC where scientific issues related to academic and research programs, infrastructure development, organization of symposia and meetings, updates on research support facilities, opportunities for extramural and intramural funding support and related matters are discussed.

<b>Chairperson</b>	Dr. Shubhada Chiplunkar, Director, ACTREC
<b>Co-Chairperson</b>	Dr. Sudeep Gupta, Dy Director, CRC - ACTREC
<b>Member Secretary</b>	Dr. Tanuja Teni
<b>Members</b>	All Principal Investigators & Co-Investigators In-Charges of Facilities in CRI

### Institutional Animal Ethics Committee (IAEC)

IAEC reviews the maintenance of the ACTREC laboratory animal facility as well as animal study proposals, and also advises the investigators to ensure optimal use of the animals as per the guidelines laid down by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Environment, Forests and Climate Change, Govt. of India. As per guidelines, both CPCSEA registration and IAEC are to be renewed and reconstituted every three years, and accordingly the IAEC of ACTREC has been reconstituted in 2015. The Laboratory Animal Facility of ACTREC itself is registered with the CPCSEA for breeding and conducting experiments on small laboratory animals, vide registration no. 65/GO/ReBi/S/1999/CPCSEA.

<b>Chairperson</b>	Dr. Shubhada Chiplunkar, Director, ACTREC
<b>Member Secretary</b>	Dr. Arvind Ingle
<b>Members</b>	Dr. Sorab Dalal Dr. Sanjay Gupta Dr. Rahul Thorat Dr. Haladhar Dev Sarma, Main Nominee (CPCSEA) Dr. Vikas Karande, Link Nominee (CPCSEA) Dr. Madhumanjiri Gatne, Scientist from Outside the Institute Mr. Dharmesh Solanki, Socially Aware Nominee

## Institutional Biosafety Committee (IBSC)

IBSC serves as the nodal point for implementation of the biosafety guidelines for recombinant DNA research, their production and release into the environment, and setting up containment conditions for certain experiments as set by the Recombinant DNA Advisory Committee of DBT. Research projects involving the use or production of microorganisms or biologically active molecules that might cause a biohazard must be notified to the IBSC in the DBT-prescribed format. The IBSC permits genetic engineering activity on classified organisms only at places where such work should be performed. The committee members are empowered to subject the storage facility, work place, etc. to inspection.

<b>Chairperson</b>	Dr. Shubhada Chiplunkar, Director, ACTREC
<b>Member Secretary</b>	Dr. Manoj Mahimkar, Basic Scientist
<b>Members</b>	Dr. Sanjay Gupta, Internal Expert Dr. Pritha Ray, Internal Expert Dr. Sanjeev Waghmare, Internal Expert Dr. Shashank Ojha, Biosafety Officer Dr. Shubha Tole, TIFR - DBT Nominee Dr. Geetanjali Sachdeva, NIRRH - Outside Expert

## Institutional Radiation Safety Committee (IRSC)

IRSC is mandated to ensure that the guidelines of the Atomic Energy Regulatory Board for the use, storage, handling and disposal of radioactivity are followed in the respective areas by the designated officers, along with guidelines defined by IRSC. At ACTREC, radioactive sources are used for in-vitro assays, radiation treatment and radiodiagnosis procedures in clinical and preclinical setup. IRSC monitors the safe handling, use and disposal of radioactive sources, and occupation safety aspects while working in the radiation areas.

<b>Chairperson</b>	Dr. Shubhada Chiplunkar, Director, ACTREC
<b>Member Secretary</b>	Dr. Pradip Chaudhari, Radiation Safety Officer, CRI
<b>Members</b>	Dr. DD Deshpande, Head, Medical Physics Div., TMH Dr. JP Agarwal, Dept of Radiation Oncology, TMH Dr. Shashikant Juvekar, Dept. of Radiodiagnosis, TMH Dr. Shashank Ojha, Dept of Transfusion Medicine, ACTREC Ms. Reena Devi, CRC, ACTREC Ms. Siji Paul, CRC, ACTREC

## Academic Committee

The Academic Committee oversees all matters pertaining to the JRF program and coordinates the academic coursework (core course and electives), JRF entrance exam paper setting, and ensures the smooth conduct of the course exams.

<b>Convenor</b>	Dr. Neelam Shirsat
<b>Members</b>	Dr. Manoj Mahimkar Dr. Sanjay Gupta Dr. Kakoli Bose Dr. Murali Krishna Chilakapati Dr. Pritha Ray Dr. Sanjeev Waghmare

## Internal Complaints Committee (ICC)

In pursuance of section 4 read with its applicable sub-clauses of the aforesaid act, the Internal Complaints Committee (ICC) at TMC-ACTREC is empowered to enquire into the complaints related to the sexual harassment of women at the workplace.

<b>Chairperson</b>	Dr. Meera Achrekar, Prof. & Asst. Nursing Supdt, ACTREC
<b>Members</b>	Dr. Prafulla Parikh, Asst. Prof., General Medicine, ACTREC Dr. Rukmini Govekar, Scientific Officer 'F', ACTREC Mrs. Bhagyashree Tillu, Medical Social Worker, ACTREC Mr. Vinod Kumar Singh, Jr. Administrative Officer (EM), ACTREC Dr. Nasreen Rustomfram, Prof. & Chairperson, Centre for Life Long Learning, Tata Institute of Social Sciences, Mumbai - Outside expert

## Anti-Ragging Committee

In May 2014, an Anti-Ragging Committee was constituted at ACTREC in terms of the decision taken by the Government of India, duly notified through the Homi Bhabha National Institute (HBNI) under whose affiliation the Centre conducts its Ph.D. program in Life Sciences. This committee looks into the matter of complaints of ragging at ACTREC.

<b>Chairperson</b>	Dr. Sanjay Gupta
<b>Members</b>	Dr. Prasanna Venkatraman Dr. Rukmini Govekar Dr. Sanjeev Waghmare
<b>Student Members</b>	Ms. Abira Ganguly Mr. Raja Reddy Kuppili

## Grievance Committees

Grievance Committees have been constituted to redress the grievances of regular staff as well as of temporary staff, registrars and students working at ACTREC, TMC.

### Committee for Regular Staff

Dr. Ashok Varma, PI & Sc. Officer 'F'

Dr. Sorab Dalal, PI & Sc. Officer 'G'

Mr. Mushtaq Shaikh, Admin Officer –II

Dr. Arvind Ingle, OIC, LAF & Sc. Officer 'F'  
(Representative of SC/ST)

Dr. Rukmini Govekar, PI & Sc. Officer 'F'

Dr. Vikram Gota, Assoc. Prof. & Clin. Pharmacol 'F'

Mr. Suresh Dakave, Technician 'G' & Representative,  
TMH Workers Union, ACTREC

### Committee for Temporary Staff, Students, Registrars, etc

Dr. Prashant Bhat, Medical Superintendent

Dr. Sanjay Gupta, PI & Sc. Officer 'F'

Mr. Anand Jadhav, Sc. Officer 'D', IT Dept (Representative of SC/ST)

Mrs. Shilpa Sardesai, Asst. Admin. Officer (Est)

Mr. Janardan Rane, Technician 'G' & Representative, TMH  
Workers Union, ACTREC

Mr. Md. Moquitul Haque, Student (SRF), Sarin Lab, CRI

Ms. Arunabha Bose, Student (SRF), Sorab Lab, CRI

## Students' Council of ACTREC (SCA)

In July 2013, the Centre constituted SCA for the PhD research scholars of ACTREC enrolled under HBNI. SCA organizes various student welfare and recreation (academic, sports and cultural) activities, and liaises between students and ACTREC faculty/ management for academic and non-academic issues - including grievances. The core committee consists of five members with no hierarchy. The committee includes one student from each batch up to the 5<sup>th</sup> year, at least one hostel resident and one female candidate. Core committee members are selected on the basis of nominations from each batch and membership is for one year. SCA meetings are held twice a month, or whenever needed.

### Members

Ms. Rajashri Kadam (2013 batch)

Ms. Asmita Sharda (2013 batch)

Mr. Arijit Mal (2014 batch)

Mr. Joel Christie (2015 batch)

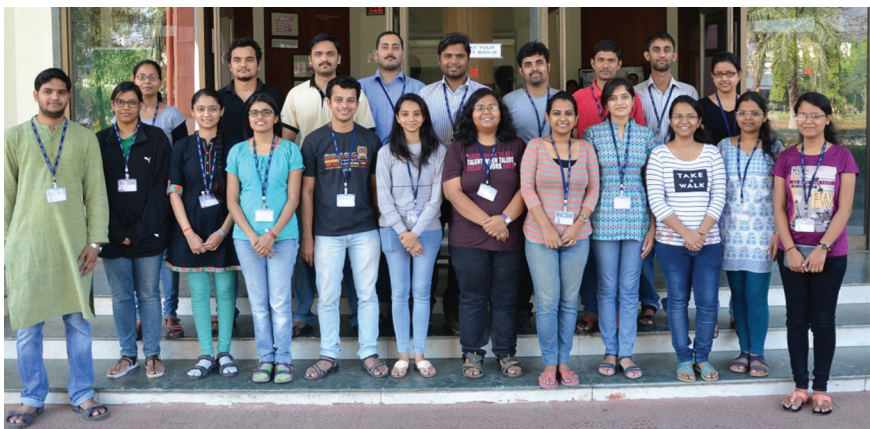
Ms. Kuheli Banerjee (2016 batch)

## Academics at ACTREC

In keeping with the third vital mandate of ACTREC - Education, there is a strong focus on Academics at ACTREC. The Centre's doctoral program is a big magnet drawing aspirants seeking the Ph.D. degree in the Life Sciences, while its training program gets an enthusiastic response from undergraduate and postgraduate students of colleges and universities across India and even overseas. The academic fervor on campus is strengthened by the regular in-house data presentations and journal clubs that are conducted by the basic and clinical research groups. The annual academic program of the Centre involves organization of several local, national and international Conferences, Symposia, Workshops and Training Courses on diverse topics in the biological and life sciences and oncology so that new knowledge from eminent experts in the field is disseminated to its staff and students. Programs of the Centre are enriched academically through the seminars delivered by visiting national and international scientists and clinicians of repute. Every year the Centre also welcomes students from colleges, universities and institutes across the country for educational visits, Open Day and the National Research Scholars Meet.

### Doctoral Program

The Academic and Training Program Office, chaired by Dr. Shubhada Chiplunkar, Director, ACTREC oversees the Ph.D. Life Sciences program at ACTREC. This program is affiliated to the Homi Bhabha National Institute (HBNI), a deemed university established in 2006 under the aegis of the University Grants Commission; it encompasses all the constituent units of the Department of Atomic Energy, Government of India. The Program Office maintains a close



*JRF 2016 batch of Ph.D. Life Sciences students*

liaison with HBNI towards resolving queries pertaining to the research scholars. The Office ensures the smooth conduct of the research scholars' annual doctoral committee (DC) meetings ensuring that a minimum of four DC meetings are held during the tenure of each research fellow, handles correspondence, collates documentation pertaining to DC meetings and submits DC reports to HBNI. The Office is also responsible for the pre-synopsis documentation, submission of synopsis and thesis to HBNI, correspondence with external examiners, conduct of the open viva voce examination, and submission of the final reports to HBNI. The other key players in the doctoral program are: the Academic Committee which plays a vital role in planning, monitoring and ensuring the smooth conduct of the doctoral program, SCOPE Cell which manages the intake of Junior Research Fellows as also the formal academic coursework, and ACTREC Administration which handles enrolment and fellowship matters.

During 2016, 114 graduate students were enrolled into the Centre's Ph.D. program; these included 21 new students of the JRF 2016 batch.

### Award of the Ph.D. Degree in Life Sciences (HBNI)

During the year, 13 students completed work towards their doctoral thesis and were awarded the Ph.D. degree. Their details are given below.

**Ms. Rubina Shaikh**

(Guide Dr. Murali Krishna Chilakapati)

Elucidation of Raman spectral markers in the progression of cervical cancers

**Mr. Kumarkrishna Raychaudhuri**

(Guide: Dr. Sorab Dalal)

Role of  $14-3-3\sigma$  and  $14-3-3\gamma$  in regulating cell to cell adhesion

**Mr. Srikanta Basu**

(Guide: Dr. Sorab Dalal)

Identification of pathways that determine tumor survival and radio-resistance upon plakophilin3 loss

**Ms. Lumbini Yadav**

(Guide: Dr. Ashok Varma)

Structural and functional approaches to evaluate novel missense germline mutations in BRCA1

**Mr. Mohd Yasser**

(Guide: Dr. Tanuja Teni)

Identification of radioresistance related proteins in human oral cancer

**Ms. Sushmita Chatterjee**

(Guide: Dr. Abhijit De)

Evaluation of sodium iodide symporter (NIS) mediated targeted radioiodine therapy in breast cancer by non-invasive imaging

**Mr. Lalith Kumar Chaganti**

(Guide: Dr. Kakoli Bose)

Role of HtrA2 and its domains in regulating its specificity and functions

**Mr. Indrajit Sahu**

(Guide: Dr. Prasanna Venkatraman)

Elucidating the functional significance of protein interaction networks mediated by 19S regulatory particle of proteasome

**Mr. Ram Kumar Singh**

(Guide: Dr. Pritha Ray)

Molecular imaging of cancer stem cells (CSCs) during development of chemoresistance in ovarian carcinoma

**Mr. Raja Reddy Kuppili**

(Guide: Dr. Kakoli Bose)

Understanding the mechanism of apoptosis regulation involving anti-apoptotic protein HAX1 and pro-apoptotic serine protease HtrA2/Omi

**Mr. Kedar Yogi**

(Guide: Dr. Neelam Shirsat)

WNT signaling driven up-regulation of microRNAs in medulloblastoma

**Ms. Rupa Mishra**

(nee Vishwanathraman)

(Guide: Dr. Tanuja Teni)

Molecular insights into p53 repressed anti-apoptotic proteins, Clusterin and Survivin in human oral cancer

**Mr. Bhanu Prakash Jagilinki**

(Guide: Dr. Ashok Varma)

Structural and molecular characterization of extracellular signal

regulated kinase (ERK 1/ 2) in association with ribosomal S6 kinases

**Mr. Saikat Bhattacharya**

(Guide: Dr. Sanjay Gupta)

Chromatin organisation: molecular role of H2A variants

**Mr. Shyam More**

(Guide: Dr. Shubhada Chiplunkar)

Altered cell surface glycosylation and organ specific metastasis

**Ms. Aparna Chaudhari**

(Guide: Dr. Shubhada Chiplunkar)

Role of Galectin-3 in modulating tumor-specific immunity and lung metastasis in mice

**Ms. Swati Phalke**

(Guide: Dr. Shubhada Chiplunkar)

Understanding the crosstalk between bone and gamma delta T lymphocytes in cancer patients

**Ms. Aditi Sahu**

(Guide: Dr. Murali Krishna Chilakapati)

Raman micro-spectroscopy studies of oral cancerous and premalignant conditions

**Ms. Abira Ganguly**

(Guide: Dr. Dibyendu Bhattacharyya)

Size and shape control mechanism of nucleus

**Ms. Poonam Kakade**

(Guide: Dr. Milind Vaidya)

Role of glycosylation in regulating keratin 8/18 functions

**Mr. Asif Amin Dar**

(Guide: Dr. Shubhada Chiplunkar)

Immune dysfunction in oral cancer patients: role of tumor microenvironment

**Mr. Rajan Kumar Choudhary**

(Guide: Dr. Ashok Varma)

Molecular mechanism of BRCA1-BARD1-CstF50 complex and breast cancer risk

**Mr. Rushikesh Patil**

(Guide: Dr. Shubhada Chiplunkar)

Understanding pathogenesis of gallbladder cancer: role of TH17 and regulatory T cells

## Short Term and Summer Training Program

ACTREC conducts a Short term and Summer Training program that accepts (a) graduate students seeking to work on their Master's dissertation; (b) individuals who have completed their academic studies and who wish to gain research experience; (c) staff or students of collaborators of ACTREC faculty who wish to learn specific technologies; (d) undergraduate students seeking research exposure during their college's summer break; and (e) students or staff of academic/research institutions or hospitals who pay short visits to observe techniques or gain exposure to the working of specific departments. ACTREC's training program had 306 participants during 2016, of which 103 trainees worked for their Master's dissertation, 154 trainees were for experience or collaborative trainees, 23 were observers, 24 were summer trainees and two were research associates. The trainees worked under the close supervision of senior scientists, clinicians and other officers of the Centre.

## Educational Visits

ACTREC welcomes educational visits from students of colleges and universities from across the country, as a means of creating awareness about the opportunities for higher education and careers at the Centre. During 2016, ACTREC accepted four educational visits from nursing students from Pravara Institute of Medical Sciences' College of Nursing in March 2016, MSc Pharmaceutical Medicine students of Seth GS Medical College and Class XII students of Delhi Public School in April 2016, and participants of DAE's All India Essay Contest in October 2016.

## Open Day 2016

(Co-ordinator: Dr. Aparna Bagwe)

ACTREC's Open Day 2016 was conducted on 1–2 December 2016. Around 480 students and 36 faculty members from science, medical, and allied colleges/ institutions of Mumbai and Navi Mumbai participated in this much awaited event. On each day, in the

morning and afternoon session, batches of fifteen students and one faculty member from each of eight colleges visited ACTREC. The program included a poster session in the entrance foyer, which was followed by an introductory talk about ACTREC delivered by members of the Events Committee. After this, each college group along with

an ACTREC student volunteer was taken around eight departments, facilities or research labs of CRI and CRC, where varied aspects of cancer research, diagnosis and treatment were highlighted. As always, the visiting college groups appreciated the Open Day program as evident from their feedback.



## 12<sup>th</sup> National Research Scholars Meet 2016

(Organizers: JRF 2013 batch of students)

The 12<sup>th</sup> National Research Scholars Meet (NRSN) in Life Sciences is an annual event organized by the graduate student fraternity of ACTREC. The idea of organizing this unique meeting was born in 2005 to provide a platform to research scholars from the biological sciences to present their innovative scientific ideas and research before their peers as oral or poster presentations. Over the past 11 years, this event has gained immense popularity and prestige amongst the graduate student community across India. For the 12<sup>th</sup> NRSN, all out efforts went into making this event scientifically profound for the participants. NRSN 2016 took place at ACTREC



*The NRSN 2016 organizing team*

on 15-16 December 2016. The inaugural function of NRSM 2016 was graced by Prof. Shubhada Chiplunkar, Director, ACTREC, Prof. Sudeep Gupta, Dy. Director, CRC-ACTREC and the Chief Guests - Dr. PD Gupta, Vice-Chancellor, HBNI, and Prof. RB Grover, Convener, Board of Studies in Applied Systems Analysis, HBNI. During the two day meet, inspirational talks were delivered by Special Guests Prof. Anil Gupta, IIM Ahmedabad, Prof. Ashok Venkitaraman, Director, MRC Cancer Unit, Cambridge and Mr. Atul Tiwari, Director/ Actor and Writer of 'One's life as a journey'. Keynote lectures by Dr. S. Ramaswamy, InStem, Bangalore, Dr. Sandeep Eswarappa, IISc, Bangalore, Dr. S. Ganesh, IIT-Kanpur and Dr. Amitabha Chattopadhyay, CCMB, Hyderabad took the meet to a higher level. At the core of the 12<sup>th</sup> NRSM was the whole hearted participation of 55 research scholars from 21 research institutes across India who came to ACTREC with quality oral and poster presentations. There was keen competition amongst the participants for the scientific awards. The meet also featured special talks on photography and scientific writing as a career option, and presentations by biotech companies. The 'Creative corner' brought out the artistic talent of budding photographers, while 'Scientifia' a unique quiz competition showcased the wit and intellect of youthful minds. The cultural evening enthralled all the participants. NRSM 2016 succeeded in its objective of enhanced communication and interaction between research scholars, scientists and industry.

## DBT-NER Hands-on Training Courses on Basic and Advanced Immunological Techniques

(Co-ordinators: Dr. Shubhada Chiplunkar and Dr. Jyoti Kode)



In 2016, two DBT-NER Hands-on Training Courses on 'Basic and Advanced Immunological Techniques' were organized by the DBT Biotechnology/ Bioinformatic Training Centre in association with the Mumbai Immunology Group at ACTREC during 18-22 January 2016 and 1-5 March 2016. Two fortnight-long training courses were conducted - one for faculty and one for students. The sessions covered 20 faculty members and 20 research scholars from the North

East Region (NER) and other parts of the country. The programs focused on basic and advanced immunological assays and flow cytometry techniques. Lectures on basic and advanced immunology were delivered by in-house as well as invited faculty. Both the training courses provided laboratory protocols/ manuals and soft copies of all the lectures to each participant. The training programs were fully funded by the Department of Biotechnology, Government of India.

## Bioinformatics Workshop

(Co-ordinator: Dr. Ashok Varma)

The Biotechnology Information System Network (BTISnet) Sub-DIC, ACTREC has for the past several years been conducting annual two day workshops on 'Applications of Bioinformatics' that are funded by the Department of Biotechnology, Government of India. These workshops encompass lectures and hands-on training, and target teachers and research scholars from colleges, universities and institutions in and around Mumbai. Twelve faculty members and Ph.D. students attended this year's workshop, which was held at ACTREC during 17-18 March 2016. Theory sessions were conducted in the morning and covered basic aspects of bioinformatics as well as updates about



modern techniques used in bioinformatics, while the afternoon was devoted to 'hands-on' sessions encompassing homology modelling, protein structure visualization, docking, and Next-generation sequence analysis of exome data. The hands-on sessions

were conducted on a one computer per participant basis to maximize the participants' learning experience. The latter part of the day also included visits to ACTREC facilities such as Genomics, Proteomics and Macromolecular crystallograph & X-ray diffraction.

## DBT Biotechnology/ Bioinformatics Training for Teachers & Research Scholars from the North-East and other regions of India

(Co-ordinator: Dr. Ashok Varma)



Two fortnight-long training programs on 'Gene cloning, protein biochemistry, structural biology, and bioinformatics' were conducted at ACTREC during 4-15 July 2016 and 18-29 July 2016. Each of these sessions covered 15 faculty members and 20 research scholars respectively from the North East Region (NER) and other parts of the country. The programs focused on cancer biology, gene cloning, expression and purifications of various cancer associated proteins. Before the start of wet lab experiments, lectures on chemical and biosafety were delivered to the participants. Both the training courses provided laboratory protocols/ manuals and soft copies of all the lectures to each participant. These training programs too were fully funded by the Department of Biotechnology, Government of India.

## Conferences, Scientific Meetings & Seminars at ACTREC

18-22 January	DBT-NER Hands on Training Workshop on 'Basic and Advanced Immunological Techniques', jointly with the Mumbai Immunology Group Coordinators: Dr. Shubhada Chiplunkar & Dr. Jyoti Kode, ACTREC
1-5 March	DBT-NER Hands on Training Workshop on 'Basic and Advanced Immunological Techniques' Coordinators: Dr. Shubhada Chiplunkar & Dr. Jyoti Kode, ACTREC
17-18 March	DBT-BTIS Workshop on 'Applications in Bioinformatics' Coordinator: Dr. Ashok Varma, ACTREC
19 March	CME - III <sup>rd</sup> Quality Conclave of Laboratory and Transfusion Services Organizers: Dr. Preeti Chavan, Dr. Vivek Bhat, Dr. Shashank Ojha, ACTREC
30 April	Bhabhatron Users Meeting Coordinator: Dr. Tejpal Gupta, ACTREC
4-15 July & 18-29 July	Biotechnology/Bioinformatics Training Program for Teachers & Research Scholars from the NER and other regions of India Coordinator: Dr. Ashok Varma, ACTREC
1 August	Live Surgery Workshop Coordinator: Dr. Aliasgar Moiyadi, ACTREC
1-3 August	8 <sup>th</sup> PAGIN Workshop 2016 - 'Data analysis using non-MEM' Coordinator: Dr. Vikram Gota, ACTREC
7-9 September	Workshop on 'In vivo preclinical imaging and drug discovery' Coordinator: Dr. Pradip Chaudhari, ACTREC
6-7 October	Electron Microscopy Workshop 2016 Coordinator: Mrs. Sharada Sawant, ACTREC
12 October	Monsoon Retreat- 'Radiation biology: current perspectives and future challenges' Coordinator: Dr. Sanjeev Waghmare & Dr. Ashok Varma, ACTREC
14 October	Workshop on 'Going about lean process improvement in your laboratory' Coordinator: Dr. Preeti Chavan, ACTREC
November onwards	One year Advanced Certificate Course in Medical Laboratory Technology Organizers: Dr. Preeti Chavan, Dr. Vivek Bhat, Dr. Shashank Ojha, ACTREC
7-11 November	Cancer Registry Training Organizer: Dr. Rajesh Dixit, CCE
25 November	GCP/ IEC SOP Training Organizer: Dr. Vedang Murthy, ACTREC
1-2 December	14 <sup>th</sup> Open Day 2016 Coordinator: Dr. Aparna Bagwe, ACTREC
9-10 December	National Training Program for BMT Nurses Organizer: Dr. Meera Achrekar, ACTREC
7-14 December	Indian Cancer Genetics Conference and Workshop (ICGCW2016) Organizers: Dr. Rajiv Sarin & Dr. Pradnya Kowtal, ACTREC
15-16 December	12 <sup>th</sup> National Research Scholars Meet 2016 Organizers: JRF 2013 batch, ACTREC

## Guest Seminars

8 January	Interplay between mitochondria and nucleus to maintain genome integrity Dr. Sagar Sengupta, National Institute of Immunology, New Delhi
21 January	IGFBP2 as a potential therapeutic target in glioblastoma Dr. Paturu Kondaiah, Indian Institute of Science, Bengaluru
1 February	Context dependent actions of miRNAs: implications for cancer therapy Prof. D. Karunakaran, Bhupat and Jyoti Mehta School of Biosciences, Indian Institute of Technology – Madras, Chennai
25 February	Making cancer history Dr. Ronald DePinho, President, The University of Texas M.D. Anderson Cancer Center, Houston, USA
22 March	Immune resistance mechanisms in pediatric brain tumors Dr. Vidya Gopalakrishnan, The University of Texas MD Anderson Cancer Center, Houston, USA
29 March	Post-transcriptional regulation of miRNA activity in mammalian immune and neuronal cells Dr. Suvendra Bhattacharyya, CSIR - Indian Institute of Chemical Biology, Kolkata
29 March	Depletion of the epigenetic regulator KDM2A inhibits Kras-driven lung tumorigenesis in vivo Dr. Hunain Alam, The University of Texas MD Anderson Cancer Center, Houston, USA
20 April	An integrated approach to study glioblastoma Dr. Kumar Somasundaram, Indian Institute of Science, Bengaluru
5 July	Early detection: a journey with mitochondria and exosomes Dr. Santanu Dasgupta, The University of Texas Health Science Center, Tyler, USA
11 August	Adipose tissue stem cells in the management of diabetes and obesity Dr. Ramesh Bhonde, Former Dean, School of Regenerative Medicine, Manipal University, Manipal
12 August	Epigenetic basis underlying colon cancer development Dr. H. Easwaran, Johns Hopkins Medical Institutes, Baltimore, USA
16 August	Tackling enzymes of cancer metastasis using chemical biology approaches Dr. Sanjai Kumar, City University of New York, Queens College, New York, USA
6 October	Bioinformatics approaches in cancer biology Dr. Anita Grigoriadis, King's College, London; Guy's Hospital, London, UK
17 October	GPCR - cholesterol interaction: novel insights in health and disease Dr. Amitabha Chattopadhyay, Centre for Cellular & Molecular Biology, Hyderabad
25 October	Spatio-temporal dynamics of signaling pathways altered by 'undruggable proteins' in cancer using peptide discovery and protein engineering Dr. Amol Shivange, California Institute of Technology, Pasadena, USA
3 November	Biomedical applications of vibrational spectroscopy: disease diagnostics and beyond Prof. Hugh Byrne, FOCAS Research Institute, Dublin Institute of Technology, Dublin, Ireland
19 December	Hippo signalling in breast cancer progression Dr. Madhura Kulkarni, Cancer Science Institute, Singapore

## ACTREC Imaging Seminars

20 October	SEM for life sciences with correlative microscopy Dr. Ruth Chalmers Redman, Zeiss, Singapore
3 November	Understanding confocal and multiphoton microscopy Prof. Sudipta Maity, TIFR, Mumbai
2 December	A mechanism to control triglyceride secretion from liver across feeding-fasting cycles Dr. Roop Mallik, TIFR, Mumbai

## Special Lectures

18 January	Basics of Immunology (Basic & Advanced Immunological Techniques Workshop) Dr. KB Sainis, President, Mumbai Immunology Group
10 March	Interact with the Master: recent advances in flow cytometry (Cell Sorting Workshop) Dr. Joe Trotter, Principal Scientist & BD Fellow, BD Biosciences, USA
23 March	Magic of empathy (Science and Society Oration) Dr. Anand Nadkarni, Institute for Psychological Health, Thane
1 April	Challenges before today's women (International Women's Day) Adv. Jayashri Akolkar, Mumbai
12 May	Communication: the foundation of care (Nurses Day Oration) Dr. Sybil Thomas, Principal, St. Xavier's Institute of Education, Mumbai
13 December	Our footprints on the sands of time (2 <sup>nd</sup> Dr. SS Agarwal Oration - ICGCW 2016) Prof. Partha Majumder, National Institute of Biomedical Genomics, Kolkata

# Centre for Cancer Epidemiology



Affordable healthcare to all ..... at their doorsteps

Dr. Rajesh Dikshit,  
Head

## Centre for Cancer Epidemiology

Dr. Atul Budukh  
Dr. Rajini Nagrani  
Miss Sharayu Mhatre

The Centre for Cancer Epidemiology was established in the year 2009 as a part of TMC (on ACTREC campus) with the broad vision of conquering cancer by Epidemiological Research and Education. The full-fledged working within its own premises began in the year 2016 with the objectives to:

- Build a program to identify Cancer Burden, Cancer Causation and cancer prevention strategies
- Build a platform to conduct large scale cutting edge Epidemiological studies with accurate exposure movement
- Build capabilities to conduct Population genetic studies
- Develop manpower for cancer Surveillance, Epidemiology and Molecular Epidemiological studies
- Partner with universities and other organizations that have complementary capabilities.

The activities of centre comprised of Descriptive and Analytical Epidemiology, education and training.

### Descriptive Epidemiology:

- Support to Cancer Registries in India and South Asian countries
- Established first tribal population based cancer registry at Gadchiroli
- Released the first report of Chandigarh and Punjab Population Based Cancer Registry (PBCR)



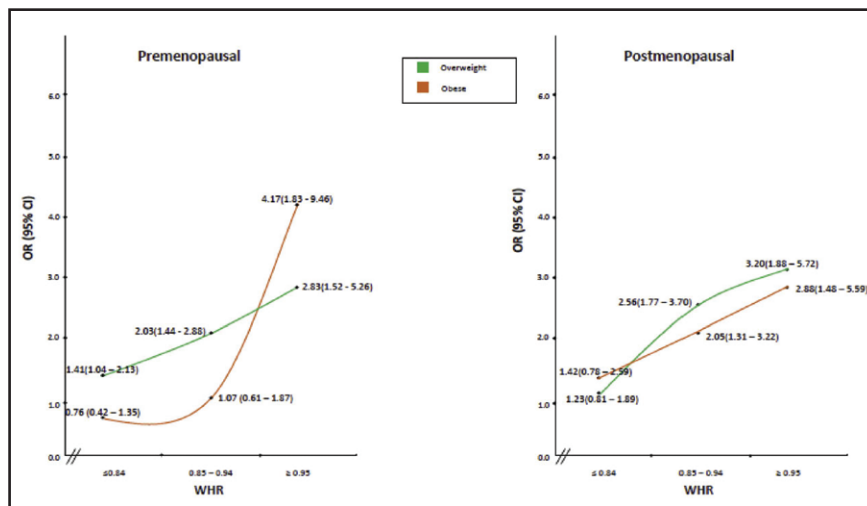
- Established collaboration with Municipal Corporation of Greater Mumbai (MCGM) and Centers for Disease Control and Prevention, USA to improve the medical certification of cause of death.

### Analytical Epidemiology:

- Completed case control study on breast cancer. Key factors (central obesity and age at first pregnancies) identified for intervention towards prevention of breast cancer

**Central Obesity was observed to increase the risk of breast cancer (Nagrani et al. European Journal of Cancer 2016 October).**

- Major risk factors for gall bladder cancer identified (High consumption of mustard oil, fresh fish, and use of tobacco) for intervention towards prevention of gall bladder cancer
- Novel genetic risk loci for development of gall bladder cancer identified

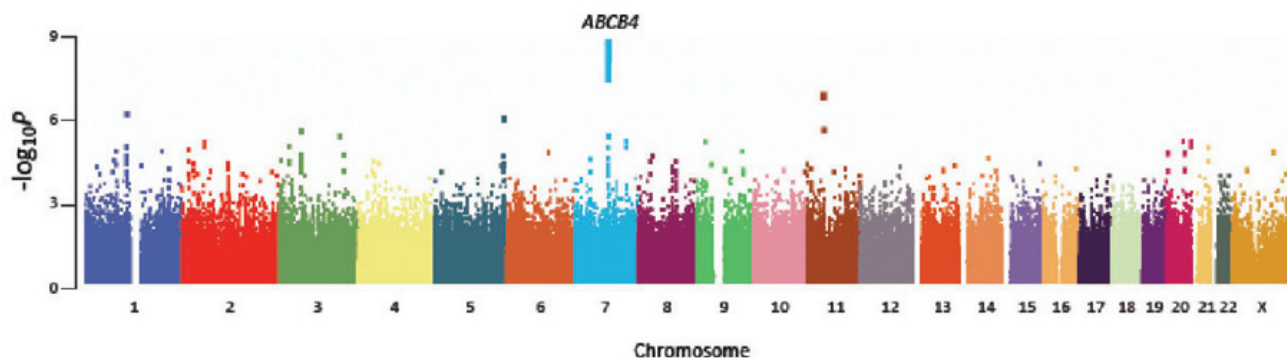


**New genetic loci identified which increases the risk of Gall Bladder Cancer (Mhatre et al. Lancet Oncology 2017 April: 18 (4) 535-544).**

- Utility of menstrual pad to detect HPV infection was confirmed

- Studies regarding identification for risk factors for lung cancer among life time non smokers and identification of risk (if any) of developing brain tumours among mobile phone users was ongoing

- A cohort was established at Barshi with baseline lifestyle information and collection of biological samples. This would form platform to conduct cutting edge epidemiological studies in future.



**Education and training:**

The education and training programme consisted of short term and long term training programme and PhD in Epidemiology. Three students were enrolled in PhD programme and one PhD thesis was completed by one student.

In collaboration with Municipal Corporation of Greater Mumbai (MCGM) and Centers for Disease Control and Prevention-USA, physicians were trained to write properly, the cause of death.

The Inter country training programme to establish cancer registry was organized from 7-11 November 201 in collaboration with WHO. A total 25

participants from all south East Asian countries participated in training programme.



**Faculty for Scientific Symposium "Frontiers in Epidemiology" organized on 6<sup>th</sup> and 7<sup>th</sup> March 2017**

**Leading cancer site Chandigarh: 2013**

ICD 10	Site	Male		ICD 10	Site	Female	
		Number	AAR			Number	AAR
C33-C34	Trachea, Bronchus & Lung	53	12.4	C50	Breast	154	37.5
C61	Prostate	32	8.8	C53	Cervix Uteri	43	10.3
C82-85,C96	Non Hodgkins Lymphoma	30	7.3	C56	Ovary	30	7.2
C15	Oesophagus	26	5.6	C23-24	Gall Bladder	25	5.8
C03-06	Mouth	20	4.3	C54	Corpus Uteri	20	5.1
	All Site	406	93.4		All Site	427	105.0

**ICD 10** = International Statistical Classification of Disease and Health related problems revision 10

**AAR** = Age Adjusted Incidence Rates

### Leading cancer site SAS Nagar: 2013

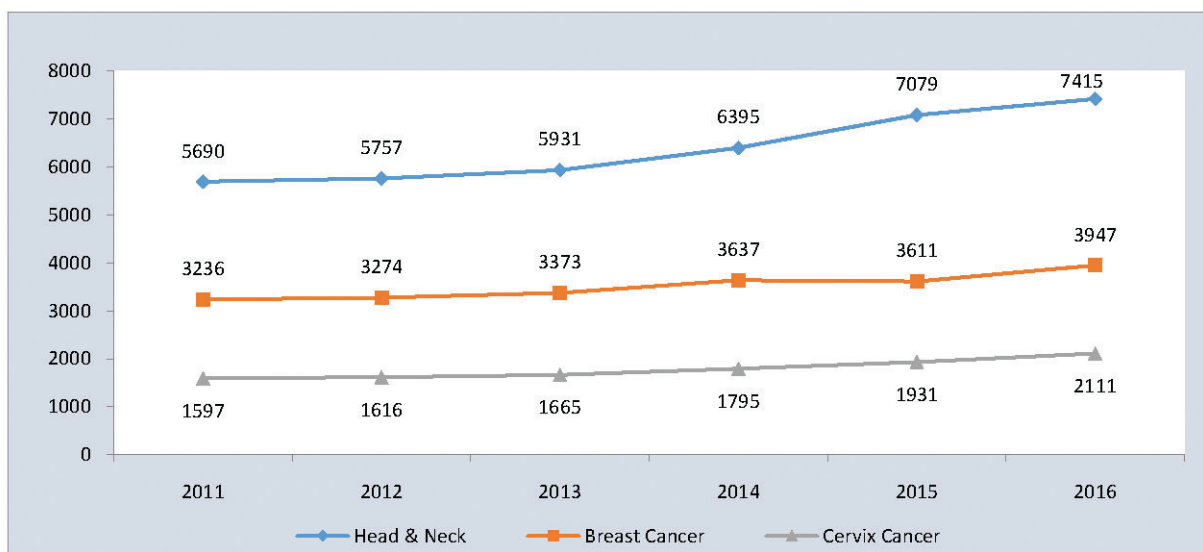
ICD 10	Site	Male		ICD 10	Site	Female	
		Number	AAR			Number	AAR
C33-C34	Trachea, Brochus & Lung	32	7.3	C50	Breast	137	33.9
C61	Prostate	29	6.3	C53	Cervix Uteri	58	13.8
C15	Oesophagus	25	5.8	C56	Ovary	32	7.4
C32	Larynx	20	4.6	C23-24	Gall Bladder	24	5.8
C01.9-C02.9	Tongue	18	3.9	C54	Corpus Uteri	19	4.8
	All Site	334	74.3		All Site	433	104.2

### Leading cancer site Sangrur: 2013

ICD 10	Site	Male		ICD 10	Site	Female	
		Number	AAR			Number	AAR
C15	Oesophagus	44	5.1	C50	Breast	96	11.8
C61	Prostate	24	2.7	C53	Cervix Uteri	77	9.7
C70-C72	Brain, Nervous System	17	2.0	C15	Oesophagus	31	3.9
C22	Liver	15	1.8	C56	Ovary	28	3.5
C33-C34	Trachea, Brochus & Lung	14	1.7	C23-C24	Gall Bladder	19	2.4
	All Site	378	43.7		All Site	420	52.6

### Leading cancer site Mansa: 2013

ICD 10	Site	Male		ICD 10	Site	Female	
		Number	AAR			Number	AAR
C15	Oesophagus	28	6.8	C53	Cervix Uteri	48	12.3
C03-C06	Mouth	10	2.4	C50	Breast	40	10.5
C91	Lymphoid Leukemia	08	2.3	C15	Oesophagus	24	6.2
C32	Larynx	08	1.9	C56	Ovary	18	4.9
C92-C94	Myeloid Leukemia	08	1.9	C23-C24	Gall Bladder	06	1.7
	All Site	187	45.3		All Site	216	55.8




Common Cancers – 2011-16

The Hospital Based Cancer Registry was one of the major activities of the Department. The Cancer Registry contained demographic and clinical data of the patients registered in the hospital and, in year 2016, data till the year 2013 was collated. The data compilation of the following years was in progress. The leading cause of cancer in males was found to be of the buccal mucosa in males and breast in females.

The department scanned old patient case files and converted them to digital formats.



Demographics of registrations in TMH (2016)

Males			Year 2013	Females		
Site	Total	%		Site	Total	%
Buccal Mucosa	1633	9.9		Female Breast	3373	27.4
Leukemia	1379	8.3		Cervix	1422	11.6
Lung	1333	8.1		Ovary	707	5.7
NHL	852	5.1		Gall Bladder	630	5.1
Anterior Tongue	775	4.7		Leukemia	585	4.8
Oesophagus	632	3.8		Lung	501	4.1
Stomach	592	3.6		Thyroid	418	3.4
Prostate	509	3.1		Oesophagus	341	2.8
Brain & Nervous System	499	3.0		Buccal Mucosa	328	2.7
Rectum	450	2.7		NHL	312	2.5
<b>Total</b>	<b>16552</b>	<b>100.0</b>		<b>Total</b>	<b>12300</b>	<b>100.0</b>

**Hospital Cancer Registry – Leading cancers**

## Service

The department provided new case files for patients for their convenience for record keeping and was also useful whenever and if, the patient got admitted in the hospital ward.

The department also provided patient information in cases of medical insurance claims, Right to Information (RTI) Act, Parliament inquiries etc.

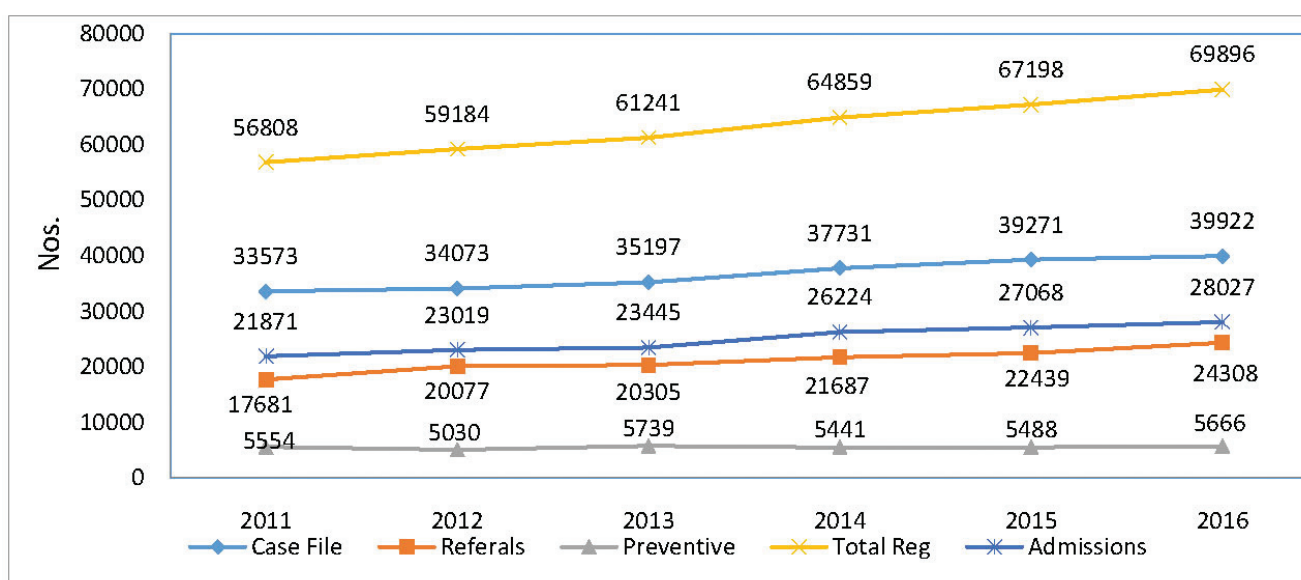
Health check-up activities continued at Kaiga and Rawatbhata under the department supervision and guidance. The first report of Kaiga Health check-up was sent to Chairman of DAE. The Kaiga Health check-up screened 12,481 individuals and the Kota Health Survey screened 15,269 individuals from a population of the 21,579 individuals.

The department had set up a new Population Based Cancer Registries

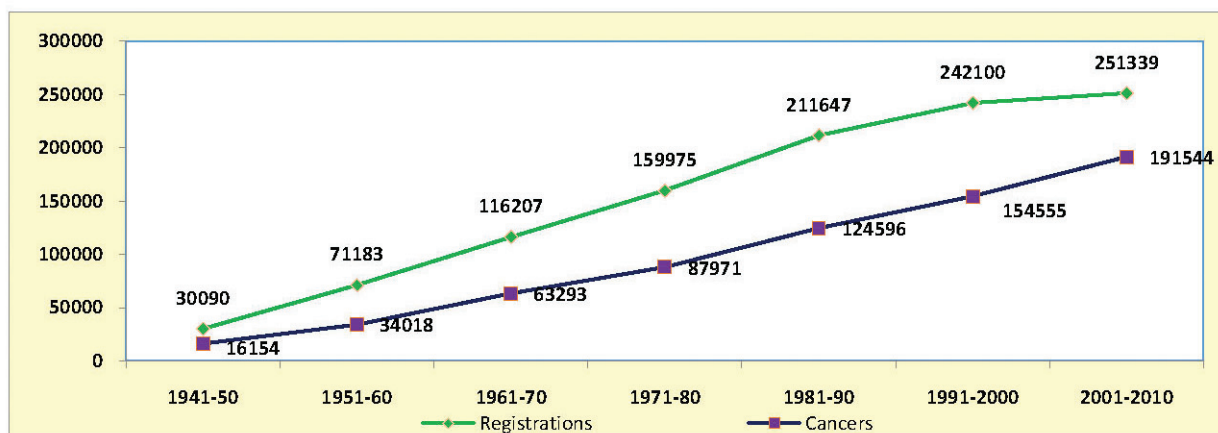
under the DAE Project in Ratnagiri, Sindhudurgh, Tarapur, Karwar, Rawatbhata and Kakrapar.

The department continued operations for PBCR at Kalpakkam. Kudankullam and Visakhapatnam and, also the collaboration with WIA Cancer Institute, Adyar, Chennai.

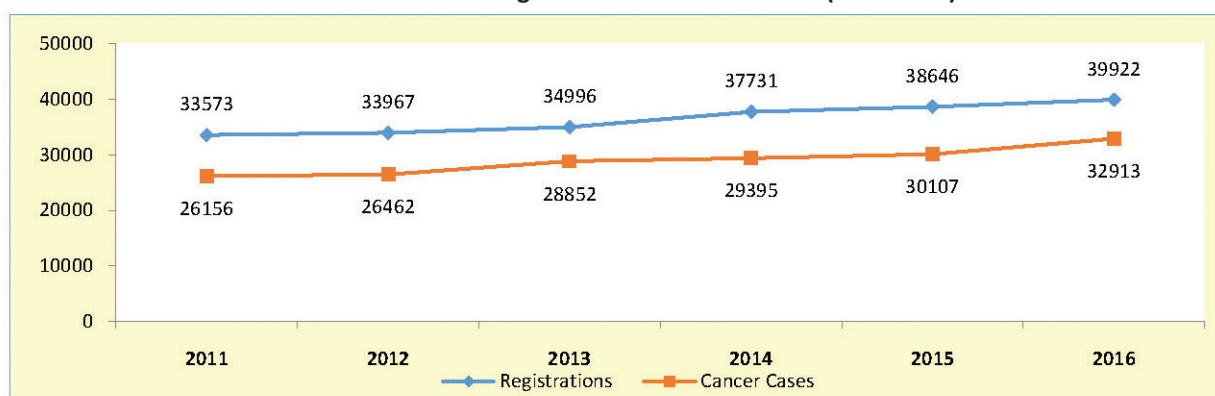
**TMH – Registrations and Admissions Trend**



**Tata Memorial Hospital - Trends of Patient Registration and Cancer Cases 1941-2010**



**Trend of Patient Registration and Cancer Cases (2011-2016)**



## Research

The department conducted the Patterns of Care & Survival Studies (POCSS) project for cancer of the breast, cancer cervix and head & neck cancers. The project had collected data for 8802 breast cancer cases, 3891 cervix cancer cases and 12036 head & neck cancer cases till date.

## Education

The department trained the nursing, infection control, Ph. D. and research students in biostatistics and epidemiology. Cancer registry personnel were also trained for setting up newer registries at Kolhapur etc.; and hospitals and in Abstraction and ICD Coding of diseases.

Three Ph.D. (Doctoral) students were registered under HBNI.

Dr. Ganesh was the member of the Expert Committee of Board for Research in Nuclear Science (BRNS), DAE for various Health Survey Projects. He was the co-principal Investigator for two BRNS projects of DAE.

Two of the staff members attended the World Cancer Congress held in Paris in 2016.

## TMH-DAE Cancer Registries

### Rawatbhata Cancer Registry:

Population 140128 Male: 72654 Female: 67474

Leading Cancer Sites- Incidence rates (AAR) per 100,000					
	Male			Female	
Site	Nos.	AAR*	Site	Nos.	AAR *
Mouth	17	8.7	Breast	15	8.0
lung	16	8.9	Cervix	14	8.0
Tongue	11	5.8	Ovary	8	4.3
All cases	119	64.5	All cases	82	43.9

### Karwar Cancer Registry:

Population 156133 Male: 78633 Female: 77500

Leading Cancer Sites- Incidence rates (AAR) per 100,000					
	Male			Female	
Site	Nos.	AAR*	Site	Nos.	AAR *
Lung	15	6.8	Breast	43	17.4
Mouth	13	5.3	Oesophagus	20	4.8
Tongue	11	4.5	Mouth	20	2.8
All Cases	111	49.0	All Cases	144	59.4

**Kakrapar Cancer Registry:****Population 464238 Male : 231459 Female : 232779**

Leading Cancer Sites- Incidence rates (AAR) per 100,000					
	Male			Female	
Site	#	AAR	Site	#	AAR
Tongue	16	6.5	Breast	17	7.3
Mouth	8	4.1	Cervix	15	6.6
Larynx	6	3.6	Tongue	5	2.2
All cases	62	31.2	All cases	66	29.5

**Sindhudurgh Cancer Registry:****Population 849651 Male: 417332 Female: 432319**

Leading Cancer Sites- Incidence rates (AAR) per 100,000					
	Male			Female	
Site	#	AAR	Site	#	AAR
Mouth	62	6.1	Breast	103	9.7
Tongue	37	3.7	Cervix	40	3.6
Rectum	24	2.3	Mouth	32	2.8
All cases	341	34.3	All cases	380	35.9

**Ratnagiri Cancer Registry:****Population 1612098 Male: 760030 Female: 852068**

Leading Cancer Sites- Incidence rates (AAR) per 100,000					
	Male			Female	
Site	#	AAR	Site	#	AAR
Mouth	70	8.2	Breast	114	11.4
Tongue	28	3.4	Cervix	49	5.1
Oesophagus	22	2.7	Mouth	42	4.4
All cases	359	42.3	All cases	453	45.3

**Kalpakkam Cancer Registry:****Population 4069603 Male: 2114763 Female :1954840**

Leading Cancer Sites- Incidence rates (AAR) per 100,000					
	Male			Female	
Site	#	AAR	Site	#	AAR
Stomach	216	11	Breast	607	31.2
Lung	173	9	Cervix	421	22
Mouth	136	6.8	Ovary	153	7.6
All cases	1883	96.8	All cases	2226	115.7

**Kudankulam Cancer Registry:****Population 3131579 Male: 1597500 Female: 1534079**

Leading Cancer Sites- Incidence rates (AAR) per 100,000					
	Male			Female	
Site	#	AAR	Site	#	AAR
Stomach	101	6	Breast	257	15.3
Lung	60	3.6	Cervix	160	9.6
Mouth	37	2.3	Stomach	56	3.3
All cases	660	40.4	All cases	825	49.1

**Tarapur Cancer Registry:****Population 557721 Male: 292153 Female: 265568**

Leading Cancer Sites- Incidence rates (AAR) per 100,000					
	Male			Female	
Site	#	AAR	Site	#	AAR
Mouth	26	5.2	Breast	50	10.6
Tongue	25	5.2	Cervix	30	7.3
Lung	17	4.3	Ovary	20	4.2
All cases	225	50.0	All cases	213	46.9

# Preventive Oncology

**Dr. Sharmila Pimple,**  
Head

Dr. Gauravi Mishra

The department of Preventive Oncology conducted informative, educative and communicative programs to create awareness of early warning signs of common cancers, the risk prevention, the life style modifications, and to improve health seeking behavior towards early detection of common cancers across all sections of the society. The screening of oral, breast and cervical cancers were undertaken through hospital and community based clinics. Training workshops for health manpower development, technology transfer & dissemination were organized for government and non-government workforce for cancer control, prevention, screening and early detection. Special events were organized to commemorate the National and World Cancer Days and, the hospital and workplace tobacco cessation programs.

## Service

In 2016, a total of 5660 new patients were registered and 6141 for follow up screening services; of these, there were 7230 women & 4571 men.

The department screened 1144 women for oral, breast and cervical cancers through its community based cancer screening programs. The Tobacco Cessation Clinic registered and counseled 1769 tobacco users. Across the Mumbai region, 6035 men and women benefited through the 28 cancer awareness programs.

## Research

There were 13 Investigator initiated research projects, investigating effective



**Awareness Program for Tobacco Control and Cessation in progress**

strategies for cervix cancer screening, HPV vaccination and, tobacco control and cessation. Two projects had been funded through the Department of Biotechnology (DBT) and Biotechnology Industry Research Assistance Council (BIRAC) respectively. A HPV vaccination study was taken up in collaboration with International Agency for Research on Cancer (IARC), France.

Department had 2 international research publications in "Oncology" and "Current Opinion in Obstetrics and Gynecology".

## Education

Two 3-days workshops in Preventive Oncology on "Cancer Control, Prevention, Screening & Early Detection" and for "Tobacco Control & Cessation", were organized for Medical and paramedical personnel. There was a 1-day Pre Conference workshop on "Women's Cancer Prevention, Screening and Early Detection" as a part of the 17<sup>th</sup> Maharashtra State Joint

Conference of IAPSM & IPHA 2016 at Tata Memorial Hospital.

A total of 8 one-day training programs were conducted for Civil Surgeons & Medical Officers from district & sub district Hospitals, Maharashtra State Health Services & NTCP, Govt. of Maharashtra.

Dr. Sharmila Pimple received Travel Grant Award for UICC World Cancer Congress, Paris, France and was also selected to attend UICC Master Course titled "Cancer Control Planning & Implementation."

Dr. Gauravi Mishra received Travel Award from the National Cancer Institute (NCI), Center for Global Health (CGH), for the abstract titled "Community Based Tobacco Cessation Programme among Women in Mumbai, India" to be presented at the International Conference on Betel Quid and Areca Nutco-sponsored by the US NCI and Ministry of Health, Malaysia during April 27-28, 2016.



# Satellite Centers



Affordable healthcare to all ..... at their doorsteps

## Homi Bhabha Cancer Hospital & Research Centre, Mullanpur Village, Dist. Mohali



The Punjab Government allocated a 50 acres plot of land and, sanctioned INR 480.00 crore for construction of a 100 - bedded Homi Bhabha Cancer Hospital & Research Centre in the Mullanpur Village of Mohali District in Punjab. The hospital would offer complete range of services to the cancer patients. The phase I of the project involved utilization of approx. 10 acres of the land.

M/s. DDF Consultants Private Limited, New Delhi was appointed as Engineering Procurement & Construction (EPC) consultant for providing Architectural Consultancy Services and Project Management Consultant (PMC) Services. The Conceptual Master Plan in principle had been approved by Greater Mohali Area Development Authority (GMADA).

After obtaining approval from the Department, the work order had been issued to EPC developer M/s. Shapoorji Pallonji & Company Private Limited. The detailed architectural drawings, layout plans etc. had been submitted to the Punjab Bureau of Investment Promotion, to obtain the Consent to Establish (CTE) approvals by EPC developer.

The work order for Boundary Wall Phase – II was already issued to the contractor by GMADA and the work was in progress.

The project deadline for completion had been fixed as 02.10.2018.

## Homi Bhabha Cancer Hospital, Sangrur



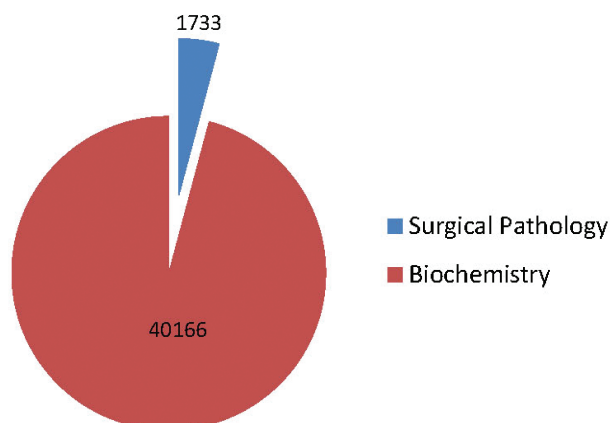
Homi Bhabha Cancer Hospital, Sangrur was commissioned at Civil District Hospital, Sangrur, Punjab in January 2015. The hospital had been recognised under the Mukh Mantri Punjab Cancer Raah Kosh Scheme (MMPCRKS) to support cancer patients from Punjab. A simple dharamshala for the patients and their relatives was constructed for their use.

The hospital was well equipped to offer medical, surgical and radiation oncologic services to cancer patients.

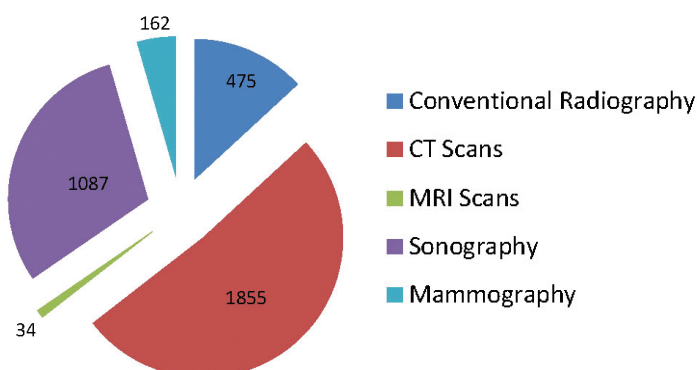
The facilities included the state-of-the-art Operating room and radiotherapy equipments like the Multislice CT scanner with CT simulator, Tele-Cobalt Unit Bhabhatron II, Linear Accelerator Elekta Versa-HD and the Integrated Brachytherapy Unit Nucleatron 18 Channel HDR.

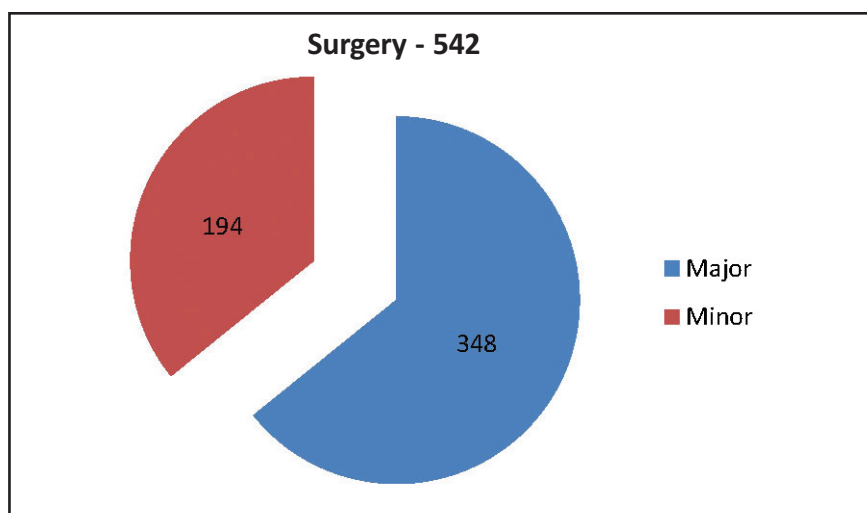
The diagnostic equipment included Digital Radiography and Digital Mammography, High-end Ultra-sonographic machines, the Biochemistry Analyser Olympus AU 400, Tumor Marker Architect Abbott 1000i SR, Haematology Analyzer-Advia

**Laboratory Investigations - 41899**



**Radiological Investigations - 3613**





2120i and Immunohistochemistry for breast cancer. Magnetic Resonance Imaging machine had been recently commissioned through a grant from the Punjab government.

A mobile Direct Digital Radiographic machine for in-patients was donated by the Tata Trust.

The Phase II for expansion of existing facility through the support of Punjab Government was initiated early in 2017.

### Service

About 4000 patients including those sent for second opinion had been registered in HBCH. There were 810 admissions for treatment.

### Education

On the educational front, B.Sc courses for Technicians in RT, Lab, Radiology, Anesthesia & OT were started with the support of State Govt and two seats for each course was allotted to HBCH, Sangrur through Baba Farid University of Health Sciences, Faridkot, Punjab.

A one-year Medical Physicist Internship was started along with a six-month laboratory training course.

Recognition was awaited from the Punjab University to start a regular 3-year course in Medical Physics.

# Homi Bhabha Cancer Hospital & Research Centre, Visakhapatnam

Dr. Digumarti Raghunadharao,  
Director



**Homi Bhabha Cancer Hospital & Research Centre**

The Homi Bhabha Cancer Hospital & Research Centre at Aganampudi, Visakhapatnam in the state of Andhra Pradesh was opened to public on 2<sup>nd</sup> June 2015 and construction within the campus was ongoing. Surgical and in-patient facilities of the nearby Visakhapatnam Post Trust (VPT) hospital were availed of till the construction work was completed. The staff strength included 12 medical, 20 nursing, 9 administrative and 17 technical personnel. Most of the diagnostic and therapeutic facilities were in place except for radiation oncology (in the process). The centre attended to 2, 165 (1, 312 females and 852 male) new patients and followed up 10, 009 cases. One hundred and sixty six (166) surgeries were performed compared to the 45 in year 2015. The biochemistry laboratory performed 3, 583 tests and tumor marker studies on 256 patients. Histopathological studies were performed on 441 and fine need aspiration cytology on 192 cases. A total of 43 bone marrow aspirates were analyzed and 200 molecular testing were performed. Radiological investigations included conventional radiography (773), mammography (191), ultrasonography (161) and imaging guided biopsies (42). The palliative care department attended to 341 new patients and followed up 1, 002 cases. Hospice services were offered to 63 cases and home care to 26. Cancer screening programs included 18 camps that evaluated 600 women.

Of the cancers detected, 357 were from the gastrointestinal tract, 283 from breast, 231 of the head & neck, 226 of the hematolymphoid system, 150 of the male genito-urinary tract, 115 of the lung and 81 from the ovaries. Bones accounted for 43 and brain for 23 cancer cases.



# Staff Honours



Affordable healthcare to all ..... at their doorsteps

## Staff Achievements

### Ambulkar R

- Secretary: Indian Society of Critical Care Medicine, Mumbai Branch: 2015-16
- Certification as NABH Assessor.

### Arora B

- Best paper award at PHOCON 2016 in Mumbai titled: Voriconazole Plasma Levels, its Determinants and Impact on Outcome of Invasive Fungal Infections in Children with Cancer: A Prospective Study.

### Badwe RA

- Lokmat Manbindu award for the year 2016.

### Bobade A

- Best Poster Award: Red Cell Hemolysis during transportation at 2<sup>nd</sup> International Conclave on Total Quality management and Recent Trends in Transfusion Medicine held at Kokilaben Dhirubhai Ambani Hospital, Mumbai.

### Bose K

- National Women Bioscientist Award (Young Category): Department of Biotechnology, Government of India

### Bobade A

- Second prize in Quiz competition at 41<sup>st</sup> ISBTI Annual Conference, TRANSCON 2016, Pune.

### Chandrani P

- First Prize: 'Discovery of actionable alterations in lung adenocarcinoma' (poster presentation) 1<sup>st</sup> Conference of Molecular Oncology Society - MOSCon 2016 - 'Decoding the genetics of common cancers in India', Pune: January 29-30, 2016
- Third Prize: 'Discovery of actionable alterations in lung adenocarcinoma'

(poster presentation) TMC Platinum Jubilee Celebrations Conference on 'New ideas in cancer – challenging dogmas'- 2016.

### Chatterjee G

- Awarded 1<sup>st</sup> prize for oral paper in Malignant Laboratory Hematology titled: A high sensitivity cost affect single tube B cell precursor acute lymphoblastic leukemia (BCPALL) minimal residual disease (MRD) assay; presented in Haematocon 2016, Jaipur
- 2nd prize for oral presentation: Utility of the new versus old immuno-phenotypic markers in the flow cytometric immunophenotyping of multiple myeloma at the Myeloma State-of-the-art 2016, PGIMER, Chandigarh.

### Chaturvedi P

- Global Coordinator of World Head Neck Cancer Day
- Kumud Ray Oration of Indian Medical Association at Kolkata, IDA Annual oration at National IDA meeting, Kolkata, SMS Hospital Oration, Jaipur
- Member, Technical Advisory committee for Global Adult tobacco Survey 2016, Ministry of Health, Member of the Government delegation, Seventh Session of the conference of parties (COP7) to FCTC WHO, New Delhi, November 2016
- General Secretary, International Federation of Head Neck Oncologic Society
- Vice Chairman of International Academy of Oral Oncology for 2017.

### Chaudhari P

- Nature Travel Award: 'Role of hemidesmosomal linker proteins in neoplastic progression of squamous cell carcinomas' (poster presentation), Gordon Conference on Intermediate Filaments, Stowe, USA: June 11-17, 2016.

### Chaudhari S

- Organizing Secretary for 2<sup>nd</sup> CME on Fusion of Imaging and Therapy with Recent advances in Technology held at Tata Memorial Hospital, Mumbai on Feb-20-21, 2016.

### Chawan K

- Technologist Award 2016: 'Optimization of donor pool, product quality, inventory management and product cost on the basis of single versus high yield plateletapheresis' (oral presentation) Conference of the Indian Society of Transfusion Medicine - Transmedcon 2016, Bhopal: November 18-20, 2016.

### Chinchalkar G

- 3<sup>rd</sup> prize in poster presentation in IAPCON 2016.
- IAHPSC scholarship to attend the EAPC conference, Dublin in 2016.

### Chiplunkar SV

- Chairperson: Scientific Advisory Committee and Member, Research & Recognition Committee, MGM Institute of Health Sciences, Navi Mumbai: 2014-18
- Chairperson: Ad-hoc Board of Studies in Applied Biology, University of Mumbai, Mumbai: 2015-18
- Secretary, Mumbai Immunology Group: July 2009-till date

- External Member on Senate: Indian Institute of Technology-Bombay, Mumbai, 2016
- Member: Internal Quality Assurance Cell, Homi Bhabha National Institute: 2016-18
- Member: International Union of Immunological Societies Education Committee 2016-18
- Member: Apex Committee on Environmental Health, The Ministry of Environment, Forest and Climate Change, Environmental Health Cell, Government of India, New Delhi: 2016-19
- Chairperson: TMC Platinum Jubilee Conference 'A conference of new ideas in cancer: challenging dogmas', NCPA, Mumbai: February 26-28, 2016
- Chairperson: Hands on Workshop on 'In vivo preclinical imaging and drug discovery', ACTREC, Navi Mumbai: September 7-9, 2016
- Organising Secretary: Molecular Immunology Forum 2016, Lonavla: February 19-21, 2016.

#### **Chopra K**

- Awarded Second Prize as Junior Investigator 'Multiple copy of isochromosome 17 and trisomy 8 in acute promyelocytic leukemia - a rare case' (oral presentation), at Thane Haematology Group : October 22, 2016.

#### **Dalal S**

- Editorial Board Member: Journal of Biosciences

#### **Damani A**

- AAHPM Scholarship to attend Annual Hospice and Palliative Care Conference at Chicago, USA.

#### **Dar AA**

- First Best Poster Award: 'Contribution of myeloid derived suppressor cells to immune suppression in oral tumor microenvironment' (poster presentation), 13<sup>th</sup> FIMSA Advanced

Immunology Course, Postgraduate Institute of Medical Education and Research, Chandigarh: March 17-19, 2016.

#### **D'cruz AK**

- Oration at the 3rd International Clinical Oncology Conference, Kathmandu, Nepal
- Outstanding Teacher Award, Indian Medical Association (IMA) – Mumbai
- Prof. S.C. Mishra Oration, King George's Medical University, Lucknow
- Ranjit Roy Chaudhury Oration at 9th Annual ISCR Conference, Mumbai
- Visiting Professor at Hamad Medical Corporation, Qatar.

#### **De A**

- Indian Patent final application and Trademark application: 'Photo-disintegrable, near-infra red responsive gold coated poly-(lactic-Co-glycolic acid) nanostructures and a process for its preparation': Final IPA no. 4082/MUM/2015, October 28, 2016.
- Academic Editor: Plos One
- Academic Editor: Scientific Reports (Nature Publishing Group)
- Editorial Board Member: Breast Cancer (Dove Press).

#### **Deodhar J**

- Editorial Board of Psycho-Oncology Journal Affiliate
- Executive Committee Member of Indian Psychiatric Society- Western Zonal Branch.

#### **Deshpande DD**

- Chairperson at 37<sup>th</sup> Conference AMPI 2016 at Krishna Medical Institute, Hyderabad
- Speaker on International Day of Medical physics organized by Ram Manohar Lohia Institute of Medical Sciences,(RMNLIMS)Lucknow
- Co-ordination team for exporting Co-60 source to Mongolia for

Bhabhatron Machine donated by Prime Minister

- As IAEA Expert to National Oncology Centre, Royal Hospital at Muscat, Oman to advise them on policies & guidelines in brachytherapy.

#### **Dhaliwal D**

- Second Prize: 'A high sensitivity cost affect single tube B cell precursor acute lymphoblastic leukemia (BCPALL) minimal residual disease (MRD) assay' (oral presentation), 20<sup>th</sup> Annual Conference of Pediatric Hematology Oncology Chapter, Indian Academy of Pediatrics 2016, Mumbai: November 4-6, 2016.

#### **Divatia JV**

- Editor-in-Chief, Indian Journal of Anaesthesia
- Nitte Oration, All India Diffcult Airway Association
- President, All-India Diffcult Airway Association.

#### **Dubey A**

- Prof. AS Mukherjee Memorial Prize for Best Paper Presentation by young scientists in oral session: 'Regulation of PRL-3 translation by plakophilin-3' (oral presentation), XL All India Cell Biology Conference, Jiwaji University, Gwalior: November 17-19, 2016

#### **Dutt S**

- Dr Virendra Balkrishna Kamat Award for best oral presentation by a mid-level scientist: 'Radiation induced multinucleated giant cells formed by homotypic cell fusion undergo NHEJ repair to survive and generate recurrent glioblastoma cells' (oral presentation), 35<sup>th</sup> Annual Convention of Indian Association for Cancer Research, New Delhi: April 8-10, 2016.

#### **Gajiwala AL**

- Reviewer, Cell and Tissue Banking, an International Journal for Banking, Engineering & Transplantation of Cells and Tissues, ISSN 1389-9333 CODEN CTBAFU.

**Ghogale S**

- Consolation Prize: 'SLAM family member "CD229": a novel gating marker for plasma cells in flow cytometric immunophenotyping (FCI) of multiple myeloma (MM)' (poster presentation), Myeloma - State of the Art 2016, PGIMER, Chandigarh: September 30 - October 1, 2016.

**Ghosal A**

- Selected to the MSc. Clinical Research program of King's College London, UK.

**Ghosh-Laskar S**

- Dean, Students affairs for HBNI, Health Science TMH in December 2016.

**Gota V**

- Recognition as Assistant Professor and Faculty/ Guide for Ph.D. in Life Sciences: Homi Bhabha National Institute: 2016

**Gujral S**

- Editorial Board Member: Clinical Cytometry, Part B
- Editorial Board Member: Indian Journal of Cancer
- Editorial Board Member: Indian Journal of Pathology and Microbiology.
- Editorial Board Member: National Journal of Basic Medical Sciences.
- Member of Technical committee of National Accreditation board for Testing and Calibration laboratories (NABL) in Medical testing.

**Gulia A**

- Secretary, Indian Musculoskeletal Oncology Society.

**Gupta Sanjay**

- Editorial Board Member: Journal of Clinical Epigenetics.
- Associate Editor: Journal of Integrated-Omics: a methodological journal.
- Associate Editor: Journal of Radiation and Cancer Research.

**Hudlikar R**

- Smt. Mangala Bamne Award for Best Oral Presentation: 'Modulation of tobacco carcinogen induced early molecular markers by various doses of polymeric black tea polyphenols (PBPs) in lung and liver of A/J mice' (oral presentation), 35<sup>th</sup> Annual Convention of the Indian Association for Cancer Research, New Delhi: April 8-10, 2016.

**Ingle A**

- President: Asian Federation of Laboratory Animal Science

**Iyer Prajish**

- Poster Prize (US\$100 and 1-yr subscription of Nature Reviews Cancer): 'Deciphering the diversity of somatic alteration and Salmonella infection in gall bladder cancer by whole exome sequencing' (poster presentation), 2016 NextGen Genomics, Biology, Bioinformatics and Technologies (NGBT) Conference, Cochin: October 3-5, 2016.

**Iyer Prasanna**

- Second Prize for Oral Presentation: Does PtdIns4P effector – Vps74/ GOLPH3 an oncogene affect Golgi size? 12<sup>th</sup> National Research Scholars Meet 2016, ACTREC, Navi Mumbai: December 15-16, 2016.

**Jalali R**

- President of Indian Society of Neuro Oncology for 2016-17
- Webmaster for the Asian Society for Neuro-oncology.

**Jamema SV**

- Recipient of American Brachytherapy Society BEST fellowship award 2016 sponsored by Best Medicals.
- As IAEA expert to initiate interstitial 3D IGBT programme for gynaecological malignancies, University Kebangsaan Malaysia
- Recipient of American Brachytherapy Society BEST

fellowship award 2016 sponsored by Best Medicals.

**Joshi SS**

- 5000 Euros was awarded from SANOFI Espoir foundation under the project: My Child Matters. The amount was utilized for conducting train the trainer workshop
- President, Oncology Nurses Association.

**Jayita D**

- Member Educational committee of International Psycho-Oncology Society.

**Kane SV**

- Executive committee members of Indian Academy of Cytologists (IAC)
- Member of Board of Studies of HBNI University.

**Karnik N**

- Best poster presentation award: Cytomorphological spectrum for Eyelid Tumours on Fine Needle Aspiration in Tertiary Cancer Centre; at CYTOCON 2016.

**Khan N**

- First Prize for Oral Presentation: 'Founder and recurrent mutations in MMR genes in the Indian Lynch syndrome families' (oral presentation), Indian Cancer Genetics Conference 2016, ACTREC, Navi Mumbai: December 12-14, 2016.

**Khare N**

- First Prize (US \$125 + 1 yr online subscription of Nature Reviews Cancer): 'Isolation of circulating chromatin fragments from serum of cancer patients and healthy volunteers' (Poster presentation) TMC Platinum Jubilee Celebrations' Conference of 'New ideas in cancer – challenging dogmas', Tata Theatre, NCPA, Mumbai: February 26-28, 2016.

**Khattry N**

- JG Parekh oration - Mumbai Hematology group.

**Khirwal K**

- Second Prize for Best Oral Paper: 'Multicolor flow cytometry – an objective, rapid and highly sensitive technique for detection of bone marrow involvement by round cell tumors' (oral presentation), Annual Pediatric Solid Tumor Meeting, TMH: April 22-24, 2016.

**Kode J**

- Recognition as Assistant Professor and Faculty/ Guide for Ph.D. in Life Sciences: Homi Bhabha National Institute: May 2016.

**Kori RK**

- Second Prize for Best Poster Award: 'Expression pattern of CD25 in B cell acute lymphoblastic leukemia (B-ACL) and its value in the minimal residual disease (MRD) monitoring: a study of 206 cases' (poster presentation), 9<sup>th</sup> annual TCS event and flow cytometry workshop on 'Flow application in basic applied and clinical biology', Guwahati: November 3-5, 2016.

**Kulkarni AP**

- President, Association of SAARC Critical Care Societies
- President, Indian Society of Critical Care Medicine.

**Kulkarni AP**

- General Secretary, Asia Pacific Assoc. of Critical Care Medicine.

**Kulkarni SS**

- General Secretary, Indian Society of Vascular and Interventional Radiology (ISVIR)
- General Secretary, Indian Society of Interventional Onco-radiology (ISVIR).

**Kumar P**

- Dayawati Rastogi Best Oral Presentation Award: 'Raman spectroscopy of experimental oral carcinogenesis: investigating

precancer changes due to confounding factors in controls' (oral presentation), 6<sup>th</sup> International Conference on Perspectives in Vibrational Spectroscopy - ICOPVS 2016, Lucknow: November 5-8, 2016.

**Mahajan A**

- Gold Medal - best poster presentation at IFHNOS- FHNO, New Delhi from 12 – 15 Oct, 2016.

**Maheshwari A**

- Hon. Secretary - The Association of Gynaecologic Oncologists of India.

**Mishra G**

- Received Travel Award from the National Cancer Institute (NCI), Center for Global Health (CGH), for the abstract titled: Community Based Tobacco Cessation Programme among Women in Mumbai, India; presented at the International Conference on Betel Quid and Areca Nut co-sponsored by the US NCI and Ministry of Health, Malaysia.

**Moiyadi A**

- Section Editor (Tumor): World Neurosurgery

**Muckaden MA**

- President of Indian Association of Palliative care.

**Myatra S**

- 3rd prize for oral paper presentation: Safety and efficacy of overnight intubation compared to tracheostomy for postoperative airway management in head and neck cancerpatients undergoing surgery; at the European Airway Congress in Valencia, Spain. 1-3 December 2016
- Elected Secretary Accreditation of Indian College of Critical Care Medicine of the Indian Society of Critical Care Medicine (ISCCM)
- General Secretary of All India Difficult Airway Association (AIDAA) – Second Term

- International Keynote Address: Perioperative Airway Challenges in Head and Neck Cancer; on 3rd February 2016 at the ENT Anesthesia Meeting conducted by the Association of Anaesthetists of Great Britain and Ireland (AAGBI) in London,UK.

**N Arunkumar**

- First Prize in Quiz Competition: Inaugural Conference of the Blood Centre Technologists' Association, Maharashtra - BCTA 2016, Tata Memorial Hospital, Mumbai: January 11, 2016.

**Nagrani R**

- First Prize (US\$125 + 1-yr Online Subscription of Nature Reviews Cancer): 'Central obesity and not reproductive or genetic susceptibility is the most important factor for reducing breast cancer burden in India' (poster presentation), TMC Platinum Jubilee Celebrations' Conference of 'New ideas in cancer – challenging dogmas', Tata Theatre, NCPA, Mumbai: February 26-28, 2016.

**Narula G**

- Launched the Pediatric Hematology Oncology Journal, the official journal of the PHO Chapter of the Indian Academy of Pediatrics as Founding Editor in Chief. 1<sup>st</sup> issue in March 2016.

**Navkudkar A**

- First prize in Quiz contest at 41<sup>st</sup> ISBTI Annual Conference, TRANSCON 2016
- Second prize in Oral papers: Granulocyte Transfusion in Allogenic Stem Cell Transplant Patients with AML; at 41<sup>st</sup> ISBTI Annual Conference, TRANSCON 2016, Pune.

**Pai P**

- Secretary, Foundation for Head and Neck Oncology and Secretary, Indian Society of Thyroid Surgeons.

### **Palliative Medicine**

- TMH Palliative Medicine residents' team won the national level quiz program held in IAPCON in February 2016 at Pune.

### **Pansare K**

- Second Prize for Oral Presentation: 'Elucidating genetic pathways altered in OSCC-GB through NGS analysis of cell lines established from Indian tobacco chewing patients' (oral presentation), Indian Cancer Genetics Conference 2016, ACTREC, Navi Mumbai: December 12-14, 2016.

### **Parab P**

- ARTTI Young Technologist Award: 'Intrafraction motion assessment of prostate on tomotherapy' (oral presentation), 20<sup>th</sup> National Conference of the Association of Radiation Therapy Technologists of India, Sri Venkateswara Institute of Medical Sciences, Tirupati: November 5-6, 2016.

### **Paramanandam VS**

- Awarded scholarship for his Ph.D from the university of Sydney.

### **Parmar V**

- Award for Excellence in Field of Oncology; awarded by Cancer Aid and Research Foundation.

### **Pathutara S**

- Keynote Speaker at the Workshop conducted by Indira Gandhi Medical College, Nagpur.

### **Patil R**

- Travel Award: 'T $\gamma$  $\delta$ 17 is a proangiogenic subtype of  $\gamma$  $\delta$  T cells and associates with poor survival of gall bladder cancer patients' (oral presentation), 13<sup>th</sup> FIMSA Advanced Immunology Course, Postgraduate Institute of Medical Education and Research, Chandigarh: March 17-19, 2016.

### **Patkar NV**

- Editorial Board Member : Pediatric Hematooncology Journal.

### **Pimple S**

- Presented: Emerging Researcher Award; at the Asia Pacific Organization for Cancer Prevention (APOCP) 8th General Assembly meeting held in Brisbane
- Received Travel Grant Award for UICC World Cancer Congress, Paris, France 2016 and was also selected to attend UICC Master Course titled Cancer Control Planning & Implementation.

### **Poladia P**

- Certificate of Appreciation from the Director, ACTREC for his contribution to patient care services in the blood sample collection area.

### **Prabhudesai N**

- Jwala Devi National Award for the best innovative technical paper: Utility of Novel Cell Transfer Technique in Cytology smears; at CYTOCON 2016 held at Nagpur.

### **Puri A**

- President Asia Pacific Musculoskeletal Tumor Society
- Member of the Peer Review Committee - Canadian Institutes of Health Research
- Felicitated for his contribution to the field of Orthopaedic Oncology at WIROC 2016
- Appointed as Professor of Materials Science and Engineering (courtesy faculty) - College of Engineering, University of North Texas
- President Indian Musculoskeletal Oncology Society.

### **Rajadhyaksha SB**

- Editor, Global Journal of Transfusion Medicine.

### **Ramadwar M**

- Best free oral paper presentation award: Rectal & Colonic brushings:

How do they help?; at CYTOCON 2016.

### **Rathod M**

- Third Prize for Poster Presentation: 'Prying the intracellular path controlling iodine pump protein localization and function in breast cancer cells' (poster presentation), 12<sup>th</sup> National Research Scholars Meet, ACTREC, Navi Mumbai: December 15-16, 2016.

### **Ray P**

- Treasurer: Indian Society for Cell Biology, 2015-17

### **Rekhi B**

- Editorial Board member of EC Orthopedics 2016
- Executive committee members of Indian Academy of Cytologists (IAC).

### **Salins S**

- Editor of Indian Journal of Palliative Care, Visiting Professor of Northern Adelaide Palliative Services, Australia.
- Visiting Professor at Northern Adelaide Palliative services, Australia

### **Sarin R**

- Chairperson, ICMR Stem Cell review committee.

### **Sengar M**

- BGRC Oration - Mumbai Hematology group.

### **Sharma J**

- Dr. RD Kulkarni Award for Third Prize (category: clinical trials/studies): 'Pharmacokinetic modeling and simulation of three hour extended infusion of Meropenem in severe sepsis: implications for targeting susceptible and intermediate strains of gram negative bacteria' (poster presentation), 9<sup>th</sup> International Annual Conference on 'Clinical pharmacology in maternal and child care', Mumbai: April 29-30, 2016.

**Sharma N**

- First prize in Quiz contest at 39<sup>th</sup> Mumbai Hematology Group, Mumbai
- Harold Gunson Fellowship for 34<sup>th</sup> ISBT International Conference, Dubai, September 2016.

**Shet T**

- Second prize for MDT discussion on Locally advanced breast cancer in Oncosurg workshop.

**Singh RK**

- Second Prize for Best Poster: 'Impact of JGF1R/Akt signaling on cancer stem cell heterogeneity and tumorigenicity' (poster presentation) TMC Platinum Jubilee Celebrations' Conference of 'New ideas in cancer – challenging dogmas', Tata Theatre, NCPA, Mumbai: February 26-28, 2016.

**Shrikhande SV**

- Dr. AK Sharma oratio: Surgery for Pancreatic Cancer: State of the Art; at SASICME 2016, Kolkata

- Prof. SM Chandramohan Oration: Pancreatic Cancer Resection – Improving Outcomes; at Madras ASI Pancreatic on 2016, Chennai
- Vice-Chair, Scientific Committee, IHPBA 2016-2018.

**Shrivastava SK**

- Gave the Academic Excellence Oration speech at Dr. Borooah Cancer Institute in Aug. 2016.

**Singh M**

- 2016 Asia Councillor for the Asia Pacific Histocompatibility and Immuno-genetics Association (APHIA).

**Singhai P**

- IAHPG scholarship to attend the EAPC conference, Dublin in 2016.

**Subramanian PG**

- Editor, Pediatric Hematology Oncology Journal (Elsevier BV)
- Editorial board of Pediatric Hemato-oncology Journal
- Section Editor for Hematopathology
- Vice President (Clinical) of the Cytometry Society of India.

**Talwadekar P**

- Selected to attend Annual Hospice and Palliative Care Conference at Chicago, IL.

**Thakur MH**

- National Project Coordinator for IAEA project: RAS-6.076 (Improving Cancer Management Through Strengthening the Computed Tomography Cancer Staging Process).

**Togar T**

- Second Prize: 'Genomic characterization of somatic alterations in cervical adenocarcinoma' (poster presentation) 1<sup>st</sup> Conference of Molecular Oncology Society - MOSCon 2016 - 'Decoding the genetics of common cancers in India', Pune: January 29-30, 2016.

**Upreti RR**

- As IAEA Expert and faculty in 1st IAEA National Training Course on Head and Neck IMRT at Pusat Perubatan university Kebangsaan, Kuala Lumpur, Malaysia.

## Books and Chapters

### Book chapters

- 1 Dave UP, Shetty DL. Array-based comparative genomic hybridization: Future in prenatal diagnosis. **In:** Sahetya R, Malhotra S, Purandary H ed. Principles and Practice of Fetal Medicine. New Delhi : Jaypee Brothers, 2016. Pp. 341-349. (ISBN:9789385999697)
- 2 Dimri S, Basu S, De A. Use of BRET to Study Protein-Protein Interactions In Vitro and In Vivo. **In:** McEwan IJ (Ed). The Nuclear Receptor Superfamily: Methods and Protocols. (Methods in Molecular Biology. Vol. 1443). New York: Springer, 2016. Pp.57-78. (ISBN 9781493937226)
- 3 Divatia JV, Kothekar A. Liberation from Mechanical Ventilation. **In:** Mehta Y, Sharma J, Gupta MK, ed. Textbook of Critical Care Including Trauma and Emergency Care. New Delhi: Jaypee Brothers, 2016. Pp.195-201. (ISBN: 9789351529682).
- 4 Divatia JV, Parekh A. Ventilator-associated Pneumonia. **In:** Sehgal R, Trikha A, ed. Yearbook of Anesthesiology-5. New Delhi: Jaypee Brothers, 2016. Pp.1-14. (ISBN: 9789352501380).
- 5 Gupta S, Mani VA, Talukdar A et al. Exigencies of Biomarker Research in the Developing World: A Focus on the Dearth of Biobanking Resources. **In:** Srivastava S ed. Biomarker Discovery in the Developing World: Dissecting the Pipeline for Meeting the Challenges. New Delhi: Springer India, 2016. Pp. 1-7. (ISBN: 9788132228370)
- 6 Gupta S, Myatra SN. Challenges in Extubating a Patient with a Difficult Airway Fluid **In:** Anaesthesia Update Book 2016. New Delhi: Jaypee Brothers Medical Publishers, 2016. Pp. 135-138. (ISBN: 9789386056672).
- 7 Gupta S, Ray S, Talukdar A et al. Geographic Pervasiveness of Cancer: Prospects of Novel Biomarker and Therapeutic Research in Developing Countries using OMICS approaches. Srivastava S ed. **In:** Biomarker Discovery in the Developing World: Dissecting the Pipeline for Meeting the Challenges. New Delhi: Springer India, 2016. Pp 9-17. (ISBN 9788132228370)
- 8 Kothekar A, Divatia JV. Fiberoptic Intubation. **In:** Gurjar M, ed. Manual of ICU Procedures. New Delhi: Jaypee Brothers, 2016. Pp. 49-61. (ISBN:9789351524229).
- 9 Kothekar A, Janarthanan S, Divatia JV. Infection in Immunocompromised Hosts. **In:** Mehta Y, Sharma J, Gupta MK ed. Textbook of Critical Care Including Trauma and Emergency Care. New Delhi: Jaypee Brothers, 2016. Pp. 819-825. (ISBN:9789351529682).
- 10 Moiyadi A V, Unsgård G. Navigable ultrasound, 3D ultrasound and fusion imaging in neurosurgery **In:** Francesco P, Solbiati L, Martegani A, DiMeco P ed. Intraoperative Ultrasound (IOUS) in Neurosurgery. Switzerland: Springer International Publishing. 2016. Pp.135-145. (ISBN:9783319252681).
- 11 Myatra SN, Desai M. Airway Management. **In:** Mehta Y, Sharma J, Gupta MK, ed. Textbook of Critical Care Including Trauma and Emergency Care. New Delhi: Jaypee Brothers. 2016. Pp. 26-41. (ISBN:9789351529682).
- 12 Myatra SN, Kothekar A. Oncological Emergencies **In:** Rungta N, Pande R, Munjal M et al. ed Critical Care. New Delhi: Jaypee Brothers Medical Publishers, 2016. Pp. 498 -507. (ISBN: 9789351522133).
- 13 Shetty P, Moiyadi A. Clinical ultrasound: Historical aspects. **In:** Prada F, Solbiati L, Martegani A et al. ed Intraoperative Ultrasound (IOUS) in eurosurgery. Switzerland: Springer International Publishing, 2016. Pp.3-8. (ISBN: 9783319252681)

### Books

- 1 Kane SV, Pathutharaj S. Comprehensive Manual of Cytotechniques. 4th ed. Mumbai: Dept. of Cytopathology, Tata Memorial Hospital. 2016 (ISBN: 9789380251196).
- 2 Jiwnani S, D'cruz AK, Badwe R. Atlas of Operative Surgical Oncology. New Delhi: JAYPEE The Health Sciences Publisher, 2016. (ISBN: 9789386261984).

## Staff Publications

### International

- 1 Aggarwal R, Ranganathan P (2016) - Common pitfalls in statistical analysis: The use of correlation techniques. *Perspectives in Clinical Research*. 7(4):187-190. PMID:27843795.
- 2 Agha RA, Fowler AJ, Saeta A, Barai I, Rajmohan S, Orgill DP, SCARE Group (2016) - Erratum to "The SCARE guidelines: Consensus-based surgical case report guidelines" [Int. J. Surg. 34 (2016) 180-186]. *International Journal of Surgery*. 36(Pt A): 396. PMID:27851898.
- 3 Ahn M-Ju, D'cruz A, Vermorken JB, Chen JP, Chitapanarux I, Dang HQ, Guminski A, Kannarunimit DA, Lin TY, Ng WT, Park KU, Chan AT (2016) - Clinical recommendations for defining platinum unsuitable head and neck cancer patient populations on chemoradiotherapy: A literature review. *Oral Oncology*. 53:42644. PMID:26712252.
- 4 Alvaro L, Mistry M, Arnaldo A, Ryall S, Guerreiro-Stucklin A, Krishnatry R, Ling C, Honnorat M, Zhukova N, Zapotocky M, McKeown T, Ramaswamy V, Bartels U, Huang A, Jabado N, Cruz O, de Torres C, Cherry H, Packer R, Tatesian R, Ellison D, Harreld J, Dalton J, Mulcahy-Levy J, Foreman N, Karajannis M, Mueller S, Nicolaides T, Eisenstat D, Carret A, Kieran M, Ligon K, Jouvett A, Perbert R, Vasiljevic A, Frappaz D, Odile Joly M, Chambeless L, Thompson R, Rao N, Chan A, HK NG, Garre ML, Nozza P, Massimino M, Leary S, Crane C, Bouffett E, Hawkins C, Tabor U (2016) - Inferior outcome and poor response to conventional therapies in pediatric low-grade gliomas harboring the BRAF V600E mutation. *Neuro-Oncology*. 18 (suppl 3):iii89.
- 5 Amin N, Tarwade P, Shetmahajan M, Pramesh CS, Jiwnani S, Mahajan A, Purandare N (2016) - A randomized trial to assess the utility of preintubation adult fiberoptic bronchoscope assessment in patients for thoracic surgery requiring one - lung ventilation. *Annals of Cardiac Anaesthesia*. 19(2): 251. PMID:27052065.
- 6 Amin P, Fox RA, Divatia JV, Pelosi P, Altintas D, Eryüksel E, Mehta Y, Suh GY, Blanch L, Weiler N, Zimmerman J, Vincent JL. The Intensive care unit specialist: Report from the Task Force of World Federation of Societies of Intensive and Critical Care Medicine. *Journal of Critical Care*. 35:223-228. PMID:27387663.
- 7 Andre N, Banavali S, Pasquier E (2016) - Paediatrics: Metronomics - fulfilling unmet needs beyond level A evidence. *Nature Reviews-Clinical Oncology*. 13(8):469-470. PMID:27349198.
- 8 Arjun C, Mukherjee A, Bhatt J, Chaudhari P, Repaka KM, Venkatesh M, Samuel G (2016) - Studies on batch formulation of a kit for the preparation of the 99mTc-Ubiquicidin (29-41): An infection imaging agent. *Applied Radiation and Isotopes*. 107: 8-12. PMID:26405838
- 9 Ashish G, Shashikant J, Ajay P, Subhash D (2016) - Melorheostosis of the Foot: A Case Report of a rare entity with a review of multimodality imaging emphasizing the importance of conventional radiography in diagnosis. *Journal of Orthopaedic Case Reports*. 6(1):79-81. PMID:27299136.
- 10 Awada A, Colomer R, Inoue K, Bondarenko I, Badwe RA, Demetriou G, Lee SC, Mehta AO, Kim SB, Bachelot T, Goswami C, Deo S, Bose R, Wong A Xu F Yao B Bryce R Carey LA (2016) - Neratinib Plus Paclitaxel vs Trastuzumab Plus Paclitaxel in Previously Untreated Metastatic ERBB2-Positive Breast Cancer: The NEfERT-T Randomized Clinical Trial. *JAMA Oncology*. 2(12):1557-1564. PMID:27078022.
- 11 Bakiratharajan D, Rekhi B (2016) - Ossifying Fibromyxoid Tumor: An Update. *Archives of Pathology and Laboratory Medicine*. 140(4):371-375. PMID:27028395.
- 12 Bakshi SG, Mapari A, Shylasree TS (2016) - Rectus Sheath block for postoperative analgesia in gynecological Oncology Surgery (RESONS): A randomized-controlled trial. *Canadian Journal of Anaesthesia*. 63(12):1335-1344. PMID:27638294.
- 13 Balla MMS, Desai S, Purwar P, Kumar A, Bhandarkar P, Shejul YK, Pramesh CS, Laskar S, Pandey BN (2016) - Differential diagnosis of lung cancer, its metastasis and chronic obstructive pulmonary disease based on serum Vegf, Il-8 and MMP-9. *Scientific Reports*. 6: 36065. PMID:27811960.
- 14 Ballinger ML, Goode DL, Ray CI, James PA, Mitchell G, Niedermayr E, Puri A, Schiffman JD, Dite GS, Cipponi A, Maki RG, Brohl AS, Myklebost O, Stratford EW, Lorenz S, Ahn SM, Ahn JH, Kim JE, Shanley S, Beshay V, Randall RL, Judson I, Seddon B, Campbell IG, Young MA, Sarin R, Blay JY, O'Donoghue SI, Thomas DM. *International*

- Sarcoma Kindred Study (2016) - Monogenic and polygenic determinants of sarcoma risk: An international genetic study. *The Lancet. Oncology.* 17(9):1261-71. PMID:27498913.
- 15 Basu S, Joshi A (2016) - 68Ga DOTATATE PET/CT in Differentiated Thyroid Carcinoma With Fibular Metastasis and Mixed Response to Sorafenib. *Clinical Nuclear Medicine.* 41(10):772-773. PMID:27500511.
  - 16 Basu S, Mahajan A, Arya S (2016) - Multimodality Molecular Imaging (FDG-PET/CT, US Elastography, and DWI-MRI) as Complimentary Adjunct for Enhancing Diagnostic Confidence in Reported Intermediate Risk Category Thyroid Nodules on Bethesda Thyroid Cytopathology Reporting System. *World Journal of Nuclear Medicine.* 15 (2):130-133. PMID:27134564.
  - 17 Basu S, Ostwal V (2016) - Observation on enhanced avidity on somatostatin receptor targeted 68Ga-DOTATATE PET-CT following therapy with everolimus and capecitabine-temozolamide: Is redifferentiation akin phenomenon a reality in neuroendocrine tumors? *Nuclear Medicine Communications.* 37(6):669-671. PMID:27105440.
  - 18 Basu S, Ostwal V (2016) - The case for combined chemotherapy-peptide receptor radionuclide therapy (chemo-PRRT) strategy in metastatic neuroendocrine tumor: Predicting and looking at the possible case scenarios. *European Journal of Nuclear Medicine and Molecular Imaging.* 43(13):2453-2455. PMID:27542673.
  - 19 Basu S, Ranade R, Ostwal V, Shrikhande SV (2016) - PET-Based Molecular Imaging in Designing Personalized Management Strategy in Gastroenteropancreatic Neuroendocrine Tumors. *PET Clinics.* 11(3):233-241.
  - 20 Batra S, Suradkar K, Talole S, Desouza A, Goel M, Shrikhande SV (2016) -Major Gastrointestinal Cancer Resections in the Elderly in India: Poised for Future Challenges. *Digestive Surgery.* 33(2):146-156. PMID:26820472.
  - 21 Baumann BC, Bosch WR, Bahl A, Birtle AJ, Breau RH, Challapalli A, Chang AJ, Choudhury A, Daneshmand S, El-Gayed A, Feldman A, Finkelstein SE, Guzzo TJ, Hilman S, Jani A, Malkowicz SB, Mantz CA, Master V, Mitra AV, Murthy V, Porten SP, Richaud PM, Sargos P, Efstathiou JA, Eapen LJ, Christodouleas JP (2016) - Development and Validation of Consensus Contouring Guidelines for Adjuvant Radiation Therapy for Bladder Cancer After Radical Cystectomy. *International Journal of Radiation Oncology, Biology, Physics.* 96(1):78-86. PMID:27511849.
  - 22 Berger T, Assenholt M, Seppenwoolde Y, Mahantshetty UM, Jürgenliemk-Schulz IM, Hoskin P, Segedin B, Haie MC, Georg D, Kirisits C, Potter R, Lindegaard JC, Tanderup K (2016) - Importance of Technique, Dose Prescription, and Contouring in Cervix External Beam Radiation Therapy: Current and Future Practice in a Large Multicenter Study (EMBRACE). *International Journal of Radiation Oncology, Biology, Physics.* 96 (2S): E292. PMID:27674292.
  - 23 Besselink MG, van Rijssen LB, Bassi C, Dervenis C, Montorsi M, Adham M, Asbun HJ, Bockhorn M, Strobel O, Batchler MW, Busch OR, Charnley RM, Conlon KC, Fernandez-Cruz L, Fingerhut A, Friess H, Izbicki JR, Lillemoe KD, Neoptolemos JP, Sarr MG, Shrikhande SV, Sitarz R, Vollmer CM, Yeo CJ, Hartwig W, Wolfgang CL, Gouma DJ. International Study Group on Pancreatic Surgery (2016) - Definition and classification of chyle leak after pancreatic operation: A consensus statement by the International Study Group on Pancreatic Surgery. *Surgery.* 161(2):365-372. PMID:27692778.
  - 24 Bhagat M, Qureshi S, Kembhavi S, Vora T, Ramadwar M, Chinnaswamy G, Laskar S (2016) - Outcomes of Surgery for Renal Tumours with Intravascular Extension. *Pediatric Blood & Cancer.* 63:S44.
  - 25 Bhanushali PB, Badgujar SB, Tripathi MM, Gupta S, Murthy V, Krishnasastri MV, Puri CP (2016) - Development of glycan specific lectin based immunoassay for detection of prostate specific antigen. *International Journal of Biological Macromolecules.* 86:468-480. PMID:26840176.
  - 26 Bhargava A, Khare NK, Bunkar N, Lenka RK, Mishra PK (2016) - Role of mitochondrial oxidative stress on lymphocyte homeostasis in patients diagnosed with extrapulmonary tuberculosis. *Cell Biology International.* 40(2):166-76. PMID:26431927
  - 27 Bhattacharya S, Reddy D, Ingle A, Khade B, Gupta S (2016) - Histone H2A mono-ubiquitination and cellular transformation are inversely related in N-nitrosodiethylamine-induced hepatocellular carcinoma. *Experimental Biology and Medicine.* 241(16):1739-44. PMID:27190257
  - 28 Bhattacharya S, Reddy D, Reddy R, Sharda A, Bose K, Gupta S (2016) - Incorporation of a tag helps to overcome expression variability in a recombinant host. *Biotechnology Reports.* 11:62-69. PMID:28352541
  - 29 Bhosale PG, Pandey M, Desai RS, Patil A, Kane S, Prabhash K, Mahimkar MB. Low prevalence of transcriptionally active human papilloma virus in Indian patients with HNSCC and leukoplakia. *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology.* 122(5):609-618.e7.

- 30 Bobdey S, Balasubramaniam G, Mishra P (2016) - Nomogram prediction for survival of patients with oral cavity squamous cell carcinoma. *Head and Neck*. 38(12):1826-1831. PMID: 27227458.
- 31 Bunkar N, Bhargava A, Khare NK, Mishra PK (2016) - Mitochondrial anomalies: Driver to age associated degenerative human ailments. *Frontiers in Bioscience (Landmark Ed.)* 21:769-793. PMID:26709805
- 32 Chakraborty S, Balogh L, Das T, Polyák A, Andócs G, Máthé D, Király R, Thuróczy J, Chaudhari PR, Jánoki GA, Jánoki G, Banerjee S, Pillai MR (2016) - Evaluation of 177Lu-EDTMP in dogs with spontaneous tumor involving bone: Pharmacokinetics, dosimetry and therapeutic efficacy. *Current Radiopharmaceuticals*. 9(1):64-70. PMID: 25771374
- 33 Chandra P, Agrawal A, Purandare N, Shah S, Rangarajan V (2016) - Coincidental Observation of Global Hypometabolism in the Brain on PET/CT of an AIDS Patient With High-Grade Pulmonary Non-Hodgkin Lymphoma. *Clinical Nuclear Medicine*. 41(8):646-647. PMID:27280906.
- 34 Chaudhari UK, Imran M, Manjramkar DD, Metkari SM, Sable NP, Gavhane DS, Katkam RR, Sachdeva G, Thakur MH, Kholkute SD (2016) - Use of ultrasound imaging for the diagnosis of abnormal uterine bleeding in the bonnet macaque (*Macaca radiata*). *Laboratory Animals*. 51(1):65-74. PMID:26946119.
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- 36 Chaukar D, Dandekar M, Kane S, Arya S, Purandare N, Rangarajan V, Deshmukh A, Pai P, Chaturvedi P, D'cruz A (2016) - Relative value of ultrasound, computed tomography and positron emission tomography imaging in the clinically node-negative neck in oral cancer. *Asia-Pacific Journal of Clinical Oncology*. 12(2):e332-338. PMID:25131685.
- 37 Chavan SS, Mahajan A, Talbar SN, Desai S, Thakur M, D'cruz A (2016) - Nonsubsampled rotated complex wavelet transform (NSRCxWT) for medical image fusion related to clinical aspects in neurocysticercosis. *Computers in Biology and Medicine*. 81:64-78. PMID:28013026.
- 38 Chopra S, Mohanty S, Mahantshetty U, Kannan S, Engineer R, Mechanery S, Phurailatpam R, Ghosh J, Gupta S, Shrivastava S (2016) - QOL after postoperative IMRT for cervical cancer: Results from matched pair analysis with 3DCRT. *Radiotherapy and Oncology*. 119:S341-342.
- 39 Choudhary RK, Vikrant, Siddiqui QM, Thapa PS, Raikundalia S, Gadewal N, Kumar NS, Hosur MV, Varma AK (2016) - Multimodal approach to explore the pathogenicity of BARD1, ARG 658 CYS, and ILE 738 VAL mutants. *Journal of Biomolecular Structure and Dynamics*. 34(7):1533-44. PMID:26307947
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- 43 Dar AA, Pradhan TN, Kulkarni DP, Shah SU, Rao KV, Chaukar DA, D'cruz AK, Chiplunkar SV (2016) - Extracellular 2'5'-oligoadenylate synthetase 2 mediates T-cell receptor CD3- $\alpha$  chain down-regulation via caspase-3 activation in oral cancer. *Immunology*. 147(2):251-264. PMID:26595239.
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- 49 Doctor JR, Solanki SL (2016) - Vaporizer interlock malfunctioning. *Journal of Anaesthesiology, Clinical Pharmacology*. 32(2):277-278. PMID:27275072.
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# TMC Audit Report



# ACTION TAKEN REPORT ON AUDITOR'S OBSERVATIONS ON ANNUAL STATEMENT OF ACCOUNTS FOR 2016-17

NAME OF INSTITUTION : **TATA MEMORIAL CENTRE**

Parel, Mumbai 400 012

Paragraph No. of Auditors Report	Auditors Comments (to be reproduced in full)	Action Taken	Expected month and year for completion of Action
(1)	(3)	(4)	(5)
1.	We have audited the attached Financial Statements of <b>Tata Memorial Centre (the Centre)</b> which comprises Balance Sheet as at 31 <sup>st</sup> March, 2017 and the Statement of Income and Expenditure Account, the Statement of Receipts and Payments Account for the year ended on that date, as required by the Bombay Public Trusts Act, 1950 (the Act), and a summary of significant accounting policies and other explanatory information.	This is a statement of fact. No action.	
2.	The trustees are responsible for the preparation of these financial statements that give a true and fair view of the financial position, financial performance in accordance with the Accounting principles and Accounting Standards generally accepted in India. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.	This is a statement of fact. No action.	
3.	Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those standards require that we comply with the ethical requirements plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of any material misstatement.  An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Centre's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Centre's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by trustees as well as evaluating the overall presentation of the financial statements.  We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.	This is a statement of fact. No action.	

Paragraph No. of Auditors Report	Auditors Comments (to be reproduced in full)	Action Taken	Expected month and year for completion of Action
(1)	(3)	(4)	(5)
4.	<p>In our opinion and to the best of our information and according to the explanations given to us, the financial statements give the information required by the Act in the manner so required, we report that:</p> <p>(a) In the case of the Balance Sheet, of the state of affairs of the Centre as at 31<sup>st</sup> March, 2017.</p> <p>(b) In the case of income and Expenditure Account of the Excess of over Income of the Centre for the year ended on that date.</p>	<p>This is a statement of fact. No action.</p>	

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**AUDITOR'S REPORT**

**The Chairman,  
Governing Council of Tata Memorial Centre,**

**Report on Financial Statements**

We have audited the attached Financial Statements of **Tata Memorial Centre (the Centre)** which comprises Balance Sheet as at 31<sup>st</sup> March, 2017 and the Statement of Income and Expenditure Account, the Statement of Receipts and Payments Account for the year ended on that date, as required by the Bombay Public Trusts Act, 1950 (the Act), and a summary of significant accounting policies and other explanatory information.

**Management's Responsibility for the Financial Statements**

The trustees are responsible for the preparation of these financial statements that give a true and fair view of the financial position, financial performance in accordance with the Accounting principles and Accounting Standards generally accepted in India. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

**Auditor's Responsibility**

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those standards require that we comply with the ethical requirements plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of any material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Centre's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Centre's internal control. An audit also includes evaluating the appropriateness of



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**G.D. Apte & Co.**  
**Chartered Accountants**

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accounting policies used and the reasonableness of the accounting estimates made by trustees as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.


**Opinion**

In our opinion and to the best of our information and according to the explanations given to us, the financial statements give the information required by the Act in the manner so required, we report that:

- (a) In the case of the Balance Sheet, of the state of affairs of the Centre as at 31<sup>st</sup> March, 2017.
- (b) In the case of Income and Expenditure Account, of the Excess of Expense over Income of the Centre for the year ended on that date.



**For G.D.Apte & Co**  
**Chartered Accountants**  
**(Firm Regn No. 100515W)**

  
**Chetan R. Sapre**  
**(Partner)**

**Membership No. 116952**

**Date:**  
**Place: Mumbai**

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TATA MEMORIAL CENTRE				in ₹
TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER.				
BALANCE SHEET AS AT 31ST MARCH, 2017				
PARTICULARS	Schedule	As at 31.03.2017	As at 31.03.2016	
<b>CAPITAL FUND AND LIABILITIES</b>				
Capital Fund	1	-	-	
Earmarked / Endowment Fund	2	1,96,63,60,472	1,55,10,35,150	
Academic Fund	3	9,37,11,838	7,31,33,253	
Current Liabilities & Provisions	4	17,46,19,68,558	13,36,92,24,303	
<b>TOTAL</b>		<b>19,52,20,40,868</b>	<b>14,99,33,92,706</b>	
<b>ASSETS</b>				
<b>Fixed Assets</b>				
Gross Block	5	7,93,82,97,214	7,70,12,44,326	
Less: Provision for Depreciation		3,34,17,14,583	3,00,49,96,690	
Net Block		4,59,65,82,631	4,69,62,47,636	
Capital Work - in - Progress		2,59,46,74,179	2,00,80,98,409	
<b>Total</b>		<b>7,19,12,56,809</b>	<b>6,70,43,46,045</b>	
Current Assets, Loans and Advances	6	8,06,40,52,545	6,50,19,89,777	
Capital Fund	1	4,26,67,31,515	1,78,70,56,884	
<b>TOTAL</b>		<b>19,52,20,40,868</b>	<b>14,99,33,92,706</b>	
<b>Significant Accounting Policies</b>				
<b>Notes on Accounts</b>				

As per our report of even date attached

For G. D. Apte & Co.

Chartered Accountants

ICAI Registration No. : 100515W

Partner : CA Chetan R. Sapre

Membership No. : 116952

Mumbai

For and on behalf of the Governing Council



Mr. Anil N. Sathe

Chief Adm. Officer

Dr. A.K. D'Cruz  
Director, TMH

Dr. R.A. Badwe

Director, TMC

## TATA MEMORIAL CENTRE

TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER.  
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31 MARCH 2017

		Year Ended 31.03.2017	Year Ended 31.03.2016
in ₹			
<b>A) INCOME</b>			
Grant in Aid - Govt of India	7	2,88,57,49,849	2,49,66,76,923
Hospital Income		2,26,27,69,764	2,09,84,06,930
Sale of Drugs and Surgical Goods		2,18,97,15,896	2,06,96,05,819
Interest Income	8	36,27,98,627	29,18,94,736
Other Income	9	6,56,41,146	4,97,86,173
<b>TOTAL (A)</b>		<b>7,76,66,75,281</b>	<b>7,00,63,70,581</b>
<b>B) EXPENDITURE</b>			
Academic Expenses		5,69,73,596	5,32,58,617
Consumption of drugs and Surgical Goods	10	2,16,79,34,810	1,99,38,73,090
Consumables		82,92,12,341	81,64,96,398
Staff Cost / Salaries	11	4,21,96,26,498	3,30,12,59,463
Other Administrative Expenses	12	83,72,95,884	82,09,15,894
<b>TOTAL (B)</b>		<b>8,11,10,43,129</b>	<b>6,98,58,03,462</b>
Excess of Income over expenditure before Depreciation and Provisions on retirement benefits of employees (A-B)		(34,43,67,848)	2,05,67,119
Less : Depreciation		43,62,55,323	45,91,13,405
Less : Provision for Retirement Benefits			
Gratuity		52,40,77,346	4,91,47,160
Pension		2,34,77,41,528	1,15,57,70,113
Leave Encashment		22,67,05,822	(2,40,31,166)
<b>Balance being deficit / (surplus) for the year trf to Balance Sheet</b>		<b>3,87,91,47,866</b>	<b>1,61,94,32,393</b>

As per our report of even date attached  
For G. D. Apte & Co.

Chartered Accountants

ICAI Registration No. : 100515W

Partner : CA Chetan R. Sapre  
Membership No. : 116952  
Mumbai



Mr. Anil N. Sapre  
Chief Adm. Officer

Dr. A.K. D'Cruz  
Director, TMH

Dr. R.A. Badwe  
Director, TMC

For and on behalf of the Governing Council

TATA MEMORIAL CENTRE			
TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER			
SCHEDULE 1 - CAPITAL FUND			
PARTICULARS	As at 31.03.2017	As at 31.03.2016	in ₹
<b>CAPITAL FUND</b>			
Balance at the beginning of the Year	(1,78,70,56,884)	(2,85,21,08,063)	
Add: Non Recurring Grant Utilised during the year	1,31,46,90,679	2,66,42,73,349	
Add: Recurring Grant utilised for Capital Expenditure	63,42,151	11,26,077	
Add: Assets purchased from Donation	7,40,18,685	88,35,791	
Add: Assets purchased out of Sponsored Project Fund	44,21,720	1,02,48,355	
Add : Others			
Less: Deficit/ (surplus) Transferred from the Income & Expenditure Account	(38,75,83,649)	(16,76,24,491)	
	3,87,91,47,866	1,61,94,32,393	
<b>Total</b>	<b>(4,26,67,31,515)</b>	<b>(1,78,70,56,884)</b>	



TATA MEMORIAL CENTRE TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER.			
SCHEDULE 1-A - NON RECURRING GRANT			
PARTICULARS	As at 31.03.2017		As at 31.03.2016
			in ₹
Balance at the beginning of the Year *	59,43,51,679		37,58,49,000
Add: Interest	-		27,76,028
Add: Grant Received During the year	1,81,00,00,000		2,88,00,00,000
Total	2,40,43,51,679		3,25,86,25,028
Less: Refund of NR Grant to DAE	8,00,00,000		-
Less: Grant Utilised for Capital Expenditure	1,20,04,42,336		2,50,66,84,771
Balance	1,12,39,09,343		75,19,40,257
Less: Grant Utilised for Revenue Expenditure- Cancer Registry, outreach, Plan Projects (Net of Income of Rs.3.23 Crore)	11,42,48,343		15,75,88,578
<b>Total</b>		<b>1,00,96,61,000</b>	<b>59,43,51,679</b>

\* Unutilised Grant from Govt. of India Includes Rs13 Crores received from BARC towards deposit works for construction of Radiological Research Unit.



TATA MEMORIAL CENTRE TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER													
SCHEDULE 2- EARMARKED / ENDOWMENT FUND													
PARTICULARS		As at 31.03.2017					As at 31.03.2016						
EARMARKED / ENDOWMENT FUND		SCIENCE & RESEARCH FUND	SAMJAL MISTRY FUND	DONATION	PROJECTS	WORKSHOP	TOTAL	SCIENCE & RESEARCH FUND	SAMJAL MISTRY FUND	DONATION	PROJECTS	WORKSHOP	TOTAL
A.													
Balance at the beginning of the Year		19,90,12,105	1,84,04,842	78,55,87,596	51,14,03,480	3,66,27,128	1,55,10,35,150	18,29,98,083	1,84,06,082	55,51,23,888	43,52,62,800	4,24,59,689	1,23,42,50,542
Addition during the year				73,87,63,243	41,39,23,840	7,72,32,955	1,22,99,20,038			54,26,28,957	38,54,85,665	6,57,43,689	99,38,58,310
Re-grouping						3,76,053	3,76,053				1,49,363		1,49,363
Interest on Saving / Bank FD received		1,49,72,104	13,16,784		4,39,33,653		6,02,22,541	1,62,46,022	15,21,425		3,18,54,094		4,96,21,541
Dividend			3,069				3,069		3,069				3,069
TDS Projects					25,21,811		25,21,811				24,23,155		24,23,155
Interest on FD													
Total (A)		21,39,84,209	1,97,24,695	1,52,43,50,839	97,17,82,783	11,42,36,136	2,84,40,78,662	19,92,44,105	1,99,30,576	1,09,77,52,845	85,51,75,077	10,82,03,378	2,28,03,05,980
B. Utilisation / Expenditure towards objective of fund													
Revenue Expenditure		-	-	35,73,49,085	37,81,93,310	6,24,15,538	79,79,57,933	2,32,000	1,240	30,71,22,458	33,43,85,163	7,14,26,887	71,31,67,748
Capital Expenditure				7,40,18,685	44,21,720		7,84,40,405			50,42,791	93,86,434		1,44,29,225
Re-grouping							-					1,49,363	1,49,363
Transfer to Samjal Scholarship Account			6,59,827				6,59,827		7,62,247				7,62,247
Transfer to Samjal Patient welfare			6,60,025				6,60,025		7,62,247				7,62,247
Total (B)		-	13,19,852	43,13,67,770	38,26,15,030	6,24,15,538	87,77,18,190	2,32,000	15,25,734	31,21,65,249	34,37,71,597	7,15,76,250	72,92,70,830
Closing Balance at the end of the year (A-B)		21,39,84,209	1,84,04,843	1,09,29,83,069	58,91,67,753	5,18,20,598	1,96,63,60,472	19,90,12,105	1,84,04,842	78,55,87,596	51,14,03,480	3,66,27,128	1,55,10,35,150



**Tata Memorial Centre**  
**Financial Year 2016-17**  
**Details of the Movement of Grants / Endowment Fund 2016-17**

IN ₹

A/C No.	Name	Opening Balance	Addition	Deduction	Closing Balance
	<b>TMH DONATION ACCOUNTS</b>				
	<b>DONATIONS FOR PATIENT WELFARE</b>				
617	Donation : PWF	14,56,12,810	7,47,17,363	7,32,59,219	14,70,70,954
7013	Donation : PWF - Sangrur		5,46,000		5,46,000
8013	Donation : PWF Vizag		50,304		50,304
2836	Samjal Patient Welfare Account	65,13,342	6,59,826	-	71,73,168
2121	Donation for Tata Clinic & Faculty Block	2,45,00,000	-	2,45,00,000	-
2458	Lymphoedema Care Account	74,224	-	-	74,224
2823	Thoriac Cancer Foundation	(3,84,996)	12,34,000	5,33,456	3,15,548
2834	GI & HPB Cancer Foundation	20,21,334	2,00,672	4,19,023	18,02,983
2840	Head and Neck Foundation	22,56,300	1,00,000	-	23,56,300
3089	Bayer Healthcare - Court Order	50,000	-	50,000	-
3090	Bajaj Herbs Donation - Court Order	10,00,000	-	10,00,000	-
3124	Donations - Pediatric Surgical	4,39,000	-	-	4,39,000
2644	Donation : Patient welfare Paediatric	40,30,000	-	40,30,000	-
2554	IMPACCT Foundation	1,16,96,168	2,69,55,780	1,21,41,323	2,65,10,625
2900	Paediatric Ward Renovation	11,05,501	-	-	11,05,501
3102	Donation-Nutrition Support to Pediatric	10,34,055	1,00,000	2,64,030	8,70,025
2424	Health Minister's Fund - M O H F W	1,37,280	-	(59,757)	1,97,037
2630	HOLISTIC - Dorabji Tata Trust	1,17,608	25,00,000	25,31,879	85,729
3231	Adult Hemato Lymphoid Foundation	-	-	-	-
2538	RUHI- Runners of Hope Initiative (for paediatric patients)	17,85,932	83,45,650	40,69,063	60,62,519
787	Brain Tumour Foundation	17,56,904	48,15,258	20,18,110	45,54,052
1605	Paediatric Palliative Care	58,94,006	16,83,302	8,32,773	67,44,535
2396	Lymphoma Foundation	38,09,386	42,35,928	36,08,201	44,37,113
3158	World Children's Winnels Games	4,83,267	5,00,000	8,74,692	1,08,575
3185	Madat Trust Cancer Support Fund	3,457	-	-	3,457
3262	Donations received against court order	-	-	-	-
3266	Allana Group - Support to Poor Patients	1,58,20,860	-	1,50,000	1,56,70,860
3267	Allana Group - Support to patients eligible for Zakat	4,23,438	-	(1,03,678)	5,27,116
3307	Donation - Shareholding Corp. of India Ltd.	66,28,020	-	-	66,28,020
3237	Adoption of children suffering from cancer	4,00,000	-	2,50,000	1,50,000
3311	Nutrition / Education Project for Pediatric patients	8,92,624	99,54,000	1,01,10,753	7,35,871
3314	Education project in Pead Oncology - NOMURA	12,18,241	18,39,600	26,43,828	4,14,013
3194	Immediate expenses for needy patients	1,00,000	-	1,00,000	-
3341	Enhancement of Retinoblastoma Services - SDFT Grant	1,68,17,325	1,49,678	1,46,79,063	22,87,940
3472	Osseo Integrated Implants - Rehabilitation of Oral Cancer Patients	10,00,000	-	-	10,00,000
3494	Donation for Lymphoma Leukemia Foundation	51,00,000	-	(21,987)	51,21,987
3504	Orthopaedic Oncology Foundation	75,000	13,13,344	1,40,000	12,48,344
3746	JSW FOUNDATION (JINDAL MEGA PROSTH.		9,00,000		9,00,000
3462	M-Can Foundation Support to Head & Neck	94,47,685	80,88,242	94,42,803	80,93,124
	<b>Total (A)</b>	<b>27,18,58,770</b>	<b>14,88,88,947</b>	<b>16,74,62,794</b>	<b>25,32,84,923</b>



A/C No.	Name	Opening Balance	Addition	Deduction	Closing Balance
	<b>DONATIONS FOR CANCER RESEARCH</b>				
623	Donation : Reseach TMH	3,35,95,243	3,16,44,106	4,59,89,605	1,92,49,744
3589	Travel support to students	7,45,657	49,11,551	40,64,645	15,92,563
2551	Donations: Centre for Cancer Epidemiology	1,08,10,422	-	1,08,10,422	-
764	Canadian Corp Gala Fund- Terry Fox	7,44,10,426	83,16,409	65,44,843	7,61,81,992
974	Womens Cancer Initiative	1,72,15,180	1,81,82,900	2,88,93,292	65,04,788
3318	Tata Trust - Support to M Res Course	1,97,38,469	59,04,620	77,77,628	1,78,65,461
3207	Donations for Research - EBMH	77,31,125	25,000	11,80,636	65,75,489
3725	Brain Tumor Research Fund - Dr.Daves		25,00,000	-	25,00,000
	<b>Total (B)</b>	<b>16,42,46,522</b>	<b>7,14,86,101</b>	<b>10,52,62,586</b>	<b>13,04,70,037</b>
	<b>ASSETS CREATED OUT OF DONATIONS</b>				
968	Donation : TMC Mahindra Bolero V-Care	1	-	-	1
1727	Donation from CBI Maruti Omni	1	-	-	1
1904	Donation from CBI-Mahindra Scorpio	1	-	-	1
2622	Donation : Research TMH - Star Bus	1	-	-	1
2856	Donation: Tata Aria	1	-	-	1
2858	Donation: BHEL Star bus	1	-	-	1
7010	Donation - HBCH, Sangrur Assets	1	-	-	1
8011	Donation - HBCH&RC, Vizag - Assets	16	-	-	16
	<b>Total (C)</b>	<b>23</b>	<b>-</b>	<b>-</b>	<b>23</b>
	<b>MISCELLANEOUS DONATIONS</b>				
660	Donation : Misc.	10,41,085	3,51,000	5,18,000	8,74,085
2575	Donation : General	2,77,40,797	25,96,162	1,14,785	3,02,22,174
	<b>Total (D)</b>	<b>2,87,81,882</b>	<b>29,47,162</b>	<b>6,32,785</b>	<b>3,10,96,259</b>
	<b>DONATIONS FOR SPECIFIC PURPOSE</b>				
2669	Corpus for PG Appreciation	16,14,434	1,13,010	-	17,27,444
2776	Interest on corpus for PG Appreciation	2,56,581	-	20,000	2,36,581
3060	Dr. Raju S. Rao Memorial Fund	7,96,045	-	-	7,96,045
2765	Donation: Dr. R.S.Rao -Prize in Mch oncology corpus A/c	1,00,000	-	-	1,00,000
2766	Interest on Dr.Rao Fund	29,625	9,067	10,000	28,692
2770	Donation: Usha Bhushan corpus fund A/c	10,00,000	-	-	10,00,000
2870	Interest on Usha Bhushan corpus fund A/c	3,91,072	90,669	-	4,81,741
2843	Laxmi Ammal Memorial Corpus Fund	5,00,000	-	-	5,00,000
2844	Interest on Laxmi Ammal Memorial Corpus Fund	88,534	35,000	-	1,23,534
3002	Sheela and Kashinath Bhagwat Corpus Fund	3,49,250	-	-	3,49,250
3003	Interest on Sheela & Kashinath Bhagwat Corpus Fund	98,552	25,202	-	1,23,754
3004	Executor of Manek Dadyseth commisariat Fund	2,50,00,000	-	-	2,50,00,000
3005	Interest on Manek Dadyseth commisariat Fund	20,90,457	16,85,988	23,39,710	14,36,735
3099	Donations : Will of Mr.Frank Sanjana	65,49,011	-	-	65,49,011
3535	Interest of Frank Sanjana	-	-	-	-



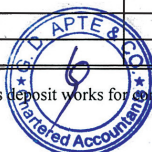
A/C No.	Name	Opening Balance	Addition	Deduction	Closing Balance
3536	Interest on Miscellaneous Donation	-	2,04,504	-	2,04,504
3340	Capt. Rameshwar Lal Rikhye	16,62,140	-	-	16,62,140
3463	Donation for Best PG Student Award	1,04,400	-	-	1,04,400
3474	Executor of the Estate of Late Mehta	80,00,000	-	-	80,00,000
3475	Interest - Executor of the Estate of Late Mehta		6,38,253		6,38,253
3595	Anchit Ahuja Fund - Donation		18,22,701	21,264	18,01,437
3667	Donations - Charity Box		57,01,706	7,98,750	49,02,956
3619	Donation - Vinay Bhat Corpus Fund	1,00,00,000	-	-	1,00,00,000
	<b>Total (E)</b>	<b>5,86,30,101</b>	<b>1,03,26,100</b>	<b>31,89,724</b>	<b>6,57,66,477</b>
	<b>CORPORATE SOCIAL RESPONSIBILITY</b>				
3331	CSR SBI LIFE- Support to Poor Patients	99,09,877	-	98,70,781	39,096
3467	Receipts as CSR for Cancer Research	30,00,000	41,22,000	-	71,22,000
3493	CSR ICICI Prudential - Support to Poor Patients	20,25,000	40,00,000	39,24,201	21,00,799
3516	CSR Nomura Bank - H&N Patients for implants	85,20,130	-	39,76,117	45,44,013
3517	CSR Nomura Bank - H&N Patients - Coordinator support	10,03,966	11,16,000	6,66,403	14,53,563
3518	CSR Nomura Bank - H&N Patients - Moulds	20,31,646	9,32,130	24,67,229	4,96,547
3519	CSR Nomura Bank - H&N Equipments	98,50,000	-	89,22,906	9,27,094
3512	CSR Deutsche Bank - Emergency Funding for Paediatric patients	35,85,000	76,92,000	59,40,905	53,36,095
3513	CSR Deutsche Bank - Seed Money for paediatric patients	1,31,40,000	2,50,00,000	1,94,40,865	1,86,99,135
3514	CSR Deutsche Bank - Financial adoption of paediatric patients	3,71,50,000	4,00,00,000	4,80,47,656	2,91,02,344
3515	CSR Deutsche Bank - Survivorship support post treatment paediatric p	43,70,000	50,00,000	58,70,000	35,00,000
3554	CSR General for equipments	2,24,50,000	2,45,30,834	1,64,49,937	3,05,30,897
3556	CSR - Infosys Foundation Corpus for fellowship	5,00,00,000	-	-	5,00,00,000
3647	Expenditure on fellowship - Infosys Foundation		77,24,751	31,29,501	45,95,250
3549	Citius Tech Healthcare Technology - Patient Welfare	41,26,200	41,26,200	30,55,014	51,97,386
3304	CSR General Patient Welfare	1,74,48,082	1,23,47,000	33,35,829	2,64,59,253
3664	Health Minister's Cancer Patient Fund		50,00,000	-	50,00,000
3694	CSR-Deutsche Bank - Support to Cancer Patients		8,40,000	91,935	7,48,065
3724	CSR - Power Grid Corporation of India Ltd.		3,00,00,000	-	3,00,00,000
3741	CSR - Pediatric Cancer Centre - Sanghvi Group		32,00,00,000	-	32,00,00,000
	<b>Total (F)</b>	<b>18,86,09,901</b>	<b>49,24,30,915</b>	<b>13,51,89,279</b>	<b>54,58,51,537</b>
	<b>GRAND TOTAL - (A TO F)</b>	<b>71,21,27,199</b>	<b>72,60,79,224</b>	<b>41,17,37,168</b>	<b>1,02,64,69,256</b>
	<b>ACTREC DONATION</b>				
637	Donation : ACTREC	64,57,574	3,10,000	21,06,167	46,61,407
609	Donation : BMT	9,76,990	1,20,000	14,839	10,82,151
1226	ACTREC PWF	33,63,706	7,19,835	9,20,669	31,62,872
2122	Donation : Interest on Travel Grant	1,32,588	-	21,840	1,10,748
2123	Donation : Travel Grant	6,50,000	-	-	6,50,000
2650	Donations: Brain Tumour Poor Patient Fund	8,58,621	5,50,000	4,42,968	9,65,653
2743	Lymphonic Foundation Fund	3,46,987	2,30,000	1,60,000	4,16,987
2779	PWF - Morgan Stanley	21,16,985	-	21,16,985	-
3116	Solid Tumor Medical Oncology	6,81,501	29,40,046	68,017	35,53,530
2188	Animal Onco Research Fund	11,08,627	3,05,920	4,620	14,09,927
2651	Donations: Neoro Oncology Research Fund	29,11,913	12,00,000	8,02,503	33,09,410
3570	Donation Dr.Rajiv Kalraiya Memorial	5,54,008	6,76,988	-	12,30,996
3571	Donation Dr.Rajv Kalraiya Memorial	90,00,000	-	-	90,00,000
2847	Pharmacology Research Fund	4,90,897	6,63,027	11,75,070	(21,146)
3601	CSR General Donation for Equipments	88,10,000	35,68,203	52,35,621	71,42,582
3602	CSR Major Works	2,90,00,000	11,60,000	34,78,895	2,66,81,105
3603	CSR for Patient Welfare	60,00,000	2,40,000	30,82,408	31,57,592
	<b>TOTAL - B</b>	<b>7,34,60,397</b>	<b>1,26,84,019</b>	<b>1,96,30,602</b>	<b>6,65,13,814</b>
	<b>TOTAL - (A+B)</b>	<b>78,55,87,596</b>	<b>73,87,63,243</b>	<b>43,13,67,770</b>	<b>1,09,29,83,070</b>



<b>TATA MEMORIAL CENTRE</b> <b>TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER</b>		
<b>SCHEDULE 3 - ACADEMIC FUND</b>		
in ₹		
<b>PARTICULARS</b>	<b>As at 31.03.2017</b>	<b>As at 31.03.2016</b>
Opening Balance	7,31,33,253	5,90,21,160
<b>Add :- Addition During the year</b>	5,69,73,596	5,32,58,618
	<b>13,01,06,849</b>	<b>11,22,79,778</b>
<b>Less : Deduction During the year</b>	3,63,95,011	3,91,46,525
<b>Total</b>	<b>9,37,11,838</b>	<b>7,31,33,253</b>

<b>TATA MEMORIAL CENTRE</b> <b>TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER</b>				
<b>SCHEDULE 4 - CURRENT LIABILITIES AND PROVISIONS</b>				
in ₹				
<b>PARTICULARS</b>		<b>As at 31.03.2017</b>		<b>As at 31.03.2016</b>
<b>A) CURRENT LIABILITIES &amp; DEPOSITS</b>				
<b>Deposits</b>				
- From Student	1,99,93,295		2,11,91,542	
- From Patient	1,49,89,33,203		1,15,16,57,084	
- From Suppliers & Contract	9,34,17,461	1,61,23,43,959	13,36,66,612	1,30,65,15,238
<b>Other Current Liabilities</b>				
Undisbursed and Unclaimed Salaries		4,63,357		24,99,716
New pension scheme liability		32,10,184		52,00,512
Sundry Creditors-Capital		1,08,24,114		1,37,10,821
Other Liabilities		11,79,18,836		15,63,49,176
Statutory Liabilities		2,12,09,271		11,60,784
<b>Outstanding Expenses</b>				
- Salary	63,13,27,340		31,35,42,989	
- Operational Expenses	38,15,96,572	1,01,29,23,912	39,89,12,159	71,24,55,148
<b>Unutilised Grant from Govt of India c/f*</b>				
- Recurring Grant	3,12,000		24,04,000	
- Non Recurring Grant	1,00,96,61,000	1,00,99,73,000	59,43,51,679	59,67,55,679
<b>TOTAL (A)</b>		<b>3,78,88,66,633</b>		<b>2,79,46,47,074</b>
<b>B) PROVISIONS( for retirement benefits of employee)</b>				
Gratuity		1,25,02,57,888		72,61,80,542
Leave Encashment		1,07,79,50,240		85,12,44,418
Pension		11,34,48,93,798		8,99,71,52,270
<b>TOTAL (B)</b>		<b>13,67,31,01,926</b>		<b>10,57,45,77,230</b>
<b>TOTAL (A+B)</b>		<b>17,46,19,68,558</b>		<b>13,36,92,24,304</b>

\* Unutilised Grant from Govt. of India Includes Rs13 Crores received from BARC towards deposit works for construction of Radiological Research Unit.



# TATA MEMORIAL CENTRE

## Schedule 5 - FIXED ASSETS

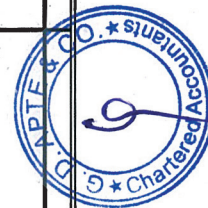
DESCRIPTION	GROSS BLOCK				DEPRECIATION				NET BLOCK	
	Cost / Valuation as at the beginning of the year (01/04/2016)	Total Additions / adjustments during the year	Deletions / Adjustment	Cost / Valuation at the end of the year (31/03/2017)	As at the beginning of the year (01/04/2016)	Depreciation on the opening balance	Depreciation on Additions during the year	Total Depreciation during the year	On Deletion / Adjustment	Total up to the year end (31/03/2017)
<b>A. FIXED ASSETS :</b>										
1. LAND:										
a) Freehold	1,97,608	-	-	1,97,608						1,97,608
2. BUILDINGS :										
a) On Freehold Land	1,70,25,59,577	5,18,86,804		1,75,44,46,381	19,94,56,861	2,78,76,017	12,26,641	2,91,02,658		22,85,59,518
3. PLANT MACHINERY & EQUIPMENT	5,30,24,96,957	24,91,64,540	14,34,16,737	5,40,82,44,760	2,33,39,80,134	33,06,97,699	1,94,59,284	35,01,56,983	8,93,00,028	2,59,48,37,089
4. VEHICLES	3,27,54,634	65,32,311	4,61,730	3,88,25,015	1,99,90,080	29,35,438	4,30,150	33,65,588	4,07,612	2,29,48,056
5. FURNITURE, FIXTURES	17,90,94,234	94,98,728	5,31,700	18,80,61,262	12,14,91,128	76,49,131	5,83,823	82,32,954	5,31,538	12,91,92,544
6. OFFICE EQUIPMENT	4,63,56,174	10,80,824	11,97,828	4,62,39,170	1,60,81,380	27,90,436	34,476	28,24,913	5,61,650	1,83,44,542
7. COMPUTER/ PERIPHERALS	43,77,85,343	7,32,74,650	87,76,975	50,22,83,018	31,39,97,107	3,07,21,206	1,18,51,019	4,25,72,224	87,36,598	34,78,32,734
<b>TOTAL (A)</b>	<b>7,70,12,44,327</b>	<b>39,14,37,858</b>	<b>15,43,84,970</b>	<b>7,93,82,97,214</b>	<b>3,00,49,96,690</b>	<b>40,26,69,927</b>	<b>3,35,85,392</b>	<b>43,62,55,319</b>	<b>9,95,37,426</b>	<b>3,34,17,14,883</b>
<b>CWIP</b>	<b>2,00,89,00,779</b>	<b>63,58,63,573</b>	<b>4,92,87,803</b>	<b>2,59,54,76,549</b>						<b>2,59,54,76,549</b>
<b>LESS: PROVISION FOR DOUBTFUL CAPITAL ADV (LAND)</b>	<b>8,02,370</b>			<b>8,02,370</b>						<b>8,02,370</b>
<b>NET CAPITAL WIP (B)</b>	<b>2,00,80,98,409</b>	<b>63,58,63,573</b>	<b>4,92,87,803</b>	<b>2,59,46,74,179</b>						<b>2,59,46,74,179</b>
<b>TOTAL (A + B)</b>	<b>9,70,93,42,736</b>	<b>1,02,73,01,431</b>	<b>20,36,72,773</b>	<b>10,53,29,71,393</b>	<b>3,00,49,96,690</b>	<b>40,26,69,927</b>	<b>3,35,85,392</b>	<b>43,62,55,319</b>	<b>9,95,37,426</b>	<b>3,34,17,14,883</b>
<b>PREVIOUS YEAR (TMC)</b>	<b>8,27,78,32,572</b>	<b>3,47,80,74,336</b>	<b>2,04,65,64,172</b>	<b>9,70,93,42,735</b>	<b>2,56,20,81,864</b>	<b>38,65,93,952</b>	<b>7,25,19,453</b>	<b>45,91,13,404</b>	<b>1,61,98,578</b>	<b>3,00,49,96,690</b>
										<b>4,37,51,78,456</b>

Note: Capital work in progress includes freehold land amounting to Rs 802370 (previous year Rs 802370) which is disputed and hence provided as doubtful from the financial year 2009-10



TATA MEMORIAL CENTRE TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER SCHEDULE 6 - CURRENT ASSETS, LOANS AND ADVANCES				in ₹	
PARTICULARS	As at 31.03.2017	As at 31.03.2016			
<b>A. CURRENT ASSETS</b>					
1. Inventories					
Stock of Drugs, Medical and Surgical Goods	27,83,05,663	23,49,75,810			24,13,73,857
Stores & stationery	66,80,759	63,98,047			
2. Sundry Debtors					
a) Outstanding more than six months					
Considered Good	6,85,86,102	6,47,99,394			
Considered Doubtful	1,93,19,507	2,58,68,303			
	8,79,05,609	9,06,67,697			
Outstanding less than six months					
Considered Good	22,01,31,972	20,55,77,039			
Considered Doubtful					
b) Less: Provision for Doubtful Debts					27,03,76,433
	30,80,37,581	29,62,44,736			
	1,93,19,507	2,58,68,303			
3. Cash Balances					
Cash in Hand	3,03,112	59,05,760			
Cheques on Hand	96,00,603	2,52,61,001			
Banking Balance	93,102	96,690			3,12,63,451
4. Bank Balances					
With Scheduled Banks :					
- Current Accounts	25,38,93,212	66,29,75,725			
- Fixed Deposit Accounts	4,76,06,77,003	3,16,70,97,096			
- Margin Money Deposit Accounts	1,67,50,00,000	1,41,50,00,000			
- Fixed Deposits Projects	46,70,79,943	46,18,94,943			
- On Savings Accounts	35,01,601	81,08,620			5,71,50,76,384
<b>TOTAL (A)</b>	<b>7,74,38,53,072</b>				<b>6,25,80,90,125</b>

contd.....



TATA MEMORIAL CENTRE TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER SCHEDULE 6 - CURRENT ASSETS, LOANS AND ADVANCES				in ₹	
PARTICULARS	As at 31.03.2017		As at 31.03.2016		
<b>B. LOANS AND ADVANCES</b>					
1. Advances recoverable in cash or in kind or for value to be received (unsecured, considered good)	39,76,775		19,48,349		
Considered Good	-		-		
Considered Doubtful	39,76,775		19,48,349		19,48,349
Less: Provision for Doubtful Advances	-	39,76,775	-		
b) Prepaid expenses		4,84,58,842			2,73,03,757
c) Other Deposits		4,11,88,575			3,01,40,475
c) Receivable from Govt of India					
2. Loans & Advances to staff					
Interest Bearing Advances	68,66,154		96,24,966		
Non Interest Bearing Advances	40,22,212	1,08,88,366	44,78,210		1,41,03,176
3. Interest Accrued					
Interest Accrued on Fixed Deposits	15,30,89,285		12,52,12,913		
Interest Accrued on Corpus Deposits	1,59,31,070		62,29,795		
Interest Accrued on Sam Jal Deposits	6,66,098	16,96,86,453	8,63,037		13,23,05,745
4. Interest Accrued but not due		1,24,14,476			1,31,57,131
5. Tax Deducted at Source		3,35,85,985			2,49,41,019
<b>TOTAL (B)</b>		<b>32,01,99,473</b>			<b>24,38,99,652</b>
<b>TOTAL (A+B)</b>		<b>8,06,40,52,545</b>			<b>6,50,19,89,777</b>



# **TATA MEMORIAL CENTRE**

**TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER.**

## **SCHEDULE 7 - RECURRING GRANT**

		in ₹	
<b>PARTICULARS</b>		<b>As at 31.03.2017</b>	<b>As at 31.03.2016</b>
Balance at the beginning of the Year	24,04,000		2,07,000
Add: Grant Received During the year	2,89,00,00,000		2,50,00,00,000
<b>Total</b>	<b>2,89,24,04,000</b>		<b>2,50,02,07,000</b>
Less: Grant Utilised for Capital Expenditure (A)	63,42,151		11,26,077
<b>Balance</b>	<b>2,88,60,61,849</b>		<b>2,49,90,80,923</b>
Less: Grant Utilised for Revenue Expenditure (B)	2,88,57,49,849		2,49,66,76,923
<b>Unspent Balance c/f</b>		<b>3,12,000</b>	<b>24,04,000</b>



## TATA MEMORIAL CENTRE

TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN  
CANCER

### SCHEDULE 8 - INTEREST INCOME

PARTICULARS	Year Ended 31.03.2017	Year Ended 31.03.2016	in ₹
<b>Interest : (gross)</b> (includes tax deducted at source)			
<b>from banks :</b>			
on fixed deposits/ margin money deposits	35,91,27,904	28,59,67,017	
on saving accounts	2,54,326	91,780	
		<b>35,93,82,230</b>	<b>28,60,58,797</b>
<b>from others :</b>			
On mobilisation advance	-	-	
on Vehicle Advances	1,22,151	2,34,338	
on House Building Advances	20,49,100	28,29,217	
on Computer Advances	1,00,452	1,95,767	
		<b>22,71,703</b>	<b>32,59,322</b>
<b>Interest accrued but not Due on staff Advances</b>			
		<b>11,44,694</b>	<b>16,14,083</b>
<b>Interest on Income Tax Refund</b>		-	<b>9,62,534</b>
<b>Total</b>	<b>36,27,98,627</b>		<b>29,18,94,736</b>



<b>TATA MEMORIAL CENTRE</b> <b>TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND</b> <b>EDUCATION IN CANCER.</b>		
<b>SCHEDULE 9 - OTHER INCOME</b>		
in ₹		
<b>PARTICULARS</b>	<b>Year Ended 31.03.2017</b>	<b>Year Ended 31.03.2016</b>
Miscellaneous Receipts	5,21,36,089	3,60,77,886
Animal House Receipts	57,85,409	70,59,652
Project Overheads	75,65,906	67,22,003
Effect of exchange fluctuation (net)	1,53,742	(73,368)
<b>TOTAL</b>	<b>6,56,41,146</b>	<b>4,97,86,173</b>

<b>TATA MEMORIAL CENTRE</b> <b>TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND</b> <b>EDUCATION IN CANCER</b>		
<b>SCHEDULE 10 - CONSUMPTION OF DRUGS &amp; SURGICAL GOODS</b>		
in ₹		
<b>PARTICULARS</b>	<b>Year Ended 31.03.2017</b>	<b>Year Ended 31.03.2016</b>
Opening stock of Drugs / Surgical goods	23,49,75,810	19,16,89,298
<b>Add:</b> Purchases	2,23,18,45,885	2,04,40,53,740
<b>Less:</b> Closing stock of Drugs / Surgical goods	27,83,05,663	23,49,75,810
<b>Less:</b> Return/ Rejected / Expired Drugs / Surgical goods	2,05,81,222	68,94,138
<b>TOTAL</b>	<b>2,16,79,34,810</b>	<b>1,99,38,73,090</b>



## TATA MEMORIAL CENTRE

TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND  
EDUCATION IN CANCER.

### SCHEDULE 11 - STAFF COST / SALARIES

		in ₹	
PARTICULARS	Year Ended 31.03.2017	Year Ended 31.03.2016	
a) Salaries and Wages	1,34,54,09,427	97,39,44,579	
b) Allowances and Bonus	1,91,22,33,054	1,64,64,55,362	
c) Expenses on Employee's Retirement and Terminal Benefits	12,79,55,902	7,64,10,402	
d) Pension scheme	45,07,24,160	28,83,65,855	
e) Fellowships	38,33,03,955	31,60,83,265	
<b>TOTAL</b>	<b>4,21,96,26,498</b>	<b>3,30,12,59,463</b>	



## TATA MEMORIAL CENTRE

TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND  
EDUCATION IN CANCER

### SCHEDULE 12 - OTHER ADMINISTRATIVE EXPENSES

		in ₹	
PARTICULARS	Year Ended 31.03.2017	Year Ended 31.03.2016	
a) Linen and Laundry	4,20,93,788	3,89,26,835	
b) Library Expenses	6,27,60,524	5,09,94,225	
c) Electricity	27,88,68,728	30,21,12,473	
d) Water Charges	1,71,53,565	1,49,45,870	
e) Repairs and Maintenance	23,69,71,008	23,44,92,930	
f) Animal House Expenses	38,52,556	38,58,110	
g) Rates, Taxes and Insurance	82,81,043	72,43,885	
h) Minor Equipments and Replacement of Capital Equipments	21,03,718	15,07,775	
i) Postage, Telephone and Communication Charges	95,53,096	63,29,222	
j) Printing and Stationery	2,28,19,881	2,12,83,115	
k) Travelling and Conveyance Expenses	2,18,88,765	1,92,51,641	
l) Intra Mural Research Expenses	2,89,54,550	2,12,52,631	
m) Cancer Registry Program Expenses	69,84,619	93,11,079	
n) Auditors Remuneration.			
Audit fees	4,00,000		
Service tax	75,000		
o) Symposium and Training	4,75,000	4,75,000	
p) Professional Charges	31,42,151	41,96,631	
q) Advertisement Expenses	51,28,801	60,75,702	
r) Provision for Doubtful Debts	1,56,97,626	1,74,74,675	
s) Hostel maintenance expenses	(65,48,796)	(71,39,122)	
t) Miscellaneous Expenses	2,17,64,122	2,45,08,858	
u) Bad debts written off	5,53,51,139	4,36,38,866	
	-	1,75,492	
<b>TOTAL</b>	<b>83,72,95,884</b>	<b>82,09,15,894</b>	



## TATA MEMORIAL CENTRE

### [TATA MEMORIAL HOSPITAL AND ADVANCED CENTRE FOR TREATMENT, RESEARCH AND EDUCATION IN CANCER]

The Tata Memorial Centre (TMC) comprising of the Tata Memorial Hospital (TMH) and the Advance Centre for Treatment, Research & Education in Cancer (ACTREC) functions as a grant-in-aid Institute under the administrative control of the Department of Atomic Energy, Government of India and recognized as the national cancer centre with a mandate for Service, Education and Research in Cancer. Two new hospitals in Visakhapatnam, Andhra Pradesh and Mullanpur District Punjab. The satellite centre in Sangrur is functional. The hospital in Visakhapatnam is providing OPD and day care services. The Centre is registered under the Societies Registration Act (1860) and the Bombay Public Trust Act (1950).

#### SCHEDULE 13 : SIGNIFICANT ACCOUNTING POLICIES

##### 1. Basis of Preparation of Financial Statements

The financial statements are prepared on historical cost convention, unless otherwise specifically stated, on the accrual basis of accounting and comply with the framework and format laid down by the Controller General of Accounts, Government of India and applicable accounting standards issued by the Institute of Chartered Accountants of India (ICAI) to the extent applicable and in the manner so required.

Revenues and costs are accrued, that is, recognized as they are earned or incurred and recorded in the financial statements of the periods to which they relate. The Centre follows accrual basis of accounting, except for Grants, Donations, Workshops / Projects and Commuted Pensions (in case of existing pensioners), which are accounted for on cash basis

##### 2. Use of Estimates

The preparation of the financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amount of assets and liabilities as of the Balance Sheet, reported amounts of revenues and expenses for the year ended and disclosure of contingent liabilities as of the balance sheet date. The estimates and assumptions used in these financial statements are based upon management's evaluation of the relevant facts and circumstances as on the date of the financial statements. Actual results may differ from those estimates. Any revision to accounting estimates is recognized prospectively.

##### 3. Revenue Recognition

- i) Hospital income from services rendered to patients is recognized as and when the bills for the services are generated.
- ii) Interest income is recognized on a time proportion basis taking into account the amount invested and the rate of interest.
- iii) Interest on employee advances are recognized in the year of its receipt where principal has been recovered. In respect of other cases they are recognized on accrual basis.



- iv) Other Revenue items are recognized only when it is reasonably certain that the ultimate collection will be made.

#### 4. Fixed Assets and Depreciation

- i) Fixed assets are capitalized at acquisition cost (net of duty / tax credits availed, if any), including directly attributable costs such as freight, insurance and specific installation charges for bringing the assets to working condition for use.
- ii) Expenditure relating to existing fixed assets is added to the cost of the assets, where it increases the performance / life of the asset as assessed earlier.
- iii) Fixed Assets are stated at cost less accumulated depreciation.
- iv) Fixed assets purchased on non-government funded projects and from donations are transferred to the assets of the Centre at purchase price.
- v) Fixed assets are eliminated from financial statements only on disposal.

Depreciation on fixed assets is provided under straight line method based on useful life of the asset determined by the management at the following rates :

Asset	Rate of depreciation
Buildings	1.63%
Electrical & Gas Installation	4.75%
Plant & Machinery	7.07%
Furniture and Fixtures	9.50%
Office Equipment	4.75%
Computers and peripherals	16.21%
Vehicles - Buses	11.31%
- Car, Jeep	9.50%

- i) Depreciation on assets purchased during the year is provided from the date of its purchase / installation
- iii) Individual assets costing less than Rs.5,000/- are expensed out in the year of purchase / WDV.
- iii) Where any asset has been sold, the depreciation on such asset is calculated on pro-rata basis up to the date, on which such asset has been sold.

#### 5. Inventories

- i) Inventories consist of Drugs and Surgical meant for sale purpose and are valued at lower of cost or Net Realisable Value. Cost is determined on first-in-first-out basis.
- ii) Stock of consumables, stationery are valued at cost
- ii) Stock of linen, laundry, cutlery and crockery, are treated as consumed as and when purchased



## 6. Government Grant

- i) Recurring and Non-recurring grant related to the revenue are recognized on systematic basis in the income and expenditure account over the period, necessary to match them with the related costs which they are intended to compensate.
- ii) Non-recurring grant to the extent utilised for capital expenditure are transferred to Capital Fund. Unutilised grants are carried forward as Current Liabilities in the Balance Sheet.

## 7. Donation

Donations in kind received prior to 1st April, 2003 are included under 'Earmarked / Endowment Funds' at comparable purchase price. With effect from 1st April, 2003, donations received in kind are being recorded in the books at nominal value. Donations are received for patient care and cancer research. Assets purchased on donations are treated as assets of the Centre and capitalised accordingly. Donation includes amount received as Corporate Social Responsibility (CSR).

## 8. Foreign Exchange Transactions

- a. Transactions in foreign currencies are recorded at the exchange rates prevailing on the transaction dates.
- b. Monetary items denominated in foreign currencies remaining unsettled at the year-end are translated at the year-end exchange rates.
- c. All exchange gains / losses on settlement / translation, are recognized in the Profit and Loss account

## 9. Employee Benefits

### Short Term Employee Benefits:

All employee benefits wholly payable within twelve months of rendering the service are classified as short term employee benefits. Benefits such as salaries, wages, bonus, etc are recognized in the period in which the employee renders the related service.

### Post Employment Benefits:

#### i) Defined Contribution Plans:

Employee benefits in the form of Contributory Provident Fund and New Pension Scheme (for employees joined from 1<sup>st</sup> January, 2004) are considered as defined contribution plans. The contribution paid / payable under the scheme is recognized in the period in which the employee renders the related service.

#### ii) Defined Benefit Plans:

Retirement benefits in the form of gratuity to eligible employees, leave encashment and pension scheme (other than employees covered in (i) above) are considered as defined benefit plans. The present value of the obligation under such defined benefit plans is determined based on actuarial valuation using the Projected Unit Credit Method, which recognizes each period of service as giving



rise to additional unit of employee benefit entitlement and measures each unit separately to build up the final obligation.

The obligation is measured using at the present value of the estimated future cash flows. The discount rates used for determining the present value of the obligation under defined benefit plans, is based on the market yields on Government securities as at the Balance Sheet date, having maturity periods approximating to the terms of related obligations.

**10. Provision, Contingent Liabilities and Contingent Assets**

- a. Provisions are recognized for liabilities that can be measured only by using a substantial degree of estimation, if
  1. The Centre has a present obligation as a result of past event.
  2. A probable outflow of resources is expected to settle the obligation.
  3. The amount of obligation can be reliably estimated.
- b. Contingent liability is disclosed in the case of :
  1. A present obligation arising from past event, when it is not probable that an outflow of resources will be required to settle the obligation.
  2. A possible obligation, unless the probability of outflow of resources is remote.
- c. Provisions, Contingent Liabilities are reviewed at each Balance Sheet date.

**11. Events occurring After the Balance Sheet Date**

Where material, events occurring after the date of the Balance Sheet are considered upto the date of approval of accounts by the members of the Governing Council.

**12. Academic Fund**

A percentage as prescribed by the Governing Council of Tata Memorial Centre is transferred from the Hospital Income to a separate fund named as the "Academic Fund". The expenditure incurred towards fulfillment of the objectives is debited to the said fund.

**13. Science & Research Fund**

The Science & Research Fund / Corpus is created in 2000 with the purpose of utilising the interest in the Fund for (i) Support of preventive oncology activities in the country (ii) Support for attending international conferences and training programmes on cancer related topics and (iii) Any other purpose with the approval of the Committee.

**14. Sam Mistry Fund**

The fund is created as per the will of Late Sam Jal Mistry and Late Alice Sam Mistry in 1999. As per the will, the interest and dividend on shares generated from the fund will be utilised equally for treatment to poor cancer patients and scholarship to PG students.



## SCHEDULES FORMING PART OF ACCOUNTS

### SCHEDULE 14: NOTES ON ACCOUNTS

1. Contingent liabilities not provided for in respect of :  
Claims against the hospital made by patients are not acknowledged as debts, since the same are not quantifiable.
2. Estimated amount of contracts remaining to be executed on capital account and not provided for (net of advances) Rs.1,08,24,114/- (Previous year Rs. 1,37,10,821/-)
3. Sundry debtors, and creditors' balances, and balances of certain liabilities are subject to confirmation, reconciliation and consequent adjustments, if any.
4. Fixed Deposits of the Centre includes an amount of Rs. 16750 Lakhs which represents Earmarked Funds kept aside for the capital commitments.
5. During the year 2015-16, an arbitration case was filed on TMC for forfeiture of Earnest Money Deposit (encashment of bank guarantee of Rs.22, 00,000/- and fixed deposit of Rs.20,00,000/-) of M/s B. K. Consortium Engineers Pvt. Ltd. The arbitration was awarded in favour of TMC. The EMD along with interest on fixed deposit amounting to Rs 42,64,658/- is treated as income during the current year.
6. Due to an incident of fire in the drug store in the Main Building Basement on 11<sup>th</sup> February, 2017, the stock of drugs and surgical goods amounting to Rs.6,01,99,611/- was damaged. A claim has been lodged with the insurance agency. The consumption of drugs for the current year includes stock of the above value.
7. One equipment was lost by fire WDV amounting to Rs 2,57,89,355/- as on 31<sup>st</sup> May, 2015, the hospital filled insurance claim which is yet to be received.
8. Prior Period Expenses of Rs.11,00,76,788/- and income of Rs.16,81,581/- included in Income & Expenditure account during the financial year. Outstanding Salary and pension expenses Rs.30,31,03,363/- included in Income & Expenditure account during the financial year.
9. The Centre is covered by a system of internal audit conducted by the Department of Atomic Energy and Indian Audit and Accounts Department.
10. The Centre has filed a writ petition in the Honorable High Court Bombay for non-applicability of Bombay Labour Fund Act, 1956 in the year 2001-02, the final verdict for which is still pending. Each year the centre recovers the LWF amount from employees and also contributes towards the said liability amounting to Rs.82,62,038/- respectively which is disclosed under current liabilities in the financial statement. The centre has also kept as deposit Rs.5, 50,000/- with Hon'ble Bombay High Court.



11. The disclosures pursuant to Accounting Standard 15 (Revised) on "Employee Benefits" are as follows:

(in Rs.)	
<b>Defined Contribution Plan :</b>	
Contribution to Defined Contribution Plan, recognised as an expense and included in "Staff and Welfare" - Schedule 12 in the Income and Expenditure Account are as under :	
- Employers contribution to Provident Fund - Rs.20,82,903/-	
- Employer's Contribution to New Pension Scheme - Rs.6,35,22,108/-	

		<b>Gratuity</b>	
		<b>31-3-2017</b>	<b>31-3-2016</b>
<b>I</b>	<b>Change in obligation during the year</b>		
1	Liability at the beginning of the year	72,61,80,542	67,70,33,382
2	Interest Cost	5,34,39,848	5,08,77,165
3	Current Service Cost	1,04,37,674	1,25,11,992
4	Past Service Cost	31,39,74,250	0
5	Benefit Paid	(8,39,87,966)	(4,58,97,075)
6	Actuarial (Gain)/Loss	23,02,13,540	3,16,55,078
7	Liability at the end of the year	125,02,57,888	72,61,80,542
<b>II</b>	<b>Net asset / (liability) recognised in the Balance Sheet</b>		
1	Liability at the end of the year	125,02,57,888	726,180,542
2	Plan assets at the end of the year	0	0
3	Liability recognised in the Balance sheet	125,02,57,888	726,180,542
<b>III</b>	<b>Expenses recognized in the Income and Expenditure account</b>		
1	Current Service Cost	1,04,37,674	1,25,11,992
2	Interest Cost	5,34,39,848	50,88,71,65
3	Expected Return on Plan Assets		0
4	Actuarial (Gain)/Loss	23,02,13,540	3,16,55,078
5	Past service cost	0	0
6	Total expenses recognised in the Income and Expenditure Account	60,80,65,312	9,50,54,235
<b>IV</b>	<b>Principal actuarial assumptions at the Balance Sheet date:</b>		
1	Discount rate at	7.15%	7.85%
2	Expected return on plan assets	0.00%	0.00%
3	Salary escalation	7.00%	7.00%
<b>General description of the defined benefit plan :</b>			
1	The Centre operates a gratuity scheme, which is an unfunded scheme for qualifying employees. The Scheme provides for lump sum payment to		



	<p>employees on retirement, death while in employment or termination of employment of an amount equivalent to 15 days salary for every completed year of service or part thereof in excess of six months, provided the employee has completed five years in service.</p> <p>Vide Order No. 7/5/2012-P&amp;PW(F)/B dated 26th August, 2016, the Ministry of Finance has extended the benefits of 'Retirement Gratuity and Death Gratuity' to the Central Government employees covered by new Defined Contribution Pension System on the same terms and conditions, as are applicable to employees covered by Central Civil Service (Pension) Rule, 1972. 838 number of employees are covered under this scheme.</p>
2	<p>The Centre operates a leave encashment scheme, which is an unfunded scheme. The present value of obligation under this scheme is based on an actuarial valuation, using the Projected Unit Credit Method, which recognizes each period of service as giving rise to additional unit of employee benefit entitlement and measures each unit separately to build up the final obligation. Based on the actuarial valuation, the liability as at 31<sup>st</sup> March, 2017 works out to Rs. 107,79,50,240/-</p>
3	<p>The Centre operates a Pension scheme which is an unfunded scheme for employees, who have joined prior to 1<sup>st</sup> January, 2004. The benefit is payable at the time of superannuation or voluntary retirement after completion of minimum of 20 years service. Based on the actuarial valuation, the liability as at 31<sup>st</sup> March, 2017 works out to Rs. 1134,48,93,797/-.</p>

12. Figures for the previous year have been regrouped / reclassified wherever necessary to make them comparable with those of the present year.

For G.D Apte & Co  
Chartered Accountants  
ICAI Registration No. : 100515W

Chetan Sapre  
Partner  
Membership No.116952



Mr. Anil N. Sathe  
Chief Adm. Officer

For Tata Memorial Centre

Dr. R.A. Badwe  
Director, TMC

Date:  
Place







Honorable Prime Minister of India, Shri Narendra Damodardas Modi with Shri Ratan Naval Tata (Chairman of Tata Trusts and former Director of Tata Sons), at the release of the book 'Indelible Footprints of the Sands of Time' to commensurate the 75<sup>th</sup> Jubilee Celebrations of Tata Memorial Hospital in May 2017.





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