



Voice of BMPS

An official E-Newsletter of BMPS, Issue 10, November 2022



Marie Skłodowska-Curie
(7 November 1867 - 4 July 1934)

November 7th, 2022

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Editorial

On behalf of Bangladesh Medical Physics Society (BMPS), we wish you all a Happy International Medical Physics day. It is a great pleasure of us to present you the "Voice of BMPS" (Electronic Newsletter of Bangladesh Medical Physics Society) Issue-10, 2022 on this joyful day. We feel honored to publish the newsletter each year on the International Day of Medical Physics (IDMP) that celebrates the birthday of Madam Marie Sklodowska-Curie. The theme of IDMP of this year 2022 is "*Medical Physics for Sustainable Healthcare*".

This edition of the newsletter contains the activities of the active participants of BMPS members. Also it contains the previous one (01) year of progress of BMPS. Medical Physics development in education, profession, training is remarkable. The young generation is driving it utmost to move it forward. A huge thanks to all the persons who contributed by writing wonderful and inspiring articles, without which there wouldn't have been this newsletter issue. I hope you will enjoy reading this issue.

Let's celebrate this joyful day with our best to improve the quality of treatment incorporated with updated technology involving all the medical physics professionals. I thank all the readers for being with us. Please do inform us if you have any suggestions regarding this sector. It will help us to grow and help the world for Sustainable Healthcare System.

Editors

Mr. K. M. Masud Rana

Mr. Safayet Zaman

Chief Editor

Prof. Dr. Hasin Anupama Azhari

Message from President, IOMP



Dear Colleagues from Bangladesh,

As you know, the IOMP celebrates annually the International Day of Medical Physics (IDMP) on November 7 to raise awareness of our profession. This is an important date in the history of medical physics. On that day in 1867, Marie Sklodowska-Curie, known for her pioneering research on radioactivity, was born in Poland. The theme of IDMP 2022 is 'Medical Physics for Sustainable Healthcare'. It is great that the Bangladesh Medical Physics Society (BMPS) took the opportunity to organize IDMP events, to inform people about our very important role in healthcare.

Medical physicists are essential healthcare professionals and are critical members of the whole healthcare team. They work in varied settings such as hospitals, industry and regulatory affairs. Regardless of where medical physicists work, and whether their roles provide direct or indirect patient care, all medical physicists contribute to safe and quality health care. A medical physicist is required to complete six to eight years of higher education that includes training in hospitals. Medical Physicists use this education and training to contribute to patient safety.

As our traditional roles change with incoming technology, there are increasing opportunities for alternative roles in a collaborative clinical environment. New models of care and new medical technologies but also information technology such as Artificial Intelligence and Machine Learning give us now the opportunity to be at the forefront of improving health care outcomes. Together with other members of the health care team, we can make a difference.

I wish you Happy IDMP 2022!

Prof. John Damilakis
IOMP President

Message from President, AFOMP



Greetings!

I am delighted to note that the International Day of Medical Physics (IDMP-2022) is being organized by Bangladesh Medical Physics Society (BMPS) on 7th November 2022.

The BMPS was founded in 2009. The gradual and sustained growth of medical physics as a profession in various clinical practices in Bangladesh owes to this society and is the voice of practicing medical physicists in Bangladesh. BMPS has been striving to uphold medical physicists of Bangladesh on international platforms and a torch bearer in promoting medical physics education and professional development not only in Bangladesh but also in the Asia Oceania and across the world.

Contribution of radiological sciences especially medical physics in healthcare is multi-dimensional. The recent advancements in medical physics be it in Radio Diagnosis, Radiotherapy, Nuclear Medicine, and various fields specially using radiation has made tremendous sprints. To recognize this, 7 November, birthday of Madam Marie Curie is celebrated as International Day of Medical Physics (IDMP) since 2013. IDMP celebrated each year is building greater awareness of the radiological research, diagnosis and treatment contributing to safe and effective patient care. These celebrations are intended for the promotion of the subject medical physics globally, increasing the visibility of the profession and outreach to fellow professionals and general public. The theme of this year's IDMP celebrations is 'Medical Physics for Sustainable Healthcare'.

Physics has got multifarious applications in various fields of life. The use of ionizing radiation in medicine has been playing a remarkable role in enhancing quality of life and saving lives by timely diagnosis of various diseases and treatment of cancer. We all are aware that the roles of medical physicists have become more challenging with the implementation of recent technological advances in imaging and treatment modalities. New technology brings opportunities and at the same time demands new set of skills. The IDMP celebrations offers a forum for the medical physicists of different disciplines to come forward, showcase their professional competencies, meet a number of great medical physicists, and share your invaluable experiences for improving the practice of Medical Physics to stand firm and tall for making healthcare sustainable.

I give my greetings and good wishes to all the distinguished delegates participating in the IDMP 2022 celebrations and wish the programme all the success in achieving its objectives. Congratulations to BMPS on organizing such an event and bringing out an e-newsletter on the occasion. Let me also urge the attendees of this IDMP to not only be confined with the challenges at their own field of specialization but take it as a moral responsibility to be proactive and enthusiastic in learning about the contemporary cutting-edge tools in all aspects of medical physics practice in medicine for a sustainable future in healthcare.

Wishing you all, a pleasant and fruitful IDMP-2022 and continued success in all your professional endeavors.

Prof. Arun Chougule
President AFOMP
Chair, ETC, IOMP
Chairman, IOMP Accreditation Board
Member, Board of Directors IMPCB

Message from Coordinator, IDMP



Dear Medical Physics Colleagues across the Globe,

It is my pleasure to announce to you the theme of this year to mark the celebrations of the International Day of Medical Physics (IDMP 2022):

“Medical Physics for Sustainable Healthcare”

Providing high quality healthcare services requires at least three important pillars:

1. Advanced Technology in the field of Healthcare.
2. Qualified Personnel with adequate education and training in healthcare and technology.
3. Intellectual System that links the above two pillars to provide a complete Pathway of Sustainable Healthcare Services.

We strongly believe that Medical Physicists across the globe furnished with these three pillars play an important and crucial role in offering a sustainable HealthCare service to humanity. The proof is evident since the discovery of X-Ray in 1895 where Radiation was and still an essential entity in the diagnosis and therapy of many diseases. This system of healthcare services was sustained and developed during more than a century of advanced technologies and competent medical physicists. IOMP as well as many relevant organizations in Medical Physics fields, work together to achieve such noble cause and urge all its members to do so.

I wish all my colleagues around the World a Happy Medical Physics Day. Enjoy the celebrations of this day and make sure as a Medical Physicist to keep on going!

Ibrahim Duhaini, PhD, FIOMP, DIMPCB

IOMP Treasurer

IDMP Coordinator

Message from President, BMPS



It is my pleasure that "Bangladesh Medical Physics Society (BMPS)" is going to observe the International Day of Medical Physics (IDMP) on 7th November- the birthday of Mary Sklodowska Curie. I am delighted that BMPS publishes its electronic newsletter- "Voice of BMPS" on this auspicious day every year.

"Medical Physics for Sustainable Healthcare" has been chosen as the theme for this year. Medical Physicists are healthcare professionals recognized by World Health Organization (WHO) and International Labour Organization (ILO). As like as other healthcare workers, Medical Physicists were also in the frontline in dealing with the patients during COVID-19 pandemic situation. Therefore, they deserve recognition and appreciation for their efforts. It is expected that this year's theme may bring awareness and importance of medical physicist to sustain healthcare discipline.

I would like to thank all BMPS colleagues for their great initiatives and efforts for the celebration of IDMP 2022 and I also wish all my Medical Physicist colleagues across the globe a "Happy International Medical Physics Day".

M. Akhtaruzzazman, PhD

President

Bangladesh Medical Physics Society (BMPS)

Message from General Secretary, BMPS



Dear Colleagues,

Greetings from Bangladesh Medical Physics Society (BMPS)!

It is my pleasure to inform you that BMPS celebrates International Day of Medical Physics (IDMP) on 7th November 2022. This is an important date in the history of medical physics. On that day in 1867, Marie Sklodowska-Curie, known for her pioneering research on radioactivity, was born in Poland.

This year, the theme of the IDMP 2022 has been chosen "*Medical Physics for Sustainable Healthcare*" which reflect that Medical Physicist personnel are very important part for success of healthcare profession. Medical Physicist are usually contribution to medical physics in various area such as Radiotherapy, Radio diagnostic, Nuclear Medicine, Radiation Protection and many other clinical departments as a main and supporting staff. It is impossible to think of radiotherapy or radiation protection without the involvement of medical physicists.

Every 7th November BMPS celebrates this day through organizing seminar, rally as well as publication of an E-newsletter is a continuation of each year. As part of the celebration of IDMP, BMPS is going to publish its of an E-newsletter "*Voice of BMPS*" Issue 10 in this year also.

This newsletter contains several interesting articles, Continuous Professional Development (CPD), as well as information about past activities on medical physics. The content is interesting, absorbing, insightful, and has depth for everyone keen to learn something new.

I wish all my colleagues around the World a Happy Medical Physics Day. Enjoy the celebrations of this day by preparing symposiums, seminar, rallies, or any other means to show our pride of being a Medical Physicist!

Thank You!

Md. Jobairul Islam

General Secretary

Bangladesh Medical Physics Society (BMPS)

General Articles

Essential Managerial Attributes of Medical Physicists working in Hospitals: Communication, Leadership, Decision Making and Management

Suresh Poudel

Medical Physicist, Department of Radiation Oncology,
B. P. Koirala Memorial Cancer Hospital, Chitwan, Nepal
Secretary, Nepalese Association of Medical Physicists.

Medical physicists are essentially the healthcare professionals working in hospitals in multidisciplinary team. In order to be a medical physicist, one has to complete a tertiary level of their education in medical physics or physics. University education in general train medical physicists to solve problems which requires knowledge of physics in medicine. However, in hospital a medical physicist is hired at such a position which requires managerial skills in addition to his/her regular scientific job. Managerial skills entail communication, leadership, decision making and management. Thus a medical physicist has to equip himself/herself with certain attributes like leadership, communication and networking skills to sustain their job and grow as a strong professional.

In addition to sound knowledge and skills areas of medical physics, a medical physicist has to build good verbal communication and interpersonal skills. These skills are essential for collaborating with others, communicating with supervisor, and speaking with patients and co-workers. For effective communication, one has to speak clearly, concisely, and loudly (but not too loud). Effective communication skills make medical physicists confident in dealing different situations, ranging from patient dealing to internal and external environments. Medical physicists who make their work relatable to variety of audiences have value both inside and outside of the field. The public awareness of medical physics and the field's future depend on how well medical physicists are able to share the importance of their work and field.

Leadership is an important function of management. Leaders influence the behavior of others. Leadership is guiding and influencing people to achieve goals willingly and enthusiastically in a given situation. There are various occasions wherein a medical physicist has to use his/her leadership skills to bring in positive changes in functioning of a hospital. For example, a medical physicist shall give relevant inputs to policy making, notify top management on policy changes and suggest its impact on hospital's performance. It helps bring in new technologies, skills, innovation in functioning of hospital and thus its performance.

A decision is a choice among alternatives. It is a course of action consciously chosen from acceptable alternatives to achieve goals. Decision making is problem solving by selecting the best course of action from acceptable alternatives to achieve goals. In this pretext, a medical physicist is involved in various activities like preparing the specification of medical equipment, selecting alternative bunker designs, etc. These require him/her a managerial skill of decision making. In addition, a medical physicist shall do quality networking with professionals to share wealth of knowledge and resources.

Management works through and with people to get the jobs done. It performs the functions of planning, organizing, staffing, leading and controlling. In many occasions, a medical physicist is hired as a professional with deep scientific aptitude and clear insight of technology, he has to do effective planning to get the job done in time, for example, before or during installation, acceptance and commissioning of machine, suggest methods for organizing, staffing and controlling for better performance of hospital.

To sum up, these managerial attributes provide opportunities for a medical physicist to flourish their talents and skills, while strengthening their roles in hospitals for their professional development.

Report on 21st Asia Oceania Congress of Medical Physics (AOCMP-2021)

Jobairul Islam, M Akhtaruzzaman
Bangladesh Medical Physics Society (BMPS)

AOCMP-2021, Dhaka, Bangladesh

The 21st Asia Oceania Congress of Medical Physics (AOCMP-2021) hosted by the Bangladesh Medical Physics Society (BMPS) at the United International University (UIU), Dhaka, Bangladesh from 10-12 December 2021. The co-organizers were Bangladesh Atomic Energy Commission (BAEC), National Institute of Cancer Research and Hospital (NICRH), United International University (UIU) and South Asia Centre for Medical Physics and Cancer Research (SCMPCR). The congress was endorsed by the International Organization for Medical Physics (IOMP), Middle East Federation of Medical Physics (MEFOMP) and European Federation of Organizations for Medical Physics (EFOMP). This was the first time the AFOMP congress held in Bangladesh.

This International conference provided a perfect forum to fulfil the objective, foster knowledge up gradation and encourage exchange of ideas. The comprehensive scientific programme divided into Kiyonari Inamura Oration Lecture, plenary session, scientific session, special ceremony, sponsor presentation, mini symposium session, poster session, award ceremony and valedictory session. A total of 360 participants were in attendance from 28 different countries in Asia-Oceania, Europe, Middle East and the US.

Many companies had exhibition stands at AOCMP-2021, thus allowing the participants to see the latest development in the medical physics related industry. The sponsors and exhibitors at AOCMP-2021 were: Varian, Team Best, Siemens Healthcares, Elekta, PTW, United International University (UIU), Labaid Cancer Hospital and Super Speciality Center, Oregon, Vision RT, LAP, RTI, ZEISS, PICO. We express sincere gratitude to all sponsors and exhibitors.

At a Glance: AOCMP-2021

Key Note Speakers- 6 (IAEA, IOMP, AFOMP, EFOMP, MEFOMP, DFMP)	Invited Speakers-26 Asia-Oceania, Europe, Middle East and the USA.	Oral Presenters- 92 Asia-Oceania, Europe, Middle East, Africa and the USA.	Mini Symposium-05 (IMPCB, AFOMP, EFOMP, COVID-19, Women for Women,
E-Poster- 64	Sponsor Presentations- 06	Kiyonari Inamura Oration Lecture	Chair, Co-Chair- 26



Fig: Virtual Platform, AOCMP-2021

Special Ceremony

Mr. Ziaul Hasan, ndc (Chief Guest), Secretary, Ministry of Science and Technology, People's Republic of Bangladesh; Professor Dr. Sanowar Hossain (Special Guest), Chairman, Bangladesh Atomic Energy Commission (BAEC); Professor Dr. A. K. H. Enayet Hussain (Special Guest), Director General, Medical Education, Ministry of Health and Family Welfare, People's Republic of Bangladesh; Dr. Kazi Anowarul Hoque (Special Guest), Additional Secretary (PRL), Local Government Division, Ministry of Local Government, Rural Development & Cooperatives, Bangladesh; Prof. Dr. M Iqbal Arslan (Special Guest), President, Swadhinata Chikitshak Parishad (SWACHIP); Prof. Dr. Chowdhury Mofizur Rahman (Patron), Vice-Chancellor, United International University; Mr. Anwarul Islam, President, BMPS; Prof. Dr. Hasin Anupama Azhari, Organizing Chairperson, AOCMP-2021; Prof. Dr. Arun Chougule (India), President, AFOMP; Prof. Dr. Eva Bezak (Australia), Vice President, AFOMP.

The session presided over Professor Dr. Golam Abu Zakaria, Patron, Organizing Committee, AOCMP-2021.

They delivered valuable speeches on medical physics, sharing experiences with scientists and helping the medical physics community by collaborative work.



Fig: Special Ceremony, AOCMP-2021

Scientific Session

Kiyonari Inamura Oration Lecture, Keynote Lectures (6), Invited Lectures (26), sponsor presentations (06), Mini Symposium (5), Oral (92) and e-poster presentations (64) in different area such as radiation oncology, radiation protection, treatment planning system, dosimetry, brachytherapy, radiology, molecular imaging, nuclear medicine, imaging, and advanced biomedical engineering were presented by local and foreign presenters during this program.



Vendor Presentation

Six vendors presented their paper on modern and updated technology of medical physics from Varian Medical Systems, Team Best, Elekta, PTW, Carl Zeiss, LAP.



Award Ceremony

Judges selected three best papers on radiotherapy session, radiology and imaging session based on the evaluation criteria out of 92 oral presentations. Also, selected three best papers on radiotherapy, radiology and imaging, nuclear medicine based on the evaluation criteria out of 64 e posters.

AFOMP Award

Best Paper Award	Yoshiro Ieko (Japan)
C. V. Saraswathi – A.N. Parameswaran Memorial AFOMP Best PhD Award	Wonjoong Cheon (Korea)
Young Achiever Award	Ying Song (China)
Prof. Sung Sil Chu's AFOMP Best Student Publication Award	Hemalatha Athiyaman (India)

AOCMP-2021: Best Oral Presenters Name

Position	Radiotherapy	Radiology and Imaging
1 st	<p>Mohammad Amin Mosleh-Shirazi</p> <p>“Influence of Post-synthesis and Post-irradiation Times on Dosimetric Properties of a VIPET-type Gel Dosimeter”</p>	<p>Susmita Afroz</p> <p>“Cluster Size Analyses of ALPIDE-CMOS Pixel Sensor for pCT”</p>
2 nd	<p>Abdul Sattar Khalid</p> <p>“A Retrospective Study on The Dosimetric Effect of Not Applying A Shift in Varian Ring Applicators For HDR Cervix Brachytherapy Treatments”</p>	<p>Kuratani Yosuke</p> <p>“Translation from Non-Contrast to Contrast Images by Cycle-GAN in Head-Neck Vascular CT Imaging”</p>
	<p>Miriam Eckl</p> <p>“Dosimetric Benefits of Daily Treatment Plan Adaptation for Prostate Cancer Stereotactic Body Radiotherapy Based on Synthetic Cone-Beam CT”</p>	<p>Katsumi Tsujioka</p> <p>“Image quality evaluation on-center and off-center FOV of CT (Spatial resolution and motion artifacts)”</p>
3 rd	<p>Nur Asilah Jalalludin</p> <p>“Photon Beam Commissioning of Elekta Versa HD Linear Accelerator: A Multi-Institutional Study”</p>	

Best Poster Award

Position	Radiotherapy	Radiology & Imaging	Nuclear Medicine
1 st	<p>Kalyan Mondal</p> <p>“Plan Quality Score To Evaluate The Impact Of Dtdc On Ipsa Optimized Treatment Plans Of Mupit Based Interstitial Brachytherapy In Cervical Cancer”</p>	<p>Urshella Hishaam</p> <p>“Optimizing Image Noise as a means to Improve Computed Tomography ATCM in Sri Lanka”</p>	<p>Dr. Chai Hong Yeong</p> <p>“Medical Imaging Capabilities of Neutron-Activated Samarium-153 Polystyrene Microspheres As A Theranostics Agent After Direct Intra-Tumoural Injection On Sprague-Dawley Rats With Xeno transplanted Liver Tumours”</p>
2 nd	<p>Cheung Ho Yin Anson</p> <p>“Dosimetric Evaluation of Helical Tomotherapy (HT) versus Volumetric Arc Therapy (VMAT) in Patients with Liver Radiotherapy Treatment”</p>	<p>Dr. Bijan Hashemi</p> <p>“Assessment of Abdomen-Pelvis CT Protocols Based on Doses for Various Patient Sizes using Anthropomorphic (XCAT) Phantoms and Monte Carlo Simulation”</p>	<p>Cheung Ho Yin Anson</p> <p>“Respiratory gated (4D) FDG-PET/CT scan for liver malignancies: Feasibility in liver cancer patient and tumour quantitative analysis”</p>
3 rd	<p>Sathiyaraj</p> <p>“Validation of non-coplanar dosimetry of SRS/SRT using Octavius 4d dosimetry system”</p>	<p>Akyea-Larbi Kofi Okyere</p> <p>“Benchmarking of a New Automatic CT Radiation Dose Calculator”</p>	<p>Shinji Kawamura</p> <p>“Study on the evaluation method of 125I source strength inserted in a sterilized cartridge”</p>

Mode Of Congress

The congress had been done virtually. The presenters had been delivered their speech over the recording and in live. Chair and Co-Chair conducted the sessions. The presenters were also present in each and every session for question-and-answer session.

Closing Ceremony

AFOMP President, Vice-President, Secretary General and Organizing Secretary shared their experiences about the arrangement of this international program for the inspiring young generation.



Fig: Closing Ceremony, AOCMP-2021

Acknowledgement

We are thankful to all of our BMPS members, local and foreign participants, colleagues, contributors, organizing committee members, co-organizers, sponsors, scientists, researchers, students, and all others for their support of the AOCMP-2021. Specially, we are very thankful to Design Accent team who had supported our virtual platform of AOCMP-2021.

Establishment of A State-of-the-Art Cancer Care Center in the Port City Of Bangladesh- An Evercare Initiative

M. Akhtaruzzaman, PhD

Department of Radiation Oncology, Evercare Hospital Chattogram (EHC)

Cancer affects people in all countries regardless of their age, gender or socio-economic conditions. According to World Health Organization (WHO), it is estimated that the global cancer burden will increase from 12.7 million new cases per year in 2008 to 21.4 million per year by 2030, with nearly two-thirds of all cancer diagnoses occurring in low- and middle-income countries. With respect to the global context, about 24.59% populations are present in South Asia area and the burden of cancer death is 68.85%. As far as cancer in the South Asia region is concerned, incidence of new cases is 10.23 % and the burden of cancer deaths as compared to the incidence is 68.44 % of the world's cases. This well-known fact indicates that this region of the world requires improving its strategies in cancer management.

According to WHO's updated estimation, the number of cancer patients are increasing day by day and at present there are over 1.5 million cancer patients in Bangladesh. It also says every year 200,000 people are attacked by cancer and 150,000 people die of the disease. The Cancer Awareness Foundation Bangladesh says the country at present has 37 cancer treatment facilities, which is ridiculously inadequate, and unfortunately most of them are situated in Dhaka.



Figure 1: Evercare Hospital Chattogram (EHC)



Figure 2: Reception of Radiation Oncology
Department-EHC

Although there are a few chemotherapy facilities available in Chattagram, however, unfortunately, there is no comprehensive cancer care center having modern radiotherapy treatment facilities in Chattagram except a single cobalt teletherapy and brachytherapy machine serving the patient in a government hospital. Therefore, it is a burning need of establishing a specialized cancer center in the port city Chattagram. One bit of good news is “EVERCARE HOSPITAL CHATTOGRAM (EHC)” has taken the initiative in setting up an international-standard cancer center, which will be launched in mid-August of this year. However, the chemotherapy and diagnostic facilities are already available at the EHC

The radiation oncology department will be well equipped and governed by the skilled expertise from home and abroad. It is going to have the latest VersaHD linear accelerator with respiratory gating, CBCT, 6D treatment couch along with the hi-tech dosimetry systems and immobilization devices. The department will offer all advanced treatment techniques including SRT and SBRT. This Cancer Center is aiming to focus providing the quality treatment with affordable cost.

Radiotherapy Treatment in Rajshahi Medical College Hospital, Bangladesh

Shahidul Miah

Department of Radiotherapy, Rajshahi Medical College Hospital, Rajshahi, Bangladesh

Introduction

Rajshahi is one of the biggest division in Bangladesh. Rajshahi Medical College Hospital established in 1958. The department of radiotherapy at Rajshahi Medical College was started from 1977. It was the second such institution in erstwhile East Pakistan after Dhaka Medical College. It is a large hospital that is the central provider for advanced health care in the northern part of Bangladesh. Here treatment is given in indoor and outdoor basis facilities. In this department has limited equipped to provide almost all possible therapeutic services for inpatients and outpatients like Radiotherapy, Brachytherapy, and Chemotherapy. The surgery treatment facilities are given by through the department of surgery and allied departments in this hospital.

In this department has provided both radiotherapy facilities (external beam radiotherapy and Brachytherapy).

Teletherapy

For Teletherapy Cobalt-60 machine is available since 1996 for cancer treatment. At present, in this department has an advanced technology 30 pair MLC based Cobalt 60 Teletherapy Machine which is installed in 2018 with PROWESS treatment planning software system and Record & Verifying system. It has multiple treatment options such as 3DCRT, IMRT etc. The cancer patient now can get advance and accurate treatment than before.

Brachytherapy

Brachytherapy treatment is very effective for many cases of cancer patients specially of cervical cancer. In this hospital most cervix cancer patients got the cervical cancer treatment by using High Dose Rate Brachytherapy machine with cobalt 60 source. A Brachytherapy treatment was started from 2016 and it's going still now. For Brachytherapy treatment has used BEBIG HDR Brachytherapy remote after loading machine with well

equipped HDRPlus Treatment Planning software systems and different type of applicator.

Manpower

Manpower facilities are limited, five radiation oncologist, two medical physicist, three radiation technologist and three nurses work here regularly. Based on patients fluence in this department has needed more doctor, physicist and associate other staff.

Summary

According to this estimation of Rajshahi district needs two radiotherapy centers and needs around four Teletherapy and two Brachytherapy machine respectively. However, in Rajshahi there are only one radiotherapy centers with one teletherapy cobalt machine and HDR Brachytherapy machine. Now In this department cancer patients are getting modern treatment. We are committed to serve the patient as our best with this limited facilities. There is no privet center in rajshahi. As a result a huge number of cancer patients come here for treatment. The most of the patients need to wait in serial for Radiotherapy for the lack of machine. In every year radiotherapy depaertment of Rajshahi Medical College Hospital has organized different cancer awarness program like World Cancer Day, Breast cancer awarness month with screeing program etc.



Fig: Radiotherapy facilities at Rajshahi Medical College Hospital

IPD will be launched with comprehensive services in November 2022



- **Radiation Oncology Unit**
External Beam
Brachytherapy
- **Medical Oncology Unit**
Chemotherapy
Hormone Therapy
Immunotherapy
Genome Therapy
- **Surgical Oncology**
Gynae Oncology Unit
Head-Neck Oncology Unit
Ortho Oncology
Uro-Oncology
- **Breast Cancer Unit**
- **Hemato Oncology Unit**
- **Pediatric Hemato Oncology**
- **Oncopsychology**
- **Pain and Palliative Care Unit**
- **PICU**
- **Medicine and Allied Service**
Interventional Radiology Unit
Neurology Unit
Pulmonology/Respiratory Unit
Internal Medicine Unit
Gastroenterology Unit
Endocrinology Unit
Rheumatology Unit
- **Physical Medicine and Rehabilitation Unit**
- **Dermatology Unit**
- **Surgery and Allied Service**
Gynecology Unit
General and Laparoscopic Surgery Unit
Hepatobiliary and Pancreatic Surgery Unit
Oral and Maxillofacial Surgery Unit
ENT Surgery Unit
Neuro Surgery Unit
Colorectal Surgery Unit
Thoracic Surgery Unit
- **Hospice Centre**
- **Bone Marrow Transplantation Centre**
- **Liver Transplantation Centre**
- **Kidney Transplantation Centre**
- **Nephrology and Dialysis Centre**
- **30 Bedded Chemotherapy Day-Care**
- **30 Bed ICU/ HDU**
- **6 Modular Operation Theater**
- **Robotic Surgery Institute**
- **PET CT Scan**

180 World-class Multidisciplinary Bedded Cancer Care Hospital Now in Bangladesh

- **Laboratory with latest technology**
Histopathology and Cytopathology
Flow Cytometry
Molecular Lab
Next Generation Sequencing (NGS)
MRI 3T
CT Scan
Ultrasonography 4D
Mammography 3D



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Scientific Articles

A Study On The Response Of Concurrent Chemoradiation With Gemcitabine Versus Cisplatin In Patients With Locally Advanced Cervical Carcinoma

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Abstract

Introduction: Cervical cancer is the most common cause of cancer death in women. Currently, platinum based concurrent chemoradiation therapy is the standard of care for locally advanced cervical cancer but treatment results are disappointing, particularly for women with bulky tumor. To improve this result, several non-platinum based agents with concurrent chemoradiation have been evolved.

Objective: To compare the response between concurrent chemoradiation with gemcitabine and cisplatin followed by intracavitary radiotherapy in patients with locally advanced cervical carcinoma.

Material and Methods: This was a quasi-experimental study, where 66 patients with untreated invasive squamous cell carcinoma of the cervix of stage IIB to stage IVA were enrolled from the Radiation Oncology Department of Rajshahi Medical College Hospital from April 2019 to March 2020. Duration of the study was 2 years. In each arm 33 patients were assigned to received 150 mg/m² of gemcitabine (arm A) or received 40mg/m² of cisplatin (arm B) weekly along with external beam radiation therapy (EBRT). EBRT dose was 50 Gy in 25 daily fractions followed by intracavitary radiotherapy (ICRT) of 21 Gy in 3 fractions.

Results: The mean age was 45.4 years & 47.3 years in arm A & B respectively. Most of the patients were in stage IIB group (59.1% patients) and most of them were moderately differentiated (62.1% patients) in both arms. After 3 months of treatment, the complete response was found in 81.8% & 72.7% patients and partial response was seen in 12.1% & 18.2% patients in arm A & B respectively (p=0.678). The grade 2 and 3 haematological tox-

icities (anaemia, neutropenia, thrombocytopenia) were more common in arm A compared to arm B ($p < 0.05$). The grade 2 and 3 proctitis & skin toxicity were more in arm A & renal toxicity was higher in arm B ($p = 0.163$). Conclusion: Concurrent chemoradiation with gemcitabine can be used as an alternative to cisplatin when cisplatin is contraindicated. However further large, randomized study is needed to reach any form of conclusion. **Key-words:** Locally advanced cervical cancer, concurrent chemoradiation, gemcitabine.

Introduction

Cervical cancer ranks fourth most common malignancy among women with both incidence (6.6%) and mortality (7.5%) reported by WHO on 12th September 2018. Approximately 90% of deaths from cervical cancer occurred in low and middle-income countries. The high mortality rate from cervical cancer globally could be reduced through a comprehensive approach that includes prevention, early diagnosis, effective screening, and treatment programs. The disease is usually advanced by the time of diagnosis with a high prevalence in developing countries, reported by the New England journal of Medicine. American cancer society of clinical oncology reported on 2018 that the 5-year survival rate for all women with cervical cancer is about 67%. Cervical cancer treatment depends on the stage of the disease and different treatment groups with curative intent have been established. According to the classification of the International Federation of Gynecology and Obstetrics (FIGO cancer report, 2018) stages between IIB and IVA are defined as locally advanced cervical cancer (LACC), which includes tumor with parametrial invasion (IIB), involve the lower third of the vagina but not extending to the pelvic wall (IIIA) or extending to the pelvic sidewall and/or involving the lower third of the vagina and/or causing hydronephrosis or nonfunctioning kidney (IIIB), invasion to the mucosa of the bladder or rectum and/or extending beyond the true pelvis (IVA). For locally advanced cervical cancer, concurrent chemoradiation is the treatment of choice in many countries (Lora et al., 2017). A meta-analysis of individual patient data from 18 randomized trial showed chemoradiation reduces local & distant recurrence & improves disease free survival (Vale et al. 2008). Platinum based chemotherapy improves progression free survival (Rose et al., 1999; Pereira et al., 2016) & reduces 30-50% risk of death in locally advanced cervical cancer (Gonzalez et al., 2011). A recent meta-analysis of 8 randomized trial sup-

port this claim (Lukka et al., 2017). In the decade since the introduction of chemoradiation (CRT), there have been no further advances in the management of locally advanced cervical cancer. Although most of the trial showed cisplatin is the most efficacious but the jury is still out there searching for the best drug available in concurrent setting. Some studies showed better response (CR>80%) in combination of platinum with non-platinum-based chemotherapy but toxicity rates were higher (Kalagchi et al., 2016; Hashemi et al., 2013; Zarba et al., 2003). To improve the survival as well as tolerability there is a need to explore the use of alternative chemotherapeutic agents. A variety of agents such as carboplatin, paclitaxel, 5-FU have been studied with good result in cervical carcinoma. Gemcitabine is a cell cycle specific cytotoxic agent & a novel deoxycytidine analogue (Kundu et al., 2008). It acts as a radiosensitizer at low doses & also shows synergistic effect with cisplatin (Chufal et al., 2007). Gemcitabine has been used in cervical cancer with good result both as a single agent (Cetina et al., 2004; Verma et al., 2009; Thakur et al., 2018) & in combination with cisplatin concurrent with radiotherapy (Umanzor et al., 2006; Gonzalez et al., 2011).

Methods and Materials

This prospective quasi-experimental study was conducted in the Department of Radiotherapy, Rajshahi Medical College and Hospital, Rajshahi from June 2018 to September 2020.

Eligibility criteria

Newly diagnosed 66 patients with histopathologically confirmed locally advanced squamous cell carcinoma of cervix, with FIGO stage IIB to IVA and no evidence of distant metastasis were enrolled in this study. ECOG performance score was upto 2 and age between 18 years and 60 years. Patients were excluded if there was evidence of uncontrolled infection, patients with double primaries, pregnant or lactating woman. Written informed consent was obtained from the patients prior to participation in the study and ethical clearance was given by local ethics committees.

Treatment Schedule

Radiotherapy

All patients were irradiated by external beam radiotherapy to the pelvis using cobalt-60 machine with a total dose of 50 Gy given in 25 fractions of 2 Gy per fraction, 5 fractions per

week starting 1 st day of the first chemotherapy. Anterior and posterior field was used where superior border was at L5-S1 junction, inferiorly at the bottom of the obturator foramen or the lower extension of the disease and laterally 2 cm beyond the lateral margins of the bony pelvic wall.

Intracavitary Radiotherapy

All the patients were treated with high dose rate intracavitary brachytherapy using after-loading cobalt-60 sources (within 1 week of completion of treatment with EBRT). A dose of 7 Gy per fraction, total 21 Gy in 3 fractions over 3 weeks were given to the point A. Bladder and rectal dose were limited to 80% prescribed dose as per ICRU recommendations.

Chemotherapy

Arm - A:

Patients in the study arm (A) received concurrent chemoradiation with gemcitabine at a dose of 150 mg/m² weekly as intravenous (IV) infusion. It was administered 2 hours before radiotherapy. Before infusion of gemcitabine, premedication with, antiemetic, H₂ blocker and steroids were given intravenously. Gemcitabine was diluted in 250 ml normal saline and infused over 30 minutes. No pre or post-hydration was given.

Arm - B:

Patients in the control arm received concurrent chemoradiation with cisplatin at a dose of 40 mg/m² weekly as intravenous (IV) infusion. It was administered 2 hours before radiotherapy. Before infusion of cisplatin, premedication with, antiemetic, H₂ blocker and steroids were given intravenously. Cisplatin was diluted with 500 ml normal saline and infused over one hour. 1000 ml normal saline was given as post chemo hydration followed by 1 amp inj. Lasix intravenously.

Patient Assessment

During concurrent chemoradiation therapy, patient was assessed every week during therapy. Symptomatic response and acute toxicities were assessed in every week with physical examination. Tumor response was evaluated according to RECIST criteria. Toxicity was observed according to RTOG cooperative group common toxicity criteria and common terminology criteria for adverse effects (CTCAE) version 5.0 (2018). After treatment patient was carefully supervised to attain first follow-up at 6 th week and second

follow-up at 12 th week for evaluation of response. Follow up examination includes history taking, physical examination, radiological and laboratory tests as needed.

Statistical analysis:

Data analysis was done according to the objectives of the study by using the SPSS (Statistical Package for Social Science) software program for windows, version 20.0 available in the institute.

Table: 1 Patient's baseline characteristics

Baseline characteristics		Arm-A		Arm-B	
		N=33	%	N=33	%
Age (years)	Mean \pm SD	45.36 \pm 9.270		47.30 \pm 8.229	
Education	Illiterate	18	54.6%	18	54.5%
	Primary	12	36.4%	12	36.4%
	SSC	3	9.1%	3	9.1%
Economic status	Lower class	27	81.8%	29	87.9%
	Middle class	5	15.2%	3	9.1%
	Upper class	1	3.0%	1	3%
ECOG performance status	PS=0,1	25	75.8%	27	81.8%
	PS=2	8	24.2%	6	18.2%
Histology grading	Well differentiated	5	15.2%	5	15.2%
	Moderately differentiated	21	63.6%	20	60.6%
	Poorly differentiated	7	21.2%	8	24.2%
Stage	Stage IIB	20	60.6%	19	57.6%
	Stage IIIA	2	6.1%	3	9.1%
	Stage IIIB	10	30.3%	8	24.2%
	Stage IVA	1	3%	3	9.1%

Table: 2 Clinical Response at the end of treatment

Response	Arm A	Arm B
Response after EBRT		
CR	60.6% (20)	54.5% (18)
PR	36.4% (12)	39.4% (13)
SD	3% (1)	3% (1)
PD	0	0
Response after ICRT		
CR	66.7% (22)	60.6% (20)
PR	33.3% (11)	36.4% (12)
SD	0	3% (1)
PD	0	0
Response after 1st follow up		
CR	75.6% (25)	69.7% (23)
PR	21.2% (7)	24.3% (8)
SD	3% (1)	3% (1)
PD	0	3% (1)
Response after 2nd follow up		
CR	81.8% (27)	72.7% (24)
PR	12.1% (4)	18.2% (6)
SD	0	0
PD	6.1% (2)	9.1% (3)

CR=complete response, PR=partial response, SD=stable disease, PD=progressive disease

Table: 3 Acute Toxicity of Concurrent Chemoradiation

Toxicity	Arm-A (CCRT with gemcitabine)				Arm-B (CCRT with Cisplatin)				P-value
	No toxicity	G-I	G-II	G-III	No toxicity	G-I	G-II	G-III	
Anaemia	0	27.3%	60.6%	12.1%	18.2%	54.6%	24.2%	3%	0.003
Neutropenia	21.2%	48.5%	24.2%	6.1%	57.6%	36.4%	6.1%	0	0.005
Thrombocytopenia	75.6%	24.2%	0	0	93.9%	6.1%	0	0	0.039
Vomiting	30.3%	39.4%	24.2%	6.1%	18.2%	27.2%	36.4%	18.2%	0.209
Diarrhoea	15.2%	27.2%	42.4%	15.2%	21.2%	45.5%	24.2%	18.2%	0.265
Proctitis	0	54.5%	36.4%	9.1%	0	54.5%	36.4%	9.1%	0.598
Cystitis	0	90.9%	90.9%	0	0	90.9%	9.1%	0	0.282
Renal toxicity	87%	3%	0	0	87.9%	12.1%	0	0	0.163
Skin toxicity	0	39.4%	45.5%	15.1%	0	57.6%	33.3%	9.1%	0.137

Results

A total 66 patients were analyzed in this study. Detailed of patient's characteristics are shown in Table 1. The mean age was 45.36 (SD: 9.270) years in arm A & 47.30 (SD:8.229) years in arm B. Most of the patients (81.8% vs 87.9%) came from lower economic class &

were illiterate (60.6% vs 54.5%). Significant number of the patients were in stage IIB group (60.6% & 57.6% in arm A & B respectively) & (63.6% vs 60.6%) moderately differentiated. According to ECOG performance status 75.8% & 81.8% patients were in PS 0, 1 group in arm A & arm B respectively.

After completion of CCRT 60.6% & 54.5% patients showed complete response and 36.4% & 39.4% had partial response in arm A & arm B respectively. After completion of intracavitary radiotherapy (ICRT), 66.7% & 60.6% had complete response while 33.3% & 36.4% had partial response in arm A & arm B respectively. After 6 weeks of completion of treatment 75.8% & 69.7% showed complete response while 21.2% & 24.3% had partial response in arm A & B respectively. After 3 months of treatment, the complete response was found in 81.8% & 72.7% and Partial response was seen in 12.1% & 18.2% patients and progressive disease was found in 6.1% & 9.1% patients in arm A & B respectively. Treatment response is listed in Table 2.

The acute toxicities observed during & after radiotherapy listed in Table 3. The grade 2 and 3 anaemia were higher in arm A compared to arm B, grade 2 anemia were found in 60.6% and 24.2% patients in Arm A and B respectively. The grade 2 neutropenia was more common in arm A (24.2%) compared to arm B (6.1%) & 6.1% patients had grade 3 neutropenia in arm A. The grade 1 thrombocytopenia was observed in 24.2% & 6.1% patients in arm A & B respectively. Acute hematological toxicities were higher in arm A compared to arm B and the difference was statistically significant (P value <0.05). The grade 2 vomiting were more observed in arm B than arm A, 24.2% and 36.4% patients in arm A and arm B respectively. The grade 2/3 diarrhoea and proctitis were more commonly observed in arm A compared to arm B, 36.4% patients in arm A and 27.2% in arm B showed grade 2 diarrhoea, 42.4% and 15.2% patients in arm A and 24.2% and 9.1% in arm B showed grade 2 and 3 proctitis respectively. The grade 2,3 skin toxicity was more common in arm A (45.5% and 15.1%) compared to arm B (33.3% and 9.1%). The grade 2 cystitis was slightly more in arm B compared to arm A (9.1% in arm A and 18.2% in arm B). Renal toxicity was higher in arm B compared to arm A (3% patients in arm A and 12.1% patients in arm B). These difference between two the arms were not statistically significant (P value >0.05).

Discussion:

Cervical cancer is one of the most common gynecological cancers worldwide. As most of the cases presented with advanced stage due to lack of screening and early detection

programs, treating cervical cancer is a bit of challenging in a developing country like Bangladesh. The standard of care for locally advanced cervical cancer is concurrent chemoradiation (CCRT) with cisplatin followed by brachytherapy (Eifel et al., 2004; Rose et al., 1999). Despite of using concurrent cisplatin along with radiation locoregional failure rate is still high. For the improvement of locoregional failure rate other approaches were analysed with different regimens. Gemcitabine has shown promising radiosensitising effect in clinical phase II trials (Zarba et al., 2003; Umanzor et al., 2006).

This study was done during the period of June 2018 to August 2020. The aim of the study was to compare the treatment outcome of concurrent chemoradiation between weekly cisplatin and gemcitabine in locally advanced cervical carcinoma. During this period patients with locally advanced cervical carcinoma were assessed for eligibility and ultimately 66 patients were included in the study after meeting inclusion criteria and giving written consent.

The mean age was 45.4 (SD \pm 9.270) years (range: 25-60 years) in arm-A and 47.3 (SD \pm 8.229) years (range: 30-60 years) in arm-B and most of the patients were in between 40-60 years of age group. This observation correlates with SEER 2016 and CDC statistics 2017. In the study, majority of the patients were from low socioeconomic condition (81.8% in arm A and 87.9% in arm B). This result was also found by the study of Thakur et al. (2018), where women from low social classes have a higher incidence of developing cervical cancer. Here most of the patients were in stage IIB (60.6% patients in arm A and 57.6% patients in arm B), which was similar with several studies (Gonzales et al., 2011; Eifel et al., 2003). According to histopathology, all patients were squamous cell carcinoma & regarding grading of tumor, most of them were moderately differentiated (63.6% vs 60.6%). This observation correlates with the study conducted by Thakur et al. (2018).

After completion of CCRT 60.6% & 54.5% patients showed complete response and 36.4% & 39.4% had partial response in arm A & arm B respectively. After completion of intracavitary radiotherapy (ICRT), 66.7% & 60.6% had complete response while 33.3% & 36.4% had partial response in arm A & arm B respectively. After 6 weeks of completion of treatment 75.8% & 69.7% showed complete response while 21.2% & 24.3% had partial response in arm A & B respectively. At final assessment (3 months after completion of concurrent chemoradiation), complete response was found in 81.8% and 72.7% patients of Arm A and Arm B, respectively. Partial response was seen in 12.1% patients in Arm A whereas for Arm B it was

18.2%. Progressive disease was found in 6.1% and 9.1% patients in arm A and arm B respectively. Arm A had slightly better response than arm B, but this observation was not statistically significant ($p > 0.05$). This result correlates with the study of Verma et al. (2009), where complete response was 70% in gemcitabine group and 68.8% in cisplatin group. CR was 89% in the study of Cetina et al. (2004) where gemcitabine dose was 300 mg/m². In case of combination chemotherapy of gemcitabine and cisplatin concomitant with EBRT response rate is higher with increase rate of adverse effect (Zarba et al., 2003; Hashemi et al., 2013).

During radiotherapy patients were assessed weekly for toxicity. Most prevalent acute toxicities were proctitis, cystitis, skin toxicity and haematological toxicities (Anaemia, Neutropenia, Thrombocytopenia). There was no treatment-related mortality identified in the present study. The grade 2 anaemia & neutropenia were higher in arm A compared to arm B (60.6% & 24.2% anaemia & 24.2% & 6.1% neutropenia in Arm A and B respectively) & 6.1% patients experienced grade 3 neutropenia in arm A. The grade 1 thrombocytopenia was observed in 24.2% & 6.1% patients in arm A & B respectively. Acute hematological toxicities were higher in arm A compared to arm B and the differences were statistically significant (P value < 0.05). The grade 2 vomiting & cystitis were more observed in arm B (36% & 18.2%) than arm A (24.2% & 9.1%) while the grade 2/3 diarrhoea and proctitis were more commonly observed in arm A compared to arm B (36.4% and 27.2% with grade 2 diarrhoea while 42.4% and 24.2% with grade 2 and 15.2% & 9.1% with 3 proctitis observed in arm A & B respectively). The grade 2,3 skin toxicity was more common in arm A (45.5% and 15.1%) compared to arm B (33.3% and 9.1%). Renal toxicity was higher in arm B (12.1%) compared to arm A (3%). These difference between two the arms were not statistically significant (P value > 0.05). In the study of Kundu et al. (2008), the grade 2-3 vomiting were higher in cisplatin arm, while the grade 2-3 skin toxicities & diarrhoea were higher in gemcitabine arm, which was similar with my study. In the study of Fu et al. (2016) the hematological & gastrointestinal toxicity were lower in CCRT with cisplatin group than other regimens.

From above discussions it can be said that for the management of locally advanced cervical carcinoma weekly gemcitabine is comparable to weekly cisplatin concurrent with EBRT, where complete response is higher in gemcitabine arm compared to cisplatin arm. Although the difference between two arm was not statistically significant (p value = 0.678). The study arm showed significant haematological toxicities which was manageable. In

my study cisplatin arm showed higher renal toxicity than gemcitabine arm, though it is not statistically significant. In the study of Cetina et al. (2004) CCRT with weekly gemcitabine was given in patients with renal dysfunction and reported normalization of renal function with excellent response rate (89%). So, it can be said that gemcitabine can be given as an alternative to cisplatin in patients with impaired renal functions.

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Guidelines for Patient Positioning & Immobilization during CT Simulation in View of IMRT/ VMAT Radiotherapy Treatment

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A. Importance of Patient Positioning & Immobilization Important in RT

In order to understand the importance of Accurate Positioning, Immobilisation, Position Verification and Execution of Treatment, RTTs should be aware of the likely acute and late toxicities associated with the delivery of radiation therapy to the head and neck region. At treatment planning, RTTs, Medical Physicists, Dosimetrists and Radiation Oncologists carefully ensure that specific dose volume constraints for OARs, such as those given by the RTOG are adhered to, in order to reduce the likelihood of such toxicity and hence minimise the impact on quality of life (QoL). Similarly, Adequate Target Volume Coverage as given in the ICRU reports is also strictly adhered to.

B. Types of Toxicities associated with radiation for Head and Neck Cancers

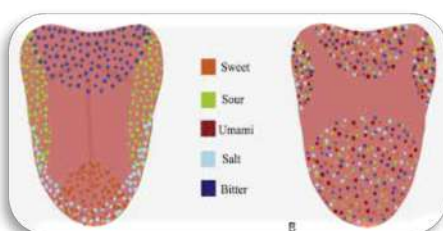
Xerostomia

Patients with xerostomia often complain of a dry and sticky sensation in the mouth, which causes them considerable difficulty to chew dry food. Associated with the Salivary Gland.



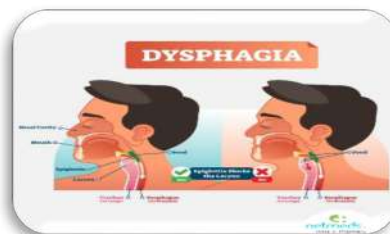
Dysgeusia

Defined as an impaired or abnormal sense of taste and usually refers to unpleasant tastes, which may be salty, bitter or metallic.



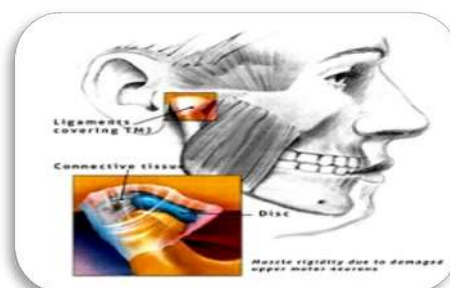
Dysphagia

Associated with Swallowing difficulty



Trismus

Tonic contraction of the muscles of mastication and limits the ability to open the mouth, which can lead to many associated difficulties for patients.



C. Importance of Patient Setup Positional Accuracy in IMRT/ VMAT

Clinical & Dosimetrically Impact:

"The most important impact of shoulder motion is the loss of target coverage (~1 Gy to 99% of a lower neck target). This may be important, particularly if there is primary disease in that region" [1].

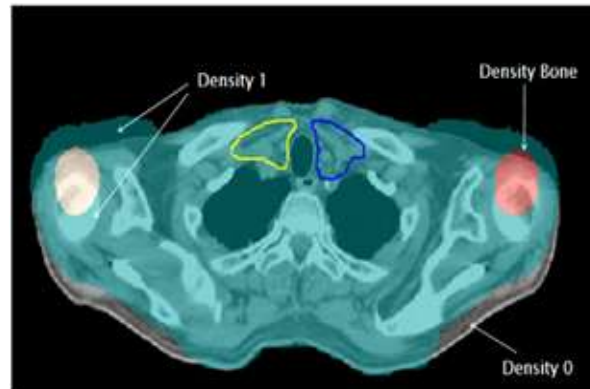
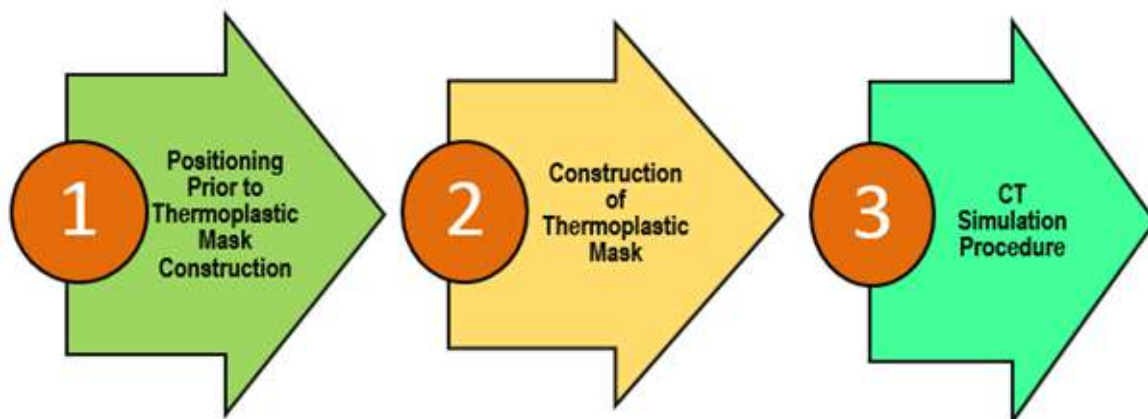


Fig: 15 mm anterior shift. Body contours are shifted, and the appropriate density is set

D. Process Flow of Patient Positioning & Immobilization during CT Simulation



D1. Positioning Prior to Thermoplastic Mask Construction:

- Following departmental Patient Identification Procedures, the patient should be brought to a designated patient information area.
- A full and detailed explanation of the procedure should be given to the patient by an RTT

- During the consultation, the importance of remaining still and breathing normally throughout the procedure should be stressed.
- Other aspects related to both the safety and efficacy of the procedure should be discussed with the patient including the likely mask temperature, and how the patient can alert the RTTs if they are having difficulty during the procedure.
- The patient should be asked to remove all clothing from the waist up. Any Dentures, Hearing Aids, Toupees and Tongue Piercings must also be removed.
- The patient should be positioned on the treatment couch, following their natural position in as comfortable and reproducible a position as possible.
- The sagittal laser should be used to ensure straightness, checking that it bisects the Nasal Septum, Sternal Notch, Xiphisternum and symphysis pubis as much as is possible. This aids in the minimisation of rotations.
- All immobilisation devices must be indexed or fixed to the couch, to minimise rotational and translational errors.
- Neck rests should provide adequate support for the head and neck and no gaps should be present underneath the head of the patient nor at the top of the neck rest.
- The RTT should be aware of the diagnosis of the patient and the likely beam arrangement when selecting the most appropriate neck position, which is usually neutral or extended in head and neck cases.
- Care should be taken to ensure that selected neck rests are of good quality and fit for purpose as differences in neck rests can result in discrepancies in positioning from pre-treatment to treatment areas.



Figure: Quality Assurance of Neck Rest



Figure: Non Indexed Supports should be avoided

- Additional supports required for the procedure, such as knee rests or shoulder retractors should be indexed to the couch.
- Documentations of the fixed positions of all immobilisation devices should be performed by one RTT and checked by a second.
- According to the treatment site and disease extension, masks should be of 3 or more fixation points. If treating the low neck, a 4 or 5-point mask is recommended. If a 3-point mask is used, a device to maintain shoulder position, such as a retractor, is mandatory.
- For post-operative patients with tracheostomies in situ, care should be taken to avoid airway obstruction. This will necessitate placing petroleum-based gauze over the stoma, which will not obstruct breathing, as well as making an appropriate sized gap in the material to clear the tracheostomy site.
- Documentation of the fixed positions of all immobilisation devices should be performed by one RTT and checked by a second.
- According to the treatment site and disease extension, masks should be of 3 or more fixation points. If treating the low neck, a 4 or 5-point mask is recommended. If a 3-point mask is used, a device to maintain shoulder position, such as a retractor, is mandatory.
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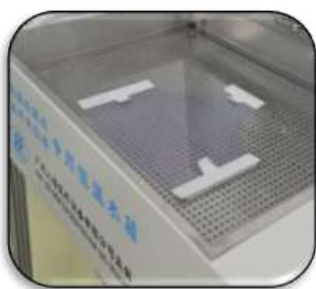


Figure: Shoulder Retractor

Figure: Tracheostomy Patient

D2. Construction of Thermoplastic Mask

1. Make sure the temperature of the water bath is between 65 °C and 70 °C (149 °F -158 °F). The ideal temperature for an oven is 75 °C (165 °F). Too hot or too low temperature would cause operation time problems.
2. After taking out the completely softened Thermoplastic Mask from the water tank, the operation should be quick and completed within 1-2 minutes. Do not spend too much time on drying the mask because this reduces the moulding time. But it does need to Dry the mask sufficiently to avoid hot water from dripping on the patient. So it is necessary to prepare some large towels with good water absorption
3. Specific attention should be given to the to the most stable bony landmarks forehead, bridge of nose, chin and shoulders to ensure that the mask will provide adequate immobilisation of the patient
4. It is recommended that the mask be removed and refitted prior to commencement of CT scanning to ensure that the fit is correct and that the immobilisation provided by the mask is adequate.
5. The procedures and Patient Position should be clearly Documented by RTTs in the patient chart. For Safety reasons, the patient name, type of neck rest and wedges, is used should always be documented on the Patient Mask.
6. Some Tips for Good Immobilization as bellows figures shows:



Figure: Good Immobilisation of Forehead, Nose and Chin



Figure: Poor Immobilisation at the Nasal Region



Figure: Good Immobilisation at the Nasal Region



Figure: Poor immobilisation of the Shoulder and Upper Thorax



Figure: Good immobilisation of the Shoulder and Upper Thorax



Figure: Use the patients ears as reference points



Figure: When moulding an immobilization mask, push the material slightly into both ears. This will serve as an easy reference point to correctly reposition the mask after hardening.

D3. CT Procedures

1. All departmental procedures in relation to patient informed consent and identification should be adhered to prior to commencing the CT scanning procedure.
2. The patient Diagnosis, Prescription and required Scanning Margins should be known to the RTTs before commencing CT, so as to adhere to the ALARA principle.
3. If contrast is to be used, the RTTs must screen the patient for potential anaphylaxis as per departmental protocol, document this screening procedure and ensure that the emergency trolley is prepared and fully stocked. It is necessary to check the patient creatinine clearance prior to intravenous contrast administration. The RTT must ensure that the contrast is heated to 37 degrees Celsius to match the patient body temperature.
4. If wire marking of any nodal regions or post-operative surgical scars is required, this should be performed prior to patient immobilisation.
5. If Bolus is planned for the patient's treatment, this should be in situ prior CT scanning so as to account for the actual bolus to be used at treatment in the dose calculations. This is preferable and more dosimetrically accurate than adding bolus during the treatment planning process and constructing it after the plan has been created.
6. Care should be taken to ensure that the treatment couch is set at an appropriate height so as to ensure that the immobilisation device is within the field of view (FOV). There should not be any slice cut after the CT image as the Patient Body also very important in terms of Dosimetrical Accuracy.
7. The Correct Scanning Protocol for the head and neck should be selected as per departmental procedures & the Slice Thickness is 3mm is recommended ensure sufficient anatomic detail for target and organ at risk delineation.
8. Scan should not be in Fast mode to Avoid Motion Artefact.
9. The RTTs must ensure that both patient orientation and the orientation of the Topogram or Pilot Scan are correctly entered at the CT console.
10. The RTTs should use the Topogram or pilot scan to confirm the scanning borders that are required for the head and neck case. It is advisable to check Orthogonal Topogram and a Single Axial Slice prior to the full scan to check for rotations.
11. Following the CT procedure, scan data can be exported to the TPS, during importing if Two CT series are there with & without contrast it is recommended to rename the CT Series accordingly during importing the TPS.

E. Conclusion

Key Points to remember for Patient Positioning & Immobilization during CT Simulation as follows:

1. Record & Documentations

- Make sure all the documentation during CT Simulation to produce as much as possible with the CT Reference information.

2. Patient Position

- Make sure patient is straight on couch, remember Curved /Crooked position is difficult to reproduce on treatment couch.

3. Appropriate Skin Marks

- Make sure to place enough marks so that they are there on the first day of treatment.
- The marks should be place where there is not much movement or sagging skin.

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On The Edge Of A New Frontier: Functional Imaging And Theragnostics

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Introduction

Nuclear Medicine is the branch of medicine using open radionuclides for physiological or functional imaging and treatment. The applications vary from routine diagnostic imaging procedures to evaluate and assess diverse physiological functions of various organs or organ systems in human body to targeted radionuclide therapy to malignant and non-malignant diseases. The nuclear medicine imaging and radiotracer studies provide functional information while conventional radiological imaging provides anatomical or morphological information. Exceptions are fMRI, contrast enhanced techniques in CT and MRI where certain functional information shall be interpreted. Nuclear Medicine imaging helps in very early diagnosis and treatment of dysfunctions or abnormalities due to progression of a disorder by visualization, characterization and quantification of radiotracer uptake, distribution and clearance from the human body. Nuclear Medicine as a branch aiding in functional diagnosis and having therapeutic applications has evolved multi-dimensionally in the past decades due to technological advancements and scientific innovations. Other branches of medicine such as cardiology, neurology, oncology, radiotherapy etc. are greatly dependent on nuclear medicine for not only imaging but also treatment planning and execution and in terms of diagnostic, prognostic and predictive endpoints. In addition to the revolutionary developments of radiopharmaceuticals, equipment, computer and data sciences, the relative importance of these theragnostic applications changed significantly in itself and also for other specialties finding wide applications in the treatment of neurological, neuroendocrine, lymphatic and prostatic cancers.

Diagnostic Nuclear Medicine

For diagnostic nuclear medicine, small amount of a radiopharmaceutical is used and is absorbed by different body parts or organs. There are many radionuclides that are available and the most routinely used are isotopes of technetium (Tc-99m discovered by Carlo

Perrier and Emilio Gino Segrè in 1937) and iodine (I-131 and I-123). Other isotopes used are chromium-51, gallium-67, gallium-68, indium-111, thallium-201, xenon-133 etc. Depending on the type of study, body part being examined and the physiological function being studied the radionuclide selected varies.

Upon injection, inhalation or ingestion of the radiopharmaceutical, body tissue or organ under study uptakes the radiotracer selectively. It gets absorbed or trapped in specific tissue and the ionizing gamma radiation emitted shall be detected by a radiation detector. The most commonly used imaging device in current clinical practice is a gamma camera.

Single Photon Emission Tomography (SPECT) and SPECT-CT

Benedict Cassen developed first rectilinear scanner and Hal O Anger developed the scintillation camera (Anger camera) in the 1950s which were used for radiotracer uptake imaging. Kuhl et al. developed a photographic attachment for the Cassen scanner in 1956 to improve sensitivity and resolution. The gamma camera uses collimators made of lead with fine holes and septa, thickness of the collimator is decided based on the energy of the gamma radiation being detected. Sodium iodide thallium-activated photo-luminescent crystals are the most commonly used scintillating material in a light and hydroscopically sealed housing. The collimators ensures only those photons traveling parallel to the collimator holes are able to reach the crystal. The photons that reach the scintillating crystal are absorbed into the scintillator and the absorbed energy is converted into light by the scintillator and emitted out. The brightness of emitted light is proportional to the energy absorbed by the scintillator crystal. Photomultiplier tubes detects the scintillations and multiplies it and fed to the pre amplifier and the output is converted into visual images by the help of analog to digital converters, digital summing circuits, positioning circuits and correction circuits. The gamma camera heads, usually two, can be rotated to acquire images from different angles and the tomographic images acquired are called single photon emission computed tomography (SPECT). A gamma camera and a CT scanner associated together enables the acquisition of SPECT-CT images where SPECT images are superimposed on CT images for better positional interpretation accuracy in imaging known as hybrid imaging.

Positron Emission Tomography (PET) and PET-CT/ PET-MRI

Positron emission tomography (PET) scan is another diagnostic imaging technique using positron emitting radionuclides to understand the biochemical or metabolic function or

dysfunction of specific tissues and particular organs. This technique enables very early detection of the abnormal metabolism of the tracer in disorders as compared to be detected in other tests. The commonly used radiotracers in PET are ^{18}F -FDG, ^{18}F -NaF, oxygen-15 etc. The other PET isotopes used are carbon-11, cobalt-55, copper-64, gallium-68, manganese-52, nitrogen-13, rubidium-82, zirconium-89 etc. These radionuclides are tagged with glucose, glucose analogues, water, ammonia, or molecules that bind to or mimic specific receptors. The positron-emitting radioisotopes are produced by cyclotrons and generally have very short half-lives requiring the cyclotrons to be near to the imaging facility.

The positron emitting radio tracer is most often injected into a vein and follows similar tracer kinetics as in diagnostic nuclear medicine radiopharmaceuticals, getting absorbed or collected into tissues or organs of higher metabolic or biochemical activity which is often the location of the abnormality or disease. The PET imaging combined with CT imaging or MRI and are termed as PET-CT or PET-MRI aiding to higher accuracy and ease in interpretation and diagnosis. The recent advancements in availability pharmaceuticals which can be labelled with positron emitting isotopes made its applications wide and common in different streams of medicine like oncology, neurology, psychiatry, cardiology etc.

Other than $\text{NaI}(\text{Tl})$, the scintillating materials which shall be used for detector configuration in gamma camera or PET scanner are $\text{Bi}_4\text{Ge}_3\text{O}_{12}$, $\text{CsI}(\text{Tl})$, $\text{CsI}(\text{Na})$, $\text{CaF}_2(\text{Eu})$, BaF_2m , $\text{LiI}(\text{Eu})$, CsF , CdWO_4 , LSO etc. In addition to the advancements in scintillating materials, advanced reconstruction methods enhances the quality of images and quantification of radiotracer distribution. Time of flight (TOF), point spread function (PSF) and ordered subset expectation maximization (OSEM) are few examples.

Therapeutic Nuclear Medicine

Therapeutic nuclear medicine treats thyroid cancer, hyperthyroidism, skin and blood disorders, etc. The radiation treatment dose (activity of radiopharmaceutical) is administered intravenous or orally or directly above or into the area to be treated.

The radiopharmaceuticals used for therapeutic purposes emit ionizing β radiations which deposits its energy locally minimizing side effects and damage to normal tissues. The therapeutic procedures are performed on inpatient or outpatient basis depending on the activity administered as per the regulatory requirements in the country.

Few examples of therapeutic radiopharmaceuticals are ^{131}I iodine- sodium iodide used for treatment of hyperthyroidism and thyroid cancer, ^{131}I -MIBG (meta-iodo-benzyl-guanidine) used for treatment of neuroendocrine tumors, ^{153}Sm lexidronam or ^{89}Sr strontium chloride used for bone pain palliation, ^{188}Re used for skin cancer treatments, ^{90}Y trium-ibritumomab tiuxetan, ^{177}Lu lutetium somatostatin analogs and ^{131}I iodine-tositumomab used for the treatment of lymphomas, ^{32}P phosphorus to treat polycythemia vera and historically to treat leukemia. Alpha particle emitting radionuclides such as ^{213}Bi bismuth or ^{211}At astatine labelled with monoclonal antibodies are used in targeted radionuclide therapy of isolated tumors or micro metastasis.

Theragnostics

The successful treatment of malignant and benign thyroid diseases with radioactive iodine marked the beginning of theragnostics. On 31 March 1941, Dr. Saul Hertz achieved this feat at Massachusetts General Hospital using ^{131}I . The ^{131}I - MIBG for diagnostic imaging and treatment of neuroendocrine tumors is another milestone. Peptide receptor radio-ablation plays a major role in the management of un-resectable or metastatic gastro-entero-pancreatic, broncho-pulmonary, and other neuroendocrine tumors. ^{177}Lu -DOTATATE has shown effectiveness over octreotide treatments. Currently, PSMA-tagged PET imaging has key clinical role. ^{68}Ga -PSMA11 and ^{18}F -PSMA ligands are under trial. A phase III ^{177}Lu - PSMA-617 trial is expecting approval soon. The extra- and intracellular destinations that can be targeted with radio-labeled peptides, small molecules, antibodies, or antibody fragments will further expand theragnostic applications. Theragnostic radiopharmaceuticals for multiple myeloma, leukemia, and central nervous system lymphoma are undergoing clinical translation. Combination therapies involving Fibroblast-activation protein (FAP), integrins, melano- cortin subtype-1 are under rigorous exploration. Preliminary reports on ^{225}Ac -PSMA an alpha particle emitter are encouraging due to the fundamental radiobiology effectiveness.

Artificial Intelligence (AI)

Artificial Intelligence plays an important role in improving and improvising image processing and pattern recognition in the nuclear medicine cardiac and brain imaging. The advantages are significant in automation of image acquisition improving patient positioning and scanning time, production of high-quality quantitative images by using AI-based scatter, attenuation and motion corrections, image reconstruction, or noise removal, and

image analysis and interpretation. The efficiency of the tracer development process are also on the rise by utilization of AI guided algorithms. The reconstruction algorithms can be more effectively trained using information from the clinical database acquired over time. One of the major limitation of nuclear medicine imaging is the resolution and this can be greatly improved. Contouring of structures and delineation of region of interests could be done automatically with the help of AI learning and training enabling time savings, improved reproducibility, and comparative reporting. Data management, workflow optimization, interoperability and data integration processes can effectively change the routine clinical practice for the better with implementation of AI which will impact the patient care positively.

Conclusions

The field of nuclear medicine has undergone dramatic changes in the past decades due to technological developments and scientific advancements. Many diagnostic procedures have been replaced by other imaging techniques and modalities. And new imaging modalities have come into picture in nuclear medicine itself. Hybrid imaging is the new norm of the day not only for diagnosis but also for treatment evaluation. Other branches of medicine such as radiation oncology, neurology, cardiology etc. are greatly dependent on nuclear medicine for not only imaging but also treatment planning and execution. Some techniques for specific procedures got extinct while new ones took its place (Liver scans, cardiac scans, PET scans). Same may be said true for radiopharmaceuticals also. Imaging and treatment of prostate cancer using radiolabeled PSMA inhibitors were considered not feasible until recently. Development of new radiopharmaceuticals were considered expensive and non-viable. A PET radiopharmaceutical other than ^{18}F -FDG and outreach to the mass population was unimaginable. The recently approved somatostatin, ^{11}C -choline, amyloid and tau ligands and prospects of PSMA ligands, have proven otherwise.

In addition to the revolutionary developments of equipment and radiopharmaceuticals, the relative importance of these theragnostic applications changed significantly in itself and also for other specialties. The scenario where changed drastically with the introduction of PET technology. The quality and resolution of images improved significantly. From only ^{18}F -FDG PET/CT as a major technique in nuclear medicine to ^{68}Ga -DOTATATE and ^{177}Lu -DOTATATE pair for imaging and therapy of neuroendocrine tumors, radiolabeled

PSMA ligands for imaging and therapy of prostate cancer the horizon has widened. The developments that happened in nuclear medicine as a specialized branch of medicine has been unpredictable and if it continues to be innovative and adapt quickly to technological advancements and clinical requirements we will have more solutions for the current challenges in medicine in the future.

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A State-of-the-Art Python Model for Breast Cancer Detection Using Kaggle Histopathology Images Database

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Background

The term “breast cancer” refers to a malignant tumor that has developed from cells in the breast. Usually, breast cancer either begins in the cells of the lobules, which are the milk-producing glands, or in the ducts, the passages that drain milk from the lobules to the nipple. Less commonly, breast cancer can begin in the stromal tissues, which include the fatty and fibrous connective tissues of the breast. Machine learning such as Python plays an important role for the early detection of breast cancer using image processing. The purpose of the study is to develop an Artificial Intelligence (AI) model for the detection of the early stage of breast cancer.

Artificial Intelligence (AI): AI is a wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. The figure is illustrated for the AI.

Machine Learning (ML): ML is an application of AI that enables systems to learn and improve from experience without being explicitly programmed. The more the program played, the more it learned from experience, using algorithms to make predictions.

Deep Learning (DL): DL can be considered as a subset of machine learning. It is a field that is based on learning and improving on its own by examining computer algorithms.

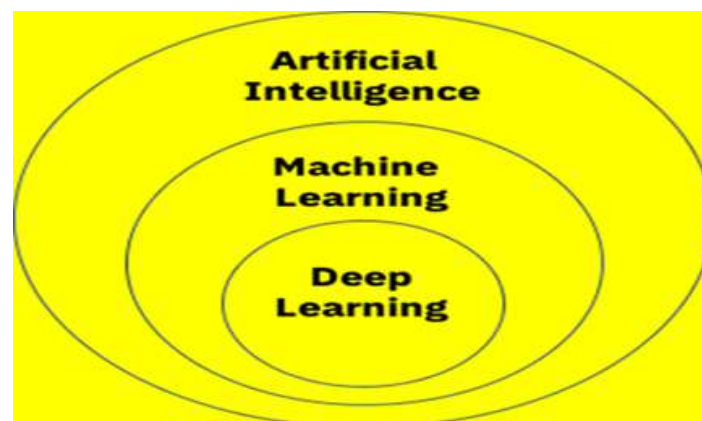


Figure: Artificial Intelligence (AI)

Precision	Recall
Classify positive samples in the model.	How many positive samples were correctly classified?
Both Positive as well as Negative samples that are classified.	All positive samples while all negative samples will be neglected.
When a model classifies most of the positive samples correctly as well as many false-positive samples, then the model is said to be a high recall and low precision model.	When a model classifies a sample as Positive, but it can only classify a few positive samples, then the model is said to be high accuracy, high precision, and low recall model.
Consider all positive samples that are classified as positive either correctly or incorrectly.	Cares about correctly classifying all positive samples.

Precision and Recall in AI

Keywords: *Breast Cancer, Histopathology, Python, Image Processing, Image Acquisition, Image Preprocessing, Image Segmentation, Artificial Intelligence, Machine Learning, Deep Learning.*

Project Problem

In this project, we proposed a Deep Learning algorithm convolutional neural network for diagnosed breast cancer using the Kaggle Histopathology Images database. We have applied deep learning technology on the Kaggle Histopathology Images Database, and we have seen that is very beneficial for us for the diagnosis of breast cancer with an accuracy of 95%. This project is divided into three parts – first, we have collected the dataset and applied pre-processing algorithm for scaling and filtering data then we have split the dataset for training and testing purposes and generated some graphs for visualization data.

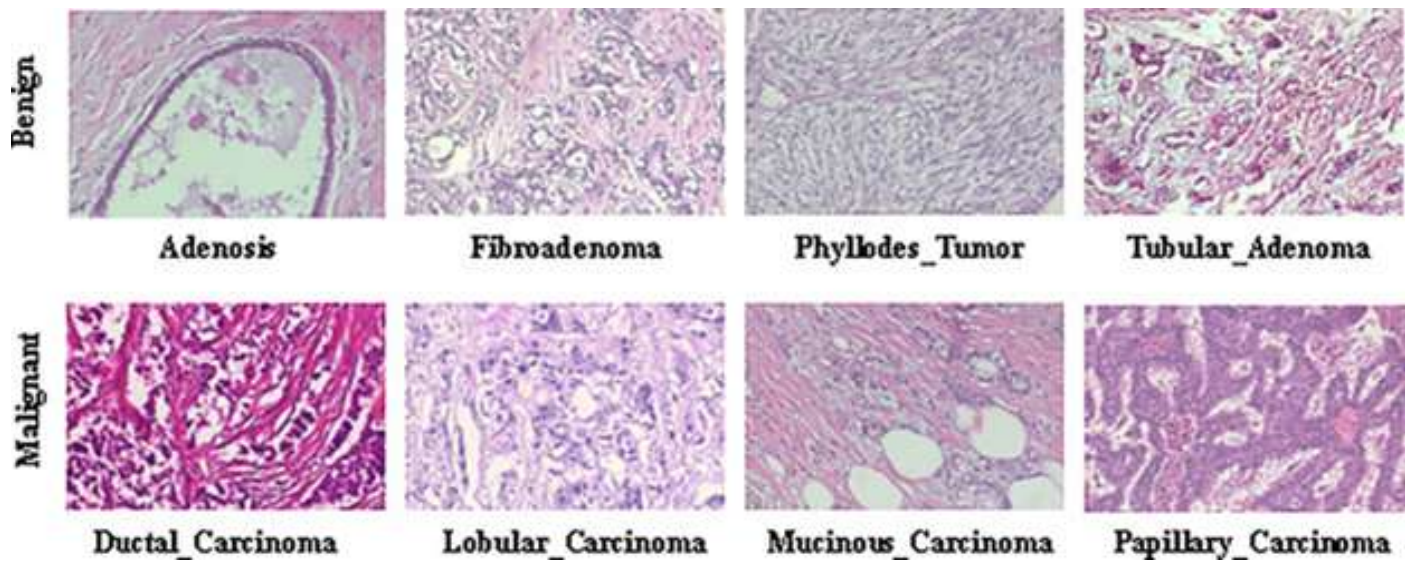


Figure2: benign and malignant histopathology sample images

Materials and Methods

During this work, we have used the IDC_regular dataset (the breast cancer histology image dataset) from Kaggle. This dataset holds 2,77,524 patches of size 50×50 extracted from 162 whole mount slide images of breast cancer specimens scanned at 40x. Of these, 1,98,738 test negative and 78,786 test positive with IDC. We applied the applications of image processing techniques to those images by using Python. At first, we read those images and converted the images from RGB to Grayscale. We Segmented images by using the threshold method. All these operations were done by the image processing toolbox in Python. During the segmentation of images, we calculated different types of statistical parameters such as mean, standard deviation, etc. After that, we identified the affected regions by calculating the geometrical features. In the next step, we classified the malignant and benign. Based on this geometric feature-based classification the algorithm, which developed in our work detected cancer presence.

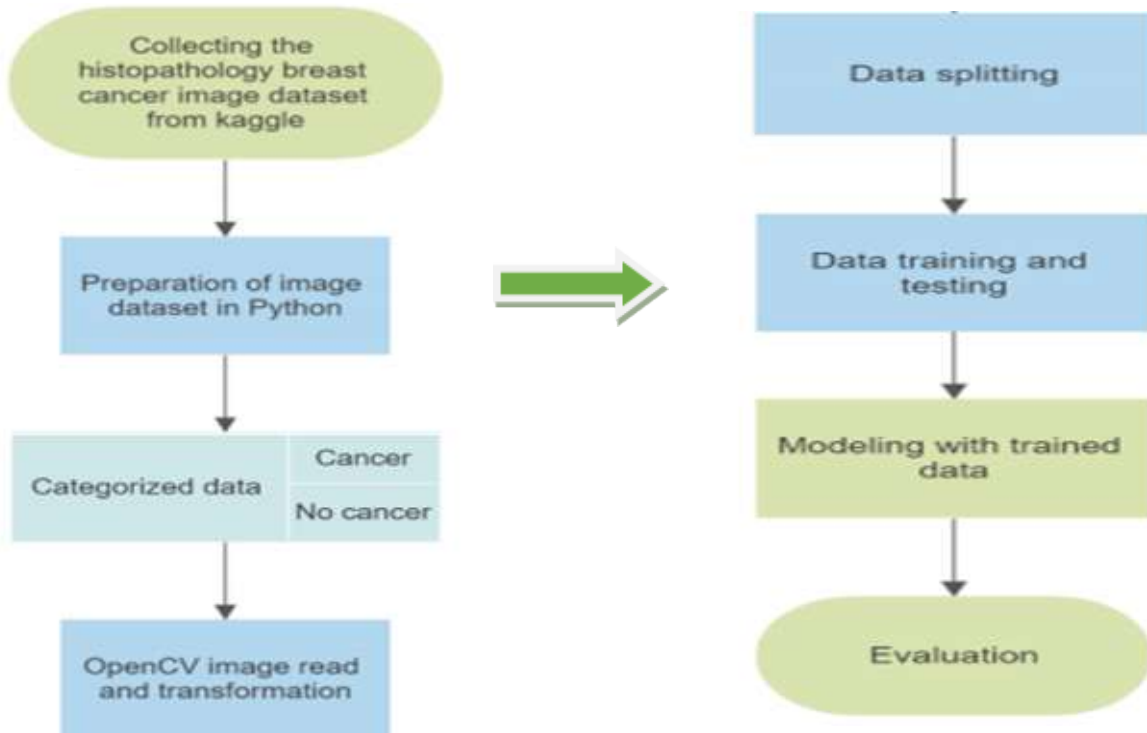
System Protocol: All of the codes were conducted on a platform with an AMD Ryzen 7 2700X CPU and 32G memory with Professional Graphics Card AMD FirePro W7000 4G DDR5.

An epoch is a term used in machine learning and indicates the number of passes of the entire training dataset the machine learning algorithm has completed. Datasets are usually grouped into batches (because the amount of data is very large). In this experiment our CPU could run up to 18th passes and after that processor stopped working.

```

3694/3694 [=====] - 1478s 400ms/step - loss: 0.1789 - accuracy: 0.9332 - val_loss: 0.2594 - val_accuracy: 0.9166
Epoch 18/30
3694/3694 [=====] - 1472s 399ms/step - loss: 0.1794 - accuracy: 0.9337 - val_loss: 0.2576 - val_accuracy: 0.9180
Epoch 18: early stopping
    
```

Figure 2: epoch execution by cpu upto 18/30



Voice of BMPs

Results

After completion of the task by Python, this is the final result we have computed by the program.

	Precision	Recall	F1 score	Support
0 (No cancer)	0.94	0.97	0.95	33328
1 (Cancer)	0.79	0.64	0.71	6065
Accuracy			0.92	39393
Macro average	0.86	0.80	0.83	39393
Weighted average	0.91	0.92	0.91	39393

From the above data it is clearly seen that no cancer detection accuracy was minimum of 94% because it was supported by 33328 data. Cancer detection accuracy was minimum of 64% and it supported only 6065 data. If our system could approach more computation, this result will be further improved.

Discussion

Our prime target was early detection of cancer because the early detection of cancer can be helpful to cure cancer effectively. Therefore, we propose a saliency detection system with the help of advanced deep learning techniques, such that the machine will be taught to emulate the actions of histopathologists for the localization of diagnostically pertinent regions. Image processing result is not always 100% accurate but it can help screen the primary data after checking. At least minimum 90% for no cancer detection and minimum 60% for cancer detection, this program can achieve.

Conclusion: In future work, we will continue to propose more efficient and rapid methods for breast cancer recognition. The target is to realize multi-class recognition of breast cancer based on the research on benign and malignant tumor recognition. In addition to improving the recognition accuracy, we also hope to extract more effective information about cancer, which can help doctors find the lesion faster and reduce the workload on doctors.

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Validation Of Treatment Planning System For 10MV Photon Beam Using CIRS Thorax Phantom Taking Four Field Box

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Introduction

To produce beam shapes and dose distributions for external radiation, computerizing treatment planning systems (TPS) are employed. This allows for optimal tumor control while limiting doses to vital organs. Computer system advancements have made it possible to simultaneously construct computerized tomography machines. With the advent of CT-based planning tools, it is now possible to get patient anatomy, target volume, and dose distributions as three-dimensional (3D) views in the world of radiation. The precision of the dose given to the patient during radiation therapy is a very important consideration. The precision of treatment planning dose calculation algorithms is the main factor affecting this problem. Since the middle of the 1950s, algorithms for calculating doses that are needed by treatment planning computers have been developed. Several reports, including AAPM TG-53, IAEA TRS 430, and NCS Report 15, make recommendations regarding the verification and commissioning of the dose calculation algorithms used in TPS[3]. Most patients receiving radiation therapy have their treatment plans designed and calculated using computer-based Treatment Planning Systems (TPS). The majority of commercial TPS are expertly developed and tested by their creators. Following installation, acceptability testing is performed on each system. Before a TPS is used to plan patient treatments in a radiation therapy center, medical physicists commission and check the system's calculations. Medical Physicists also carry out additional checks when updates are deployed and ongoing quality assurance (QA) of a TPS. The extensive significance of the accuracy of TPS calculations, however, necessitates the employment of additional QA measures because no check can completely cover all aspects of the system[2]. Treatment mistakes are reduced by a clear separation of target tissue from healthy tissues. The overall radiometric accuracy of the dose should be less than 5%, according to the clinical dose

curves. One of the key challenges in developing the dose calculation algorithms is the distinction between dose calculations in water and heterogeneous environments. The scattered radiation dose is frequently just approximated, even though the incoherent effect on the original photon is typically predicted. For a homogeneous structure with uncomplicated geometry, the majority of heterogeneous tissue modification techniques are employed. These inaccuracies have been mentioned by several authors[4]. Experimental studies have demonstrated over the years that the water dose data can fluctuate by more than 30% when low-density inhomogeneities are present in regions like the lungs. Despite the scarcity of research on the subject, considerable local impacts are anticipated when high-density inhomogeneities are present in tissues like bones[5]. There are a number of international documents on the subject, such as the International Atomic Energy Agency Technical Reports Series 430 (IAEA TRS430), which suggest categorizing the verifications into benchmark, generic beam, and user's beam data verifications. The American Association of Physicists in Medicine (AAPM) Report 85 and the European Society for Therapeutic Radiology and Oncology (ESTRO) brochure No. 7 are additional materials from different groups. To assist users in confirming the dosimetric accuracy of their systems, the IAEA produced a series of useful clinical tests for TPSs based on the TRS 430 in its TEC-DOC 1583[5]. Radiotherapy treatment planning is the process of determining the number of radiation beams or brachytherapy sources that will be employed to administer a considerable dose of radiation to a patient in order to treat or control a malignant tumor or some other issue. The bulk of the time, treatment planning is done using a computerized system that makes it easier to define the target volume, choose the beam's directions and shapes, compute the dose distribution associated with it, and assess it. The RTPS system is made up of the hardware platform, software package, and supporting hardware components[6]. The current study examined the calculation accuracy and reliability of TPS that followed IAEA TECDOC-1583 while calculating photon doses of various energies during external beam radiotherapy. TPS, which was originally commercially available, is used at the TMSS Cancer Center in Bogura, Bangladesh.

Methods

In order to acquire the proper location in the image during simulation, in each of the phantom's holes, IBA Farmer Type Ionization Chambers (FC65-P) have been placed. Using the Canon-Lightning Aquilion CT-simulator, scans have been taken. Using AAA algorithm of

the Eclipse treatment planning system (version 13.5), 12 distinct treatment plans have been carried out. The calculated dose for each unique plan has been discovered. The plan has been implemented by the measuring point and reference point. In accordance with protocol, the ionization chamber was inserted into the thorax phantom placed on the treatment couch. Every single example of the plan required the delivery of radiation to a phantom, and the dose was assessed using an electrometer and an ionization chamber.

1.1 Dosimetric test case

The position of the measuring point, gantry angle, collimator angle, and field size vary depending on the situation. For case-four field box, a dose of 200 cGy has been estimated at the reference site for SAD (100 cm) setup according to IAEA TECDOC-1583 guidelines. [18]

1.2 Test Case : Four field box

This technique is used in many radiotherapy hospitals, and the purpose of this test is to verify the calculation of the dose delivered with an individual beam and the total dose from four fields. The four fields are weighted equally, and the parameters and measurement points have been defined in the middle of holes 5, 6, and 10. [18]

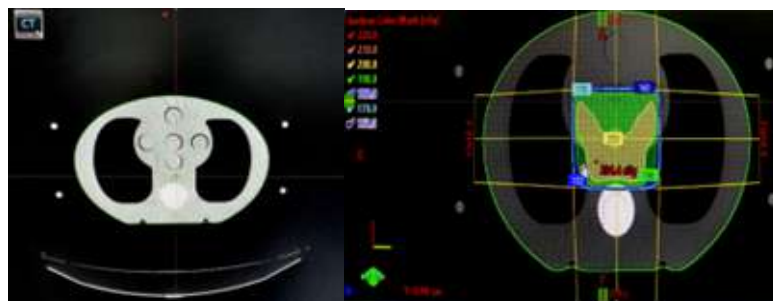


Figure-1 : CT image of CIRS Thorax phantom (Left) and Treatment planning for four field box (Right)

1.3 Error measurement equation:

Error has been measured by the following equation:

$$\text{Error [\%]} = 100 \times (D_{\text{cal}} - D_{\text{meas}}) / D_{\text{meas}} \dots\dots\dots(09)$$

Where, D_{meas} is the measured dose value. And, D_{cal} is the calculated dose value [18]

Results

The findings of the clinical test case are reported in the sections that follow, with a comparison between measured and computed values. The reference point has been taken

into account at hole-5 (water equivalent material), where the applied dose is always 200 cGy. The table shows the variations in measured and computed doses for several test situations.

Case	Ref. point	Location of measuring point	Calculated dose (cGy)	Measured dose (cGy)	Field Size (cm) L x W	Gantry angle	Collimator angle	Dev. (%)	Agreement criteria (%)
4	Hole-5	Hole- 5 (water eq.)	50	51.24	15x10	0°	0°	-2.42	2
			50	50.60	15x10	180°	0°	-1.19	3
			50	50.43	15x8	270°	0°	-0.97	3
			50	50.06	15x8	90°	0°	-0.12	3
		Total	200	202.33				1.15 (Av.)	
	Hole-6	(Lung substitute)	4	3.28	15x10	0°	0°	1.41	4
			5.6	4.91	15x10	180°	0°	1.35	3
			64.5	63.78	15x8	270°	0°	1.43	3
			31.1	35.04	15x8	90°	0°	-7.87	4
		Total	105.2	107.01				0.89 (Av.)	
	Hole-10	(Bone substitute)	36.2	39.80	15x10	0°	0°	-7.02	3
			70.8	71.29	15x10	180°	0°	-0.97	4
			3.5	3.17	15x8	270°	0°	0.65	4
			3.5	3.19	15x8	90°	0°	0.62	3
		Total	114.1	117.45				1.65 (Av.)	

Table 10 : Comparison between measured and calculated data for 10MV Photon Beam

Discussions and Conclusion:

Dose reference point was hole-5 and measured points were hole-5 , hole-6 , and hole-10. In that case, all the deviations were found under agreement criteria for measured 9 points among 12 points. Among them, for hole-5 ,hole-6, and hole-10 deviation was found -2.42% , -7.87% and -7.02% respectively which exceeds allowed limit 2% , 4% and 3% respectively. The IAEA TRS 430 and TECDOC-1583 recommendations require that dose variances between measurement and TPS calculation be within reasonable bounds. Inaccurate positioning of the ionization chamber in the phantom or air gap outside the chamber has been shown to cause the significant variations. Other issues have arisen as a result of scattered dosage, field size, and effective point of measurement of ionization chamber in a phantom. When employing the CIRS Thorax Phantom for external beam radiation, the TPS is suitable for dose computation in heterogeneous medium.

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Continuous Professional Development

Report on attending on the International Centre for Theoretical Physics (ICTP), Trieste, Italy

JD KAMANZI

Medical Physicist, Department of Radiotherapy, Rwanda Cancer Centre, Rwanda

Purpose of the visit: Attending the international college on medical physics 2022

Topic of the college: Medical Imaging Physics and Technology-Principles of Optimization, Safety, and Education Development for Building Capacity in Developing Countries.

COLLEGE ON MEDICAL PHYSICS Medical Imaging Physics and Technology – Principles of Optimisation, Safety, and Education Development for Building Capacity in Developing Countries



5 - 23 September 2022
An ICTP Meeting
Trieste, Italy

Introduction

The Physics of Medical Imaging is at the heart of contemporary medicine. The medical imaging equipment is complex and its proper and safe function requires medical physicists trained in imaging procedures and applications.

Therefore, building the capacity in developing countries on this subject is essential for the complete delivery of healthcare in these countries and the ICTP Medical Physics College 2022 was designed to support young medical physicists from developing countries.

The intensive coursework and hospital practical took 3 weeks from 04th to 24th September 2022, in Adriatico Guest house of ICTP located in Grignano/Trieste. The college covered several topics in medical imaging physics of the following contemporary technologies.



Fig1: Sky view of ICTP'S Guest house: Adriatico where the ICTP College 2022 took place.

The participants of the college were physicists working in different areas such as diagnostic radiology, nuclear medicine and oncology, and physicist's lecturers, teaching medical physics students from different universities, technologists and first year students undertaking in masters of advanced studies in medical physics at ICTP.

The college Lecturers were very experienced physicists, and provided detailed explanation on topics covered.

Achievements During The College

I received a joint award for the best poster presentation from more than 20 posters that were presented, from different countries. In the Figure, during the award acquisition, myself, Prof Lenato Padovani, Professor Slavik Tabakov, Professor Franco Milano, Prof. Stoeva Magdalena, Dr Vassilka Tabakova and Dr Paola Bregante.



Figure: The EMERALD award for Best poster presentation award given to Kamanzi JD during the ICTP College 2022.

Conclusion

The college was successful, I am very grateful to the ICTP organisers, for selecting my application and financial support. I am also grateful to my hospital for giving me permission despite busy clinic and staff insufficiency. Furthermore, I would like to thank all the ICTP 2022 lecturers, colleague's participants for making our program successful and having nice moment during the college.

Professional development of Immediate Past President of BMPS

Md. Anwarul Islam, DIMPCB

Coordinator Medical Physicist

Square Oncology and Radiotherapy Centre, Square Hospitals Ltd

Md. Anwarul Islam Ex-President and currently advisory member of BMPS took part different Continues Development Programs this year.

Mr. Islam attended Online Certificate course on Photovoltaic from 10 May-26 July 2022 organized SCMPCR.

Rayos Contra Cancer, Global Health Radiotherapy based on USA organized an online training program on the topic of "Mastering IMRT/VMAT for Medical Physicists" from May 21 to September 3, 2022. Mr. Islam attended this training program and earned 28 credit hours by didactics, live participation and assignments.

He completed and successfully passed the examination of SCMPCR ELP-06, the online training program organized by South Asia Centre for Medical Physics and Cancer Research (SCMPCR) from 01 July to 22 July, 2022. The course topic was "Clinical Medical Physics in Modern Radiotherapy" and comprised of eight-hour lectures, a moderated group discussion of one-hour and one-hour examination. SCMPCR ELP-06 was accredited by International Organization for Medical Physics (IOMP) as CPD event for Medical Physicists and awarded with 20 CPD points.

Mr. Islam also took part another training program organized by SCMPCR, ELP-07 from 07-28 October 2022. The ELP-07 training topic was "Computed Tomography and Interventional Radiology" and accredited by European Board for Accreditation in Medical Physics (EBAMP). This Course was comprised of eight-hour lectures, a moderated group discussion and one-hour examination and awarded 32 CPD points. Mr. Islam participated all the lectures and successfully pass the examination.

The list of online webinars Mr. Islam attended in this year as follows:

Date	Topics	Organizer
Mar 4, 2022	"Regional clinical training for medical physics in a changing world"	AFOMP
Sep 01, 2022	"Global Medical Physics Scenario and Need for Interdisciplinary Approach "	AFOMP
Sep 28, 2022	"Varian Think webinar: Using True Beam Advanced Imaging and Gating to Facilitate a More Targeted Delivery"	Varian Medical System International AG
Sep 30, 2022	"Intracranial Stereotactic Radiosurgery in Radiation Oncology"	Elekta
Oct 4, 2022	"Motion Management: IDENTIFY in the Community Cancer Center"	Varian Medical System International AG
Oct 18, 2022	"Breast VMAT—strategies, efficiency and patient outcomes Confirmation"	Elekta
Oct 31, 2022	"SWIRO - Treatment Without a Trace Utilizing Surface-guided Technology for a Better Patient Experience"	Varian Medical System International AG

Mr. Islam achieved total 82 CPD points including training and webinar from Jan 01 to October 30, 2022.

Online Accredited CPD Program for the Medical Physicists: SCMPCR

Safayet Zaman, Fahim Muhammad Rafiul Islam

The need for medical physicist education and training is growing over time. The increasing complexity of both treatment and diagnostic equipment coupled with the rising expectations of good healthcare in all parts of the world as well as the implementation of radiation protection and safety standards is important. However, the supply of suitably qualified and trained personnel has not kept up with these developments and hence this shortage is worsening.

Since the COVID-19 crisis till now SCMPCR has offered accredited online e-learning programs for Medical Physicists and new opportunities to adopt online-based distance learning. To meet the challenges of the next industrial revolution and the digitalization of healthcare technologies, e-learning interventions for education and training, particularly in low-resource settings where knowledge can be shared.

South Asia Centre for Medical Physics and Cancer Research (SCMPCR) has established in 2018 and constantly trying to create skilled manpower for cancer treatment through different categories of programs along with national and international collaborative approaches.

South Asia Centre for Medical Physics and Cancer Research (SCMPCR)

E-learning Program (ELP-07)

Computed Tomography and Interventional Radiology

Panel of Speakers

- Prof. Seungyong Cho, Dept. of Nuclear and Quantum Engineering, KAIST, Korea
- Dr. Dipl.-Ing. Natasa Mitroic Skaloja, Head of the Department of Medical Physics and Engineering, Sena Klinikum Offenbach GmbH, Germany
- Prof. Dr. Marc Kachelrieß, Dipl.-Phys., Division of X-Ray Imaging and CT, German Cancer Research Center (DKFZ), Heidelberg, Germany
- Dipl. Ing. Kathrin Entz, Medical Physics Expert, University Hospital Frankfurt, Germany
- Prof. Dr. Zhi Yang, School of Biomedical Engineering, Capital Medical University, China
- Prof. Dr. Xiaojuan Guo, Radiology Department, Beijing Chaoyang Hospital, China
- Dr. Stephan Garbe, Medical Physicist, University Hospital Bonn, Germany
- Prof. Dr. Cynthia H. McCallough, Medical Physics and Biomedical Engineering, Director, CT Clinical Innovation Center, USA

Moderators

- Dr. Lukmenda Evin Lubis, Indonesia
- Ms. Maheeka Jayakody, Sri Lanka
- Mr. Durinda Salharasinghe, Sri Lanka
- Mr. Fayzan Ahmad, Pakistan
- Mr. Fahim Muhammad, Bangladesh
- Mr. Ji Zhang, China
- Dr. Md Akhtaruzzaman, Bangladesh
- Assoc. Prof. Dr. Rafidah Zainon, Malaysia

Accredited by ICBAMP as CPD event for Medical Physicists with 32 CPD

Date: 07 October 2022 - 08 October 2022

Time: 9:30 AM (GMT) - 10:30 AM (GMT)

Online Platform: Zoom, Video Conferencing

Registration Fees:

- South Asia:
 - Students - 10 USD
 - Professionals - 20 USD
- International (Beyond South Asia):
 - Students - 20 USD
 - Professionals - 25 USD

Registration Link: www.scmPCR.org/elp-04/

Payment Link: www.stmms.lku.ac.bd/payment/scmPCR/






South Asia Centre for Medical Physics and Cancer Research (SCMPCR)
E-learning Program (ELP-06)
Clinical Medical Physics in Modern Radiotherapy

Panel of Speakers

 Elaine Theresa Mathews Product Specialist, RadCalc, LAP Group Singapore	 Prof. Dr. Oslam Abu Zakaria Professor of Clinical Engineering, Anhalt University of Applied Sciences, Koethen, Germany	 Dipl.- Phys. Renate Walter Medical Physics and Radiation Protection Klinikum Augsburg, Augsburg, Germany
 Carlos Bohorquez Product Manager for RadCalc Lifeline Software Inc, LAP Radiation Therapy	 Dr. Florian Kamp Head of Medical Physics, Department of Radiation Oncology and Cyberknife, University Hospital of Cologne, Germany	 Dipl.-Ing. Kirsten Hierholz Head Medical physicist, Radiation Oncology and Radiation Therapy, Klinikum Darmstadt Institute, Germany
 Dipl.-ing Volker Steil Head Physicist, Department of Radiation Oncology, University Medical Centre Mannheim, Germany	 Prof. Dr. Arun Chougule Dean and Chief Academic Officer, Swasthya Kalyan Group of Institutes, Faculty of Paramedical Sciences, Rajasthan University of Health Sciences (RUHS), India	 Prof. Dr. Sunil Dutt Sharma Scientific Officer (G) & Head Medical Physics Section Rajiv Gandhi Cancer Institute, Anushtaknagar, India

Moderators

 Safayet Zaman Senior Medical Physicist Bangladesh	 Nahida Sultana Medical Physicist Bangladesh	 Jeevanshu Jain Medical Physicist India	 Deepak Jha Senior Medical Physicist Nepal	 Bushra Intakhab Medical Physicist Pakistan	 Ishani Jayakody PG Student (MP) Sri Lanka
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**Accredited by IOMP
as CPD event for
Medical Physicists with
20 CPD**



Date
01 July, 2022 - 22 July, 2022

Time
2.30 PM (GMT) - 3.30PM (GMT)

Online Platform
Zoom: Video Conferencing

Registration Fees

- South Asia
 - o Students- 10 USD
 - o Professionals- 15 USD
- International (Beyond South Asia)
 - o Students- 15 USD
 - o Professionals- 20 USD

Registration Link
www.forms.gle/H8YeAhPmhpcuaeE9

Payment link
www.cbmsa.uu.ac.bd/payment/rh/

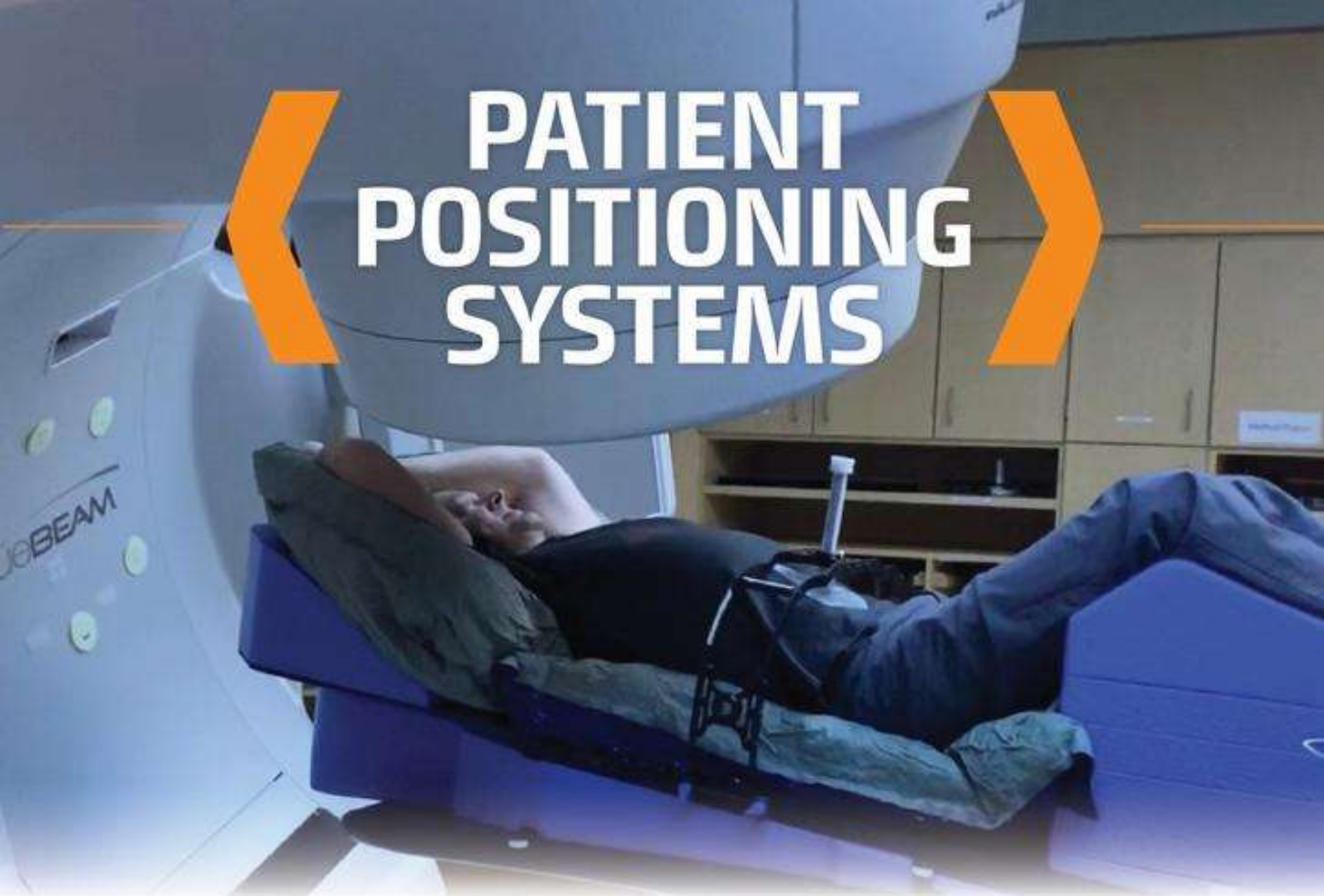
In the year 2022, SCMPCR arranged 2 E-learning programs. ELP-06 (Clinical Medical Physics in Modern Radiotherapy) and ELP-07 (Computed Tomography and Interventional Radiography). They were accredited by International Organization for Medical Physics (IOMP) and European Board for Accreditation in Medical Physics (EBAMP) with 20 and 32 CPD credit points respectively.

BMPS Executive Committee members along with others regularly participate in these programs of SCMPCR. Not to mention the names of some people such as former president Mr. Anwarul Islam and current president Dr. Akhtaruzzaman. They have been participating in all programs of SCMPCR since its inception.

Every SCMPCR E-learning program comprises 8 lectures from internationally renowned cancer personnel a moderated group discussion session and an examination.

Medical physicists all around the world, particularly in South Asia and Bangladesh, are taking part in online courses and earning CPD points. Earning CPD points is a requirement for the QMP to continue to be registered globally. In order to serve patients, SCMPCR is working to build a qualified workforce in the SA region with continuously updated technology.

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News and Events

AFOMP Announced New Award Program 'Golam Abu Zakaria AFOMP Best Young Leadership Award'!

The "Golam Abu Zakaria AFOMP Best Young Leadership Award" is dedicated to young medical physicist who has demonstrated outstanding leadership skills in the development of medical physics profession in the AFOMP region. The award is supported and funded by the Bangladesh Medical Physics Society (BMPS). One award to be given annually.

The "Golam Abu Zakaria AFOMP Best Young Leadership Award" will be presented annually at the Asia-Oceania Conference on Medical Physics (AOCMP) to the medical physicist judged by AFOMP's Awards and Honours Committee (AHC) to have demonstrated outstanding leadership skills leading to the development of medical physics profession in the AFOMP region as appropriate for early career professionals. Nominations should be made by the NMO's President or Secretary General.

The Award will consist of a cash prize of US \$ 400, a certificate and a memento. The awardee will be asked to deliver a lecture at the AOCMP. The awardee will be notified with sufficient time in advance to plan to attend the AOCMP for presentation.

Meeting of BMPS Executive Committee; September 2022

Meeting of BMPS Executive Committee was held in each month in different hospitals. Action points are taken according to the decision executive members. As medical physics situation is still in growing phase so BMPS EXCOM are trying hard to execute their decisions in different meetings. Different types of programs like training awareness seminar workshop are done through meeting decision accordingly. Also, quarterly meetings were held with all the members.



Participation Medical Physicist Transdisciplinary Foundation

Medical Physicist Transdisciplinary Foundation (MPTF) is an online learning Medical Physics platform. They are conducting online lectures (webinars) from reputable Clinical and Theoretical Physicist for the Medical Physics Community. Their audience are from South Asia, Middle East, Far East, Africa, Australia and Europe. They invited to BMPS Secretary, Md. Jobairul Islam for delivering a lecture on their platform. As an Invited speaker, Md. Jobairul Islam delivered his lecture on "Dosimetric Verification of Reference Air Kerma Rate for HDR Afterloading Units with Ir-192 And Co-60 Photon Sources: Comparison of Different International Protocols" on 22 September 2022. After the talk a very active participation of participants and speaker were observed in form of questions answers and discussion that was moderated very effectively by Mr. Asad Yousuf. The whole webinar team was happy about the audience interaction and participation.



Moderation AFOMP Monthly Webinar



On the occasion of 20th anniversary of AFOMP, they are conducting a monthly webinar from 2020. AFOMP invited to Md. Jobairul Islam, Secretary of BMPS for moderate the 28th monthly webinar of AFOMP. The 28th monthly webinar was held on 01 September 2022 at 07:00 AM GMT. The webinar title was "Global Medical Physics Scenario and Need for Interdisciplinary Approach". The speaker was Prof. Dr. Arun Chougule. He is a President of AFOMP. The webinar was focused on the medical physics scenario all over the world. Md. Jobairul Islam moderated the session very effectively. Discussion turns out to be very interesting as many participants spoke about the experience of mentoring programs they have attended. This webinar was accredited with two CPD points from Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM).

Participation in AAPM 64th Annual Meeting & Exhibition: July 2022

AAPM 64th Annual Meeting & Exhibition was held on July 10-14, 2022, at the Walter E. Washington Convention Center in historic Washington, DC. In this year, AAPM conference was held in virtual and In-Person Conference.

In this year, the meeting theme was "Celebrating Medical Physics: Transforming Human Health". The Presidential Symposium reflected on our humanity and the great impact of medical physics on human health. Across the board, the meeting program spanned the range from classic to new medical physics. They offered exceptional scientific, educational, and professional symposia, proffered sessions, and the ever-important Early-Career Investigators Symposium, along with a host of continuing education opportunities. Their technical exhibition provided the long-awaited opportunity to meet with vendors, visit their new products on the floor, and discuss their services and support.



The AAPM 64th Annual Meeting & Exhibition was one of the world's largest programs of scientific, educational, and professional presentations and exhibits in the medical physics industry drawing thousands of attendees.

Through symposia, panel discussions, poster presentations, workshops and more, the Annual Meeting presents emerging science, best practices and clinical techniques. AAPM attendees interacted with vendors and learn about the latest technology to evaluate new equipment which informs purchasing decisions.

Mr. Md. Jobairul Islam, Secretary of Bangladesh Medical Physics Society (BMPS) joined this meeting in virtually. He awarded Medical Physics Continuing Education Credits (MP-CECs) and earned 19 Credit point from CAMPEP.

International Medical Physics Week (IMPW)-2022: Celebrated by Bangladesh Medical Physics Society (BMPS)

International Organization for Medical Physics (IOMP) celebrated the International Medical Physics Week (IMPW) during 09-13 May 2022 with the objective to motivate organizational activities in this week that result in the promotion of medical physics globally. The Bangladesh Medical Physics Society (BMPS) was also part of this celebration.

Bangladesh Medical Physics Society (BMPS) organized an online Webinar to celebrate IMPW from 09 to 13 May, 2022. Each webinar was scheduled for 45 minutes followed by questions and answers for 15 minutes.

The first webinar started on 9th May 2022 at 4:45 PM with Introductory remarks by, Prof. Golam Abu Zakaria, Prof. Arun Chougule & Prof. Hasin Anupama Azhari. They emphasize the importance of research and academics in development of Medical Physics. They appreciated the contribution of BMPS to the medical physics community in Bangladesh as well beyond.



The first webinar entitled 'Improving the Quality and Safety of Radiation used in Medicine by enhancing Medical Physicists services in Nepal' was presented by Dr. Kanchan P. Adhikari. He is an Associate Professor & Chief Medical Physicist, National Academy of Medical Sciences, Bir Hospital, Nepal. The webinar was focused on the role of Medical physicists play a key role in improving the quality of health care delivery and ensuring patient safety in radiation medicine.

After the talk a very active participation of participants and speaker were observed in form of questions answers and discussion that was moderated very effectively by Md. Jobairul Islam. The whole webinar team was happy about the audience interaction and participation.

The second webinar started on 9th may at 6:00 PM with introduction of speaker by Dr. Akhtaruzzaman. The speaker of the day was Dr Sunil Dutta Sharma. He is a Senior Scientist and Head of Medical Physics Section of Radiological Physics & Advisory Division, Bhabha Atomic Research Centre, Mumbai, India. He is serving as Associate Editor of Journal of Medical Physics since 2006 and is currently, he is the President of Association of Medical Physicists of India (AMPI). The title of the presentation was "Advances in Reference Dosimetry of Therapeutic Photon Beams and Dosimetry of Brachytherapy

Sources" He focused on dosimetric aspects of beam therapy systems and brachytherapy sources of recent technology used for the treatment of cancer. He elaborated why, when and how it should be done.

Mr. Md. Mostafizur Rahman moderated the session



very effectively. Discussion turns out to be very interesting as many participants spoke about the experience of mentoring programs they have attended.

The third webinar started on 10th may at 5:00 PM. The webinar titled "Images, motion and margins: building blocks for modern radiotherapy". The speaker was Prof. Tomas Kron. He is a Director of Physical Sciences at Peter MacCallum Cancer Centre, Melbourne, Australia. He is one of the eminent medical physicists in the region. The webinar was focused on modern radiotherapy technique. He mentioned image guidance as a fundamental enabler in Radiotherapy, how imaging allows motion management. Also discussed how the use of image guidance influences margins.

This talk turned out to be very unique.

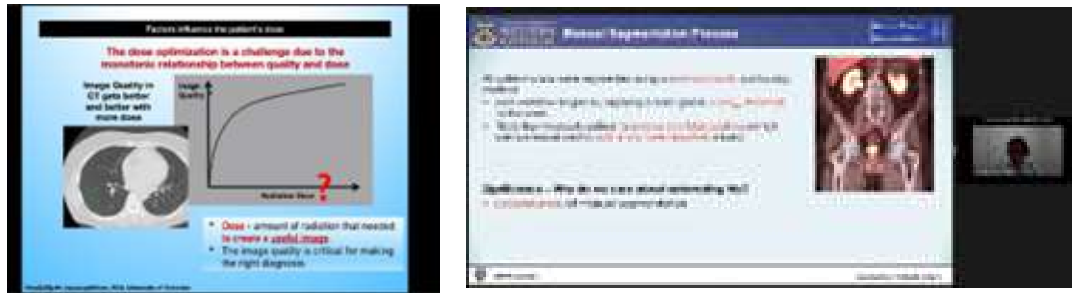
After the talk a very active participation of participants and speaker were observed in form of questions answers and discussion that was moderated very effectively by Mr Suresh Poudel, Nepal. Discussion turns out to be very interesting as many participants spoke about the experience of mentoring programs they have attended.

The fourth webinar started on the same day at 6:00 PM. The webinar title was "Radiological Protection of Patients in Diagnostic radiology". The Speaker was Dr. Jeyasingam Jeyasugiththan. He is a Senior Lecturer in Medical Physics, Department of Nuclear Science, University of Colombo (UOC), Sri Lanka. He focused on patients often raises overall safety awareness and lowers occupational radiation



doses. After the talk a very active participation of participants and speaker were observed in form of questions answers and discussion that was moderated very effectively by Mr Saad Bin Saeed Ahmed, Pakistan.

On 11th May 2022, the fifth webinar started at 5:00 PM. The webinar title was "Artificial Intelligence in the Management of Metastatic Prostate Cancer: Deep learning and Radiomics Analysis of 68-Ga-PSMA PET/CT Images". The speaker was Jake Kendrick.



He is a PhD Research Fellow at Sir Charles Gairdner Hospital, Perth, Australia. He focused on use of new radiopharmaceuticals has improved the accuracy of diagnosis and staging, refined surveillance strategies, and introduced specific and personalized radioreceptor therapies for prostate carcinoma.

Dr Mary Joan moderated the session very effectively. Discussion turns out to be very interesting as many participants spoke about the experience of mentoring programs they have attended.

The Sixth webinar Started on 12th October 2022 at 10:1 AM. The Presentation title was Expanding roles of medical physicists in precision oncology. The Speaker was Prof. Chai Hong Yeong. She is a medical physicist, a certified Radiation Protection Officer and a Professor at the Taylor's University, Malaysia. This webinar moderated by Ms Ishani Jayakody, Sri Lanka. Discussion turns out to be very interesting as many participants spoke about the experience of mentoring programs they have attended.

The Seventh webinar started on the same day at 5:00 PM. The presentation title was "ALARA- Ensuring Quality Imaging". The Speaker was Dr Mansoor Nagvi. He is a qualified and experienced Medical Physicist associated for over 15 years with the department of Radiology, the Aga Khan University & Hospital. The session moderated by Mr Safayet Zaman. After the talk a very active participation of participants and speaker were observed in form of questions answers and discussion.

On 13th May 2022, the last webinar started at 5:00 PM. The presentation title was IMRT and VMAT Planning study for rectal cancer with hypo fraction (RAPIDO Trial). The speaker was Dr. Md. Akhtaruzzaman. He is a Chief Medical Physicist at Evercare Hospital Chattogram, Bangladesh and Currently, he is serving BMPs as the President. He focused on a dosimetric comparison between intensity-modulated radiation therapy (IMRT) and volumetric-modulated arc therapy (VMAT) treatment plans in rectal cancer. He mentioned VMAT is more feasible to the patients due to significant reduction of MUs.

After the talk a very active participation of participants and speaker were observed in form of questions answers and discussion that was moderated very effectively by Md. Khairul Islam. The whole webinar team was happy about the audience interaction and participation.

180 participants registered for this webinar program, from all over Bangladesh including India, Nepal, Sri Lanka, Bhutan, Qatar, USA, Australia, Japan, China, Malaysia, Ghana, Nigeria, Pakistan, Saudi Arabia.

We express our deepest thanks to all the participants for their active participation, including Speaker, Moderator and all individuals involved in organization of webinars.

IMPCB Examination; December 2021

International Medical Physics Certification Board (IMPCB) examinations was held in Bangladesh on 13 - 14 December 2021 after the AOCMP 2021 organized by Bangladesh Medical Physics Society (BMPS). The main aim of the IMPCB is to produce QMP in those countries where there is no procedure for the accreditation of Medical Physicist. The examiners were Prof. Dr. Golam Abu Zakaria, Chair Subcommittee, Accreditation Committee, and Prof. Dr. Hain Anupama Azhari, Member, Accreditation Board, International Medical Physics Certification Board (IMPCB)



The examinees were from Lebanon, Nepal, Sudan, Sri Lanka and Bangladesh. Due to Covid-19 pandemic, many foreign participants can't attend this exam. Total 11 medical physicists had appeared in Part I (Fig-1) exam and 5 medical physicists have given part-II (Fig-2) exam. The examiners are satisfied regarding the arrangement of the exam.

Report on Annual General Meeting of Bangladesh Medical Physics Society (BMPS): December 2021

BMPS represents the interests of medical physicists globally and creates education and training possibilities for the rising scientific generation. BMPS has a long list of achievements arranging each year national and international conference, seminars, workshops and training programs in the field of Medical Physics. Moreover, BMPS has already hosted International Medical Physics Certification Board (IMPCB) exams two times (2018 & 2021) in Bangladesh.

The 21st Asia Oceania Congress of Medical Physics (AOCMP-2021), an official congress of Asia-Oceania Federation of Organizations for Medical Physics (AFOMP) hosted by the Bangladesh Medical Physics Society (BMPS) at the United International University (UIU), Dhaka, Bangladesh from 10-12 December 2021. The congress was endorsed by the International Organization for Medical Physics (IOMP), Middle East Federation of Medical Physics (MEFOMP) and European Federation of Organizations for Medical Physics (EFOMP). This was the first time the AFOMP congress was held in Bangladesh.

The annual general meeting of Bangladesh Medical Physics Society (BMPS) was held on 10 December 2021 after the scientific session of AOCMP-2021. At the beginning, Mr. Md Jobairul Islam, Joint Secretary (2019-2021) presented previous terms reports and activities. Also, Treasurer presented 2019-2021 terms treasurer report. Md. Anwarul Islam, President and Dr. Md. Akhtaruzzaman, Secretary discussed the activities and related issues of the last one year. Founder President Prof. Dr. Hasin Anupama Azhari also delivered her valuable speech for the society. Also, EC Members and general members expressed the future activities and their implementation in AGM. Some new proposals from EC were unanimously accepted by general members.

Dr. Zakaria was awarded Lifetime Achievement Award for his outstanding contributions to the Bangladesh Medical Physics field over the last three decades by BMPS. He is considered the father of medical physics in Bangladesh. Dr. Akhtaruzamman was awarded an honorary memento for achieving his PhD degree in January 2020 from Maria Sklodowska-Curie National Research Institute of Oncology, Warsaw, Poland.



Award Ceremony Program

The last stage of the meeting involved the preparation of the executive committee for the 2021-2023 sessions of BMPS under the guidance of the respected advisory member Prof. Dr. Golam Abu Zakaria. He announced the names of the members of the executive committee for 2021-2023 terms after evaluating the receiving application form of Ex-COM 2021-2023. All of the general members accepted this name for next EX-COM terms. Due that this new EX-COM were unanimously accepted by general members. Dr. Md. Akhtaruzzaman and Mr. Md. Jobairul Islam was elected President and Secretary respectively for next terms. Ms. Sadia Afrin Sarah was elected again as a treasurer. Mr. Md. Mostafizur and Mr. Md Sajan Hossain as a Vice-President and Mr. Md. Shahidul Miah was elected as a Joint secretary. Capt. Md. Khairul Islam, Md. Nazmul Islam, Mst. Zinat Rehana, Md. Mokhlesur Rahman, Polash Sarker, Rukaiya Akter select-ed as an executive member.



New Executive Committee Member:2021-2023

After the formation of the new committees, President and Secretary sought the cooperation of all in the moving ahead.

IMPCB Accreditation Committee Member

Prof. Dr. Hasin Anupama Azhari has been appointed as a member of the IMPCB (International Medical Physics Certification Board) accreditation 2 committee 2021.

She currently holds the positions of General Secretary of Alo Bhubon Trust, CEO of the South Asia Centre for Medical Physics and Cancer Research, Director of the Centre for Biomedical Science and Engineering at United International University (UIU) and General Secretary of the Asia-Oceania Federation of Organization for Medical Physics (AFOMP).

International Day of Medical Physics (IDMP)-2021: Celebrated by Bangladesh Medical Physics Society (BMPS)

The Bangladesh Medical Physics Society (BMPS) was founded in 2009 in Dhaka, Bangladesh to serve the purposes of medical physicists in Bangladesh. The purpose of this society is to foster and coordinate the activities of country medical physicists, promote scientific activities and to build a relationship with the national and international organizations. Currently, BMPS have about 250 national and international members who are working actively to improve the medical physics situation globally.

To move up the awareness of medical physics profession, International Day of Medical Physics (IDMP) is the initiative of the international organization of medical physics (IOMP) which take place on 7 November every year. On that day, Marie Skłodowska Curie was born who conducted pioneering research on radioactivity and her contribution is promoting us to fight against cancer today.

Every year IOMP chooses different and logical themes to encourage medical physicists throughout the world. The theme of IDMP 2021 is 'Communicating the Role of Medical Physicists to the Public'.

BMPS has done several activities including meeting, seminar, events, and campaign over the years. On this auspicious day, BMPS published their official e-newsletter every year. This year we published the issue number 9 of this newsletter, in the named 'Voice of BMPS'. The newsletter comprises articles, continuous professional developments, news & events, and awards & honor. All the activities throughout the year were focused on this article.

BMPS Founder President Reelected OWSD Executive Board Member

The Organization for Women in Science for the Developing World (OWSD) is an international organization founded in 1987 and based at the offices of The World Academy of Sciences (TWAS), in Trieste, Italy. By constituting the Executive Board, OWSD unites women scientists in developing nations, disseminates information on opportunities, local and regional events, and gives access to activities that promote skill-building. Regional Members are essential in decision-making, creating a Strategic Plan, and managing the Secretariat's efforts to implement that plan. For the second time, Prof Dr. Hasin Anupama Azhari has been reelected as the Organization for Women in Science for the Developing World (OWSD) EX-COM: Asia Pacific Regional Member for the years 2021-2025.

She has been working with OWSD since 2005, helping to increase the quantity and quality of women in science, said a press release.

Regional members were elected using the OpaVote platform from 28 June to 4 July 2021 where Anupama received 201 votes out of 375 cast by active full members of the OWSD in the Asia Pacific.

Now Prof. Dr. Hasin Azhari is in position as General Secretary, Alo Bhubon Trust (Alo-BT) as well as the Director, Centre for Biomedical Science and Engineering United International University (UIU), Bangladesh. She is also the first female Medical Physicist (MSc), Founder and Coordinated with Bangladesh Medical Society to ensure the position of Medical Physics in Radiotherapy Department in Bangladesh.

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AWARDS & HONORS

MPWB Awards to AAPM 64th annual meeting 2022

AAPM 64th Annual Meeting & Exhibition was held on July 10-14, 2022, at the Walter E. Washington Convention Center in historic Washington, DC. In this year, AAPM conference was held in virtual and In-Person Conference.

This year, Medical Physics for World Benefit (MPWB) provided an opportunity for those in low to middle income countries to virtually attend the AAPM conference. One BMPS member was selected for the MPWB Awards to AAPM 64th annual meeting 2022.

Md. Jobairul Islam, Medical Physicist and RCO of the Department of Radiation Oncology, Labaid Cancer Hospital and Super Speciality Center and currently he is working as Secretary of Bangladesh Medical Physics Society (BMPS)

BMPS Lifetime Achievement Award 2021

Bangladesh Medical Physics Society (BMPS) has awarded the BMPS Lifetime Achievement Award to BMPS Advisory Member, Prof. Dr. G A Zakaria on 10 December 2021 for his contribution to continuous development in the field of Medical Physics relevant activity beyond south Asia in Africa. The President & Secretary of Bangladesh Medical Physics Society (2019-2021), Md. Anwarul Islam and Dr. Md. Akhtaruzzaman handover the crest of this award to Prof. G A Zakaria.



BMPS Honorary Memento 2021

Bangladesh Medical Physics Society (BMPS) has awarded BMPS honorary memento to BMPS Secretary Dr.Md. Akhtaruzzaman on 10 December 2021 for achieving his PhD degree in January 2020 from Maria Sklodowska-Curie National Research Institute of Oncology, Warsaw, Poland. His research topic was "Dependence of Inhomogeneity Correction Factors on Photon Beams". Currently, he is a Preident of Bangladesh Medical Physics Society (BMPS), is working as a Chief Medical Physicist at Evercare Hospital Chattogram, Bangladesh.



An honorary memento from Bangladesh Medical Physics Society (BMPS) has handover to Mr. Md. Anwarul Islam, president BMPS for achieving the Qualified Medical Physicist (QMP) certification (DIMPCB No-0019) called 'Diplomat' of International Medical Physics Certification Board organized by International Organization for Medical Physics (IOMP). This professional certification is given by taking two written and five viva board exam. The worldwide most learned, famous and expert Medical Physicist nominate as an examiner of this certification board. Still, Mr. Islam is the solo internationally recognized Qualified Medical Physicist (QMP) in Bangladesh.



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Upcoming Events

Engineering and Physical Sciences in Medicine Conference 2022 (EPSM 2022),

13-16 November 2022, Adelaide, Australia

<https://www.epsm.org.au/>

2nd Annual Conference of the Asia-Oceania Particle Therapy Co-Operative Group

(PTCOG-AO 2022)

December 2-3, 2022; Jeju ICC, Jeju, Korea

<http://ptcog-ao2022.org/>

22nd Asia-Oceania Congress on Medical Physics (AOCMP 2022,

December 10 - December 12, Taipei

<http://aocmp2022.com/>

Annual Conference of Bangladesh Medical Physics Society (ACBMPS 2022)

23rd December 2022, Dhaka, Bangladesh

<https://bmps.org.bd/>

NICSTAR2023, Jan 9-12, 2023 at Kochi, India

January 9, 2023 - January 12, 2023

Japan Radiology Congress (JRC) 2023

April 13, 2023 - April 16, 2023; Yokohama, Japan

<https://www.j-rc.org/>

Hands on Workshop on Treatment Planning & Dosimetry

June 2023

<https://bmps.org.bd/>

Annual Conference of Bangladesh Medical Physics Society (ACBMPS 2022)

7th November 2023, Dhaka, Bangladesh

<https://bmps.org.bd/>

International Conference on Medical Physics (ICMP) & 23rd Asia-Oceania Congress on Medical Physics, 2023 & 44th Annual National Conference of Association of Medical Physicists of India (AMPICON 2023)

6th -9th December 2023, India



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BMPS Executive Committee (2021-2023)

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BMPS EXECUTIVE COMMITTEE: 2021-2023

	Dr. Md. Akhtaruzzaman President	
	Md. Mostafizur Rahman Vice- President	
	Sadia Afrin Sarah Treasurer	
	Major Md. Khairul Islam Member	
	Md. Nazmul Islam Member	
	Mr. Polash Sarker Member	
	Md. Makhlesur Rahman Member	

Voice of BMPS