ACBMPS- 2023

11th ANNUAL CONFERENCE OF BANGLADESH MEDICAL PHYSICS SOCIETY

FRI 26th JANUARY 2024

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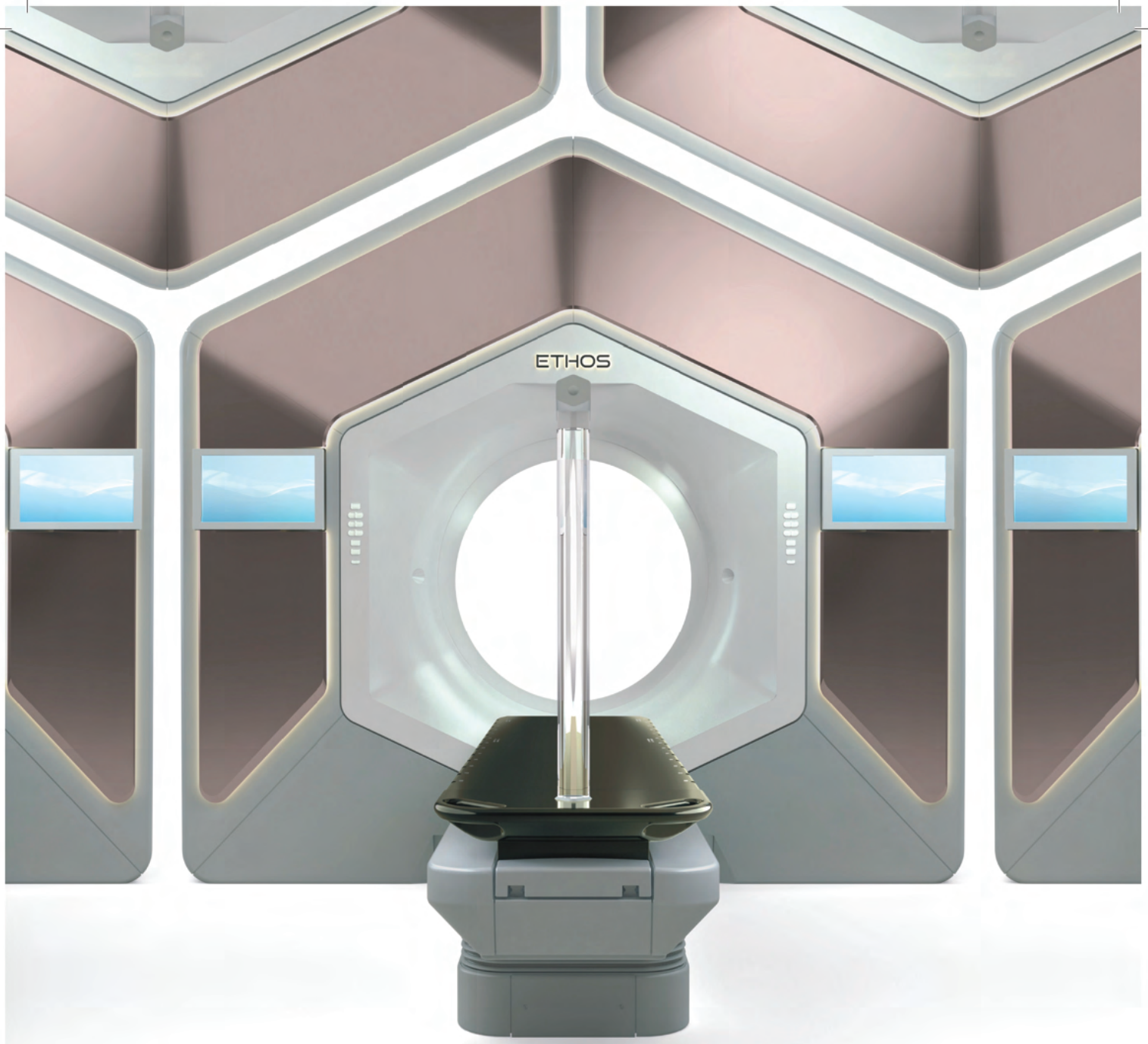

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Professor Dr. M. Nizamul Haque
Director Cum Professor,
National Institute of Cancer Research & Hospital

Message

I am very happy to know that Bangladesh Medical Physics Society (BMPS) is going organize the **"11t Annual Conference of Bangladesh Medical Physics Society (ACBMPS-2023)"** to be held on 26 January 2024 at 8.30am in Krishibid Institution, Dhaka, Bangladesh.

I commend the Bangladesh Medical Physics Society (BMPS) for its unwavering commitment to organizing this significant conference, providing a platform for the convergence of minds dedicated to advancing medical physics and, in particular, the critical field of cancer care and its management. Cancer remains a formidable challenge globally, and Bangladesh is no exception, witnessing a significant impact on the lives of our citizens. The Bangladesh government's proactive measures, including the provision of modern equipment and state-of-the-art knowledge and skills for cancer treatment, are commendable steps toward addressing the pressing needs of our society.

In this context, medical physicists emerge as key contributors to the fight against cancer. Their vital role in ensuring high-quality cancer care and its management cannot be overstated. The ACBMPS-2023 conference stands as a testament to our collective dedication to advancing healthcare and fostering collaboration between physicians and physicists for the betterment of cancer treatment in Bangladesh.

I extend my sincere thanks and felicitations to all the participants, both from home and abroad, for joining this important endeavour. Your expertise and commitment contribute significantly to the success of events like these, where ideas are exchanged, knowledge is shared, and partnerships are forged.

I wish ACBMPS-2023 as a great success.

Professor Dr. M. Nizamul Haque

Sakif Shamim
Managing Director,
Labaid Cancer Hospital and Super Speciality Centre Ltd.

LABAID
CANCER HOSPITAL
AND SUPER SPECIALITY CENTRE
Winning Cancer

Message

I am very delighted to know that Bangladesh Medical Physics Society is going to organize **"11th Annual Conference of Bangladesh Medical Physics Society (ACBMPS-2023)"** on 26 January 2024 at the Krishibid Institution Bangladesh (KIB), Dhaka, Bangladesh. On this auspicious occasion, I express my cordial felicitations to the participants from home and abroad and congratulate Bangladesh Medical Physics Society for arranging this conference.

The field of Medical Physics is evolving rapidly, establishing itself as an integral component of Radiation Oncology and Imaging. The contribution of Therapeutic Medical Physicists is indispensable in the treatment of cancer patients through radiation therapy. Their primary responsibility lies in ensuring the best possible treatment, considering the state of technology and the collective skills of the radiation oncology department.

Cancer is posing a great threat to the humanities. The rate of the cancer patient is increasing at an alarming pace across the globe including Bangladesh. Along with radiation oncologist and radiologist, Medical Physicist plays a pivotal role in cancer care and management.

Labaid Cancer Hospital & super specialty centre is the forefront of the fight against Cancer. It started with an aim to become the best cancer hospital in Dhaka by providing the best cancer treatment in bangladesh. Cancer research & treatment is an area that needs more serious work and Labaid Cancer Hospital has taken the challenges to win over Cancer.

I hope this conference will help a lot to enrich knowledge and skill of Medical physicists and other other relevant specialists. I extend my best wishes to the organizers for their untiring efforts and warm wishes to all participants and speakers.

Sakif Shamim

Organizers

Prof. Dr. Golam Abu Zakaria, FIOMP, FDGMP
Chairperson, ACBMPS-2023
Founder Chairman, South Asia Centre for Medical Physics and Cancer Research (SCMPCR)
Chair, Subcommittee AC2, the International Medical Physics Certification Board (IMPCB)

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Message

I am happy to know that Bangladesh Medical Physics Society (BMPS) is organizing its **"11th Annual conference (ACBMPS 23)"** on 26th January 2024 at the Krishibid Institute Bangladesh (KIB), Dhaka. With the foundation of BMPS in 2009 and the Medical Physics Education since 2000, it is encouraging to see that Medical Physicists (MP) in Bangladesh has advanced and is making a concerted effort to stay current with the field.

In addition to teaching medical physics in various educational institutions, my students work in the majority of radiotherapy departments in both public and private hospitals. Additionally, a few of them hold appointments to various committees and the ExCom in numerous national and international organizations, such as AFOMP. Furthermore, medical physicists are advancing their diverse pursuits and actively taking part in numerous national and international conferences. In the future, all medical physicists should work under an umbrella for their own benefits and assist one another. IMPCB's efforts to increase the number of certified MPs in Bangladesh should now be our focus. Bangladesh and other developing nations may qualify to take the International Medical Physics Certification Board (IMPCB) exam by earning CPD points through accredited SCMPCR (South Asia Centre for Medical Physics and Cancer Research) courses.

The importance of MP, particularly in quality control for therapeutic, diagnostic, and nuclear medicine, should not be overlooked. To successfully complete this mission and assemble a truly competent team of medical physicists, I sincerely hope that BMPS will demonstrate its dedication in this regard.

I would like to sincerely thank BMPS, all participants and sponsors for this wonderful event and wish a grand success of ACBMPS.

Prof. Dr. Golam Abu Zakaria

Md. Akhtaruzzaman, PhD
President
Bangladesh Medical Physics Society (BMPS)

Message

Dear colleagues,
Bangladesh Medical Physics Society (BMPS) is the professional body for medical physicists in Bangladesh. BMPS regularly organizes seminar, workshops, and conferences for the professional development of small but growing medical physicist community in the country.

In this connection, I am delighted to welcome you all to participate the 11 th Annual Conference of the Bangladesh Medical Physics Society (ACBMPS-2023), held in Krishibid Institution Bangladesh on January 26, 2024. The event has been endorsed by the Asia-Oceania Federation of Organizations for Medical Physics (AFOMP).

This daylong congress includes scientific, educational, and professional sessions that may provide networking opportunities for medical physicists, medical physics graduates and other professionals interested in medical radiation sciences.

I would also like to thank the Bangladesh Medical Physics Society (BMPS) and the organizing committee for organizing this important event. My sincere gratitude to the invited speakers, oral and poster presenters for their invaluable contribution to the ACBMPS 2023.

Furthermore, I would also like to thank to the sponsors for their valuable contribution, which facilitate BMPS to organize the conference successfully.

I wish a grand success of ACBMPS 2023.

Dr. Md. Akhtaruzzaman

Md. Jobairul Islam
Organizing Secretary, ACBMPS-2023
Secretary, BMPS

Message

Distinguish Guests and Esteemed Colleagues,
Being the organizing secretary of this conference, it is with great pleasure to invite you all of the great scientists, academician, young researchers, delegates, and students to the attend the 11th Annual Conference of Bangladesh Medical Physics Society (ACBMPS-2023) which is going to be held on January 26, 2024, Krishibid Institution Bangladesh (KIB) in Dhaka, Bangladesh.

The ACBMPS, an official yearly congress of the Bangladesh Medical Physics Society (BMPS), stands as a testament to the remarkable evolution in medical physics field. This event serves as a crucial platform to showcase advancements that benefit patients, hospital staff, and the wider public. This conference has been endorsed by AFOMP. This conference covers a broad spectrum of topics in medical physics, contributing significantly to the ongoing development of this field in Bangladesh.

BMPS is the main professional body and scientific organization, founded in 2009. It is the voice of medical physicists practicing in Bangladesh. BMPS is charged with a mission to start medical physics practice in Bangladesh. BMPS is regularly organizing annual conference and international conference every three years through which a collaborative network is continuously establishing knowledge enhancement, national and international communication, trained professionals in this field.

As we glance through the meticulously planned scientific program, the diversity of applications in medical physics becomes apparent. I encourage you to explore and participate in various offerings of the conference. My heartfelt thanks go to our advisory members, organizing team, sponsors, and all contributors for their guidance, support, and motivation toward the success of ACBMPS-2023. We except your cooperation and support to further the development of BMPS.

Thank you for being so dedicated to advancing medical physics, and we wish you a fruitful and enriching experience at ACBMPS-2023

Md. Jobairul Islam

Endorsers

Prof Eva Bezak
President
Asia-Oceania Federation of Organizations for Medical Physics
(AFOMP)

Message

Dear colleagues,

It is my pleasure to welcome you all to attend the 11 th Annual Conference of the Bangladesh Medical Physics Society (ACBMPS-2023), held in Krishibid Institution Bangladesh, Khamarbari, Dhaka, Bangladesh. The program offers exceptional educational, professional and networking opportunities for medical physicists, medical physics students and other professionals interested in medical radiation sciences.

I would like to thank the Bangladesh Medical Physics Society (BMPS) for successfully organising the ACBMPS-2023 and for being such an important and proactive professional organization and an affiliate member of the Asia-Oceania Federation of Organizations for Medical Physics. It is my pleasure to see how many young medical physicists, representing the new wave of medical physics professionals, have become actively involved on national and international levels. With them, I feel like Bangladesh is heading in the right direction and I admire the dedication of these young colleagues.

Wishing the best meeting

Prof Eva Bezak

Aik Hao Ng
Secretary General
Asia-Oceania Federation of Organizations for Medical Physics
(AFOMP)

Message

Dear colleagues,

First of all, I would like to extend my heartfelt greetings to all participants of the 11 th Annual Conference of the Bangladesh Medical Physics Society (ACBMPS-2023), held in Krishibid Institution Bangladesh, Khamarbari, Dhaka, Bangladesh.

I am honoured to witness the convergence of dedicated professionals in the field of medical physics to work together in this annual event. It serves as an important platform for knowledge exchange, collaboration and support that contribute to the growth of medical physics in Bangladesh and beyond.

I would like to congratulate to the Bangladesh Medical Physics Society (BMPS) for successfully organised ACBMPS-2023 that enables the fraternity to share the current achievements and discuss further activities of medical physics on an international scale. Your commitment to advancing medical physics practices is truly commendable.

Finally, I would like to extend my best wishes for a successful and enriching ACBMPS-2023. May the conference be filled with insightful discussions, valuable networking opportunities, and the exchange of experiences that will undoubtedly contribute to the progress of medical physics in the region.

Thank you.

Warm regards,

Dr. Aik Hao Ng

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ACBMPS-2023 Committees

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Scientific Programme

08:30-09:30	**Registration and Kits Collection**		
10:00-11:00	**Inaugural Ceremony**		
11:00-11.30	**Tea Break**		
11.30-13.00	**Scientific Session-I**		**Chair: Dr. Parvin Akter Banu** **Co-chair: Prof. Abdullah Al Mashud** **Moderator: Dr. Md Anwarul Islam**
11.30-11.50	IV-01	Advances of AI in Radiotherapy	Biplab Sarkar (IN)
11.50-12.05	IV-02	Management of quality assurance program and quality audit of radiotherapy center in Bangladesh: A review of regulatory Inspection	Md Rayhan Uddin (BAERA)
12.05-12.20	IV-03	Quantification of intra-fraction organs motion in MRI guided brachytherapy of cervical cancer	Abdus Sattar Khalid (UK)
12.20-12.30	OP-01	High-Dose-Rate brachytherapy for cervical cancer using an artificial neural network	Alamgir Hossain (RU)
12.30-12.40	OP-02	Retrospective study of CTV-PTV margin: an institutional experience	Syeda Fariha Hasan (GB)
12.40-12.50	OP-03	Detection of leukemia in microscopic images by using image processing techniques	Debojoti Paul Ananyo (IUB)
12.50-13.00	OP-04	Clinical validation of radiotherapy treatment planning system for 6 MV, 10 MV & 15 MV photon beams using CIRS thorax phantom	Mehrab Hassan Udoy (BSMMU)
13:00-14:00	**Lunch and Prayer Break**		
14:00-14:30	**Vendor Presentation**		**Chair: Prof. Golam Abu Zakaria** **Co-chair: Dr Md Rayhan Uddin** **Moderator: Mr. Md Jobairul Islam**
14:00-14:20	VP-01	Advancement in treatment planning solutions	Karrthick KP (Varian)
14:20-14:30	VP-02	Everything you need to know about cancer centers	Sajan Hossain (Trade House)
14:30-16:00	**Scientific Session-II**		**Chair: Prof. Dr. Sarwar Alam** **Co-chair: Dr. Munima Haque** **Moderator: Mr. Md Motiur Rahman**
14:30-14:45	IV-04	Dosimetric impact of grid size and statistical uncertainty on monte carlo algorithm in vmat planning with 1onaco tps for single lesion brain stereotactic radiotherapy	Md Akhtaruzzaman (EHC)
14:45-15:00	IV-05	Unlocking the therapeutic potential of Mangifera indica leaf extract compounds: an in-silico exploration for breast cancer inhibitors	Md Abdullah Al Mashud (IU)

		through quantum mechanics, molecular dynamic simulations, ADME, and toxicity analysis	
15:00-15:10	OP-05	A comparative dosimetric study of egs based monte carlo simulation code and comparison with anisotropic analytical algorithm (AAA), Acuros XB (AXB) in inhomogeneous medium.	Md Saiful Islam (CMH)
15:10-15:20	OP0-6	Prevalence of breast cancer incidence in bangladesh in association with risk factors, diagnosis and treatment procedures	Adiba Hasan Prova (GB)
15:20-15:30	OP-07	Specification of setup margin (SM) of planning target volume (PTV) in left breast cancer for specific Linac machine	Md. Zulkar Naen (CMH)
15:30-15:40	OP-08	Comparative dosimetric analysis of deep inspiration breath-hold and free breathing techniques in radiation therapy for left-sided breast cancer: a single-institution retrospective study	Md. Jobairul Islam (LCH)
15:40-15:50	OP-09	Clinical feasibility study of an artificial intelligence assisted auto-contouring system for radiation therapy treatment planning: a proof-of- concept methodology	S M Hasibul Hoque (LCH)
15:50-16:00	OP-10	Identification of skin lesions through the analysis of dermoscopy images utilizing convolutional neural network and developing a flask based artificial intelligence web application	Md. Eshtiaqul Haque (GB)
16:00-16:10	**Tea Break**		
16:10-17:00	**Poster Session (Parallel)**		**Panel of Judges:** **Prof. Golam Abu Zakaria (Chair)** **Prof. Hasin Anupama Azhari** **Dr. M. Anwarul Islam** **Mr. Md Abu Kausar** **Mr. Md Mokhlesur Rahman** **Mr. Md Shahidul Mia**
	PP-01	Deep learning for high risk and low risk ischemic strokes based on MRI images	Md Alamgir Hossain (RU)
	PP-02	Investigations of *Aloe Vera* leaves Extracted Phytochemicals to Inhibit Liver Cancer: HOMO-LUMO, Quantum Calculation, MEP, and Toxicity Analysis	Md. Abdur Rahman (IU)
	PP-03	The *In-silico* Investigations of *Averrhoa Carambola* Leaves Extracted Nanocomposites to Inhibit Breast Cancer: Quantum calculations, Molecular Dynamic Simulation, ADME and Toxicity Analysis	Md. Mobinul Hoque (IU)
	PP-04	Characterizations and In-Silico Investigations of *Coriandrum Sativum Leaves* Extracted Nano Compounds Profiling Against Colon cancer: Quantum Calculations, Molecular Docking, MD Simulation and ADMET Analysis	Nayan Kumar Sarkar (IU)
	PP-05	GCMS Extraction Phytochemicals of *Camellia Sinensis* leaves to Assay Against DENV viruses: Chemical Reactivity, Quantum Calculation, MEP, and ADMET Analysis	Md. Mehedi Hasan Somrat (IU)
	PP-06	Machine Learning Based Risk Factors Prediction and *In-*	Rakib Hasan (IU)

		Silico Exploration of *Withania Somnifera* Leaf Extracted Nanocomposites for Breast Cancer Inhibition	
	PP-07	Quantum Calculations, ADMET Analyais, and In-Silico study of *Pleurotus tuber-regium (Mashroom)* Extracted Phytochemicals to Inhibit MDA-MB-468 Cell Line of Breast Cancer	Suraya Rahman (IU)
	PP-08	A Review of Electronic Brachytherapy- Present and Future Directions	M N Hasan (GB)
	PP-09	Dosimetric Evaluation of VMAT Plans using 6MVFF and 10MVFF Energies in the Management of Carcinoma Cervix Patients: A Comparative Study	Ritu Akter Setu (GB)
	PP-10	Dosimetric Evaluation of Treatment Plans of 3DCRT, IMRT, and VMAT in Rectum Cancer	Niloy Kumar (GB)
	PP-11	The Application of Gel Dosimeters and Comparison with Other Dosimeters in Radiotherapy: A Literature Review	Md. Mahbubur Rahman (GB)
	PP-12	A Prospective Study of VMAT versus IMRT for Preoperative Rectal Cancer: A Dosimetric Analysis	Kazim Uddin Olin (GB)
	PP-13	Evaluate the Shielding Thickness of Primary and Secondary Barriers for the New LINAC Bunker at the INMP, AERE, BAEC, Bangladesh	Nahida Sultana (GB)
	PP-14	Comparative Analysis and Machine Learning Predictions of Cervical Cancer Incidence: A Multi-National Study	Shah Faisal (BRAC)
	PP-15	Comparative Analysis and Machine Learning Prediction Oral Cancer Epidemiology: A Multi-National Study	Tshewang Palden (BRAC)
	PP-16	Comparative Analysis on Biodegradable Granular Bone Substitute with in Situ Antibiotic and Growth Factor Releasing Capability	Nahid Anjum (GB)
	PP-17	Electronic Brachytherapy- The New Era of Entering into Sophisticated Cancer Treatment in Bangladesh	Nikas Kanti Nath (GKH)
16:10-17:00	**AFOMP Session: Medical Physics Education, Training and Profession (Parallel)**		**Chair: Prof. Dr. Kazi Manzur Kader** **Chair: Prof. Dr. Md. Sanowar Hossain** **Moderator: Mr. Abdus Sattar Khalid**
16:10-16:30	IV-06	Training and career for medical physics graduates: Global opportunities	Golam Abu Zakaria (DE/BD)
16:30-16:50	IV-07	Importance of a unified medical physics syllabus in AFOMP	Hasin Anupama Azhari (AFOMP)
16:50-17:00	OP-11	Aspect of medical physics in Bangladesh: a growing field with a bright future	Shahdat Hossen Shuvo (GB)
17:00-18:00	**Valedictory Session/Award Ceremony, AGM of BMPS**		

Invited Speakers

IV-01

Modern Advances (Artificial Intelligence) In Radiotherapy

Biplab Sarkar
Apollo Multispeciality Hospitals, Kolkata, India
Email: biplabphy@gmail.com

Artificial Intelligence (AI) has emerged as a transformative force in the field of radiotherapy, revolutionizing the way cancer patients are diagnosed and treated. Radiotherapy, a crucial component of cancer management, involves using high doses of radiation to target and destroy cancer cells. AI technologies are increasingly integrated into radiotherapy processes to enhance precision, efficiency, and overall treatment outcomes.

There are several applications of the Ai in Radiotherapy which bis presently in clinical use are 1. multimodal image fusion, 2. atlas segmentation-based auto contouring, 3. automated knowledge-based planning, and 4. Adaptive radiotherapy and setup image verification.
The most significant application of AI in radiotherapy is treatment planning. Traditionally, creating a treatment plan involves intricate manual calculations and adjustments by medical physicists. AI algorithms, however, can analyze vast amounts of patient data, including medical imaging, genetic information, and treatment histories, to optimize and personalize treatment plans. This not only accelerates the planning process but also ensures a more tailored and effective approach for each patient. AI is also instrumental in image-guided radiotherapy (IGRT), where real-time imaging is used to precisely target tumors during treatment. AI algorithms can rapidly analyze and interpret images, providing immediate feedback to clinicians and enabling them to make real-time adjustments to ensure accurate radiation delivery. This dynamic adaptation enhances the precision of treatment, minimizing damage to surrounding healthy tissues and reducing side effects. Furthermore, AI contributes to the automation of routine tasks in radiotherapy, freeing up healthcare professionals to focus on more complex aspects of patient care. This includes automating quality assurance processes, monitoring treatment progress, and managing treatment schedules. By streamlining these tasks, AI helps to optimize resource utilization and improve overall treatment efficiency.

Despite the numerous advantages, the integration of AI in radiotherapy also poses challenges related to data privacy, ethical considerations, and the need for continuous validation of algorithms. As technology advances, ongoing research and collaboration between healthcare professionals, technologists, and ethicists are essential to harness the full potential of AI in radiotherapy while ensuring the highest standards of patient care and safety. In conclusion, AI is transforming radiotherapy into a more precise, personalized, and efficient modality, offering new hope and improved outcomes for cancer patients.

IV-02

Management Of Quality Assurance Program and Quality Audit Of Radiotherapy Center In Bangladesh: A Review Of Regulatory Inspection

Md Rayhan Uddin
Radiation, Transport and Waste Safety Division, Bangladesh Atomic Energy Regulatory Authority
Email: rayhan.uddin@baera.gov.bd

Background and Introduction: The aim of this study is to review the management of quality system and quality audit of radiotherapy facilities in Bangladesh based on regulatory compliance. Quality Assurance (QA) is concerned with all those procedures that ensure consistency of the medical prescription and the safe fulfilment of that prescription as regards dose to the target volume, together with minimal dose to normal tissue. Quality assurance is importance to reduce of uncertainties and errors (in dosimetry, treatment planning, equipment performance, treatment delivery, etc.). The multidisciplinary radiotherapy team consists of radiation oncologists, medical physicists, dosimetrists,

and radiotherapy technologists. Responsibilities of different teams are shared between the different disciplines and must be clearly defined. Each group has an important part in the output of the entire process, and their overall roles, as well as their specific quality assurance roles, are inter- dependent, requiring close cooperation. The required quality system is essentially a total management system for the total radiation therapy process. Quality audit is an independent review of the quality assurance and quality control programs, which is ideally external to the process or part of the process under review, i.e. performed using independent procedures and by independent persons who are not responsible for the performance of the product or process under review. In this study, IAEA training course series 74 and Quality Assurance Team for Radiation Oncology (QUATRO) are reviewed to develop an infrastructure for quality assurance program and quality audit of radiotherapy center in Bangladesh.

Methods: The audit methodology refers to specific roles and responsibilities in the preparation, implementation, finalization, and follow-up phases of the audit process. The methodology described in this study builds on established approaches to comprehensive auditing of clinical practice. The request for an audit normally originates from the main stakeholders or head of the medical physics program in different radiotherapy centers. Audit coordinators receive of the audit requests and prepare audit report and results and finally recommended necessary steps to improve quality assurance of radiotherapy center.

Results and Discussion: This project has been reviewed from the IAEA publication of Quality Assurance Team for Radiation Oncology (QUATRO). It provides a guideline for independent quality audits through comprehensive reviews of radiotherapy practices to mprove quality system. A comprehensive audit of a radiotherapy programmed is very important to review and evaluates the quality of all the elements involved in radiation therapy, including staff, equipment and procedures, patient protection, and overall performance of the radiotherapy department.

IV-03

Dosimetric impact of grid size and statistical uncertainty on Monte Carlo algorithm in VMAT planning with Monaco TPS for single lesion brain stereotactic radiotherapy

M. Akhtaruzzaman[1,2], KM Rafic[1], T. Ahmed[1]. M.A. Ebert[2,3]

[1]Evercare Hospital Chattogram, Chattogram, Bangladesh,

[2]The University of Western Australia, Perth, Australia,

[3]Sir Charles Gairdner Hospital, Perth, Australia

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Introduction: Calculation grid size (CGS) and statistical uncertainty (SU) are important parameters in a Monte Carlo (MC) based treatment planning system (TPS), which determines the dose calculation accuracy and time. This study aimed to investigate the dosimetric impact of CGS and SU by varying beam energies and number of arcs in stereotactic radiotherapy of brain metastasis using Monaco TPS.

Materials and Methods: Ten single lesion brain metastasis patients with gross tumour volume (GTV) ranging from 0.5 cc to 6.0 cc were included in this study. The volumetric modulated arc therapy (VMAT) plans were generated using Monaco v6.0 TPS with a reference calculation using a CGS of 0.2 cm and SU of 1.0% with a 6 MV FFF photon beams. Each plan was recalculated with CGS and SU values ranging from 0.1 to 0.3 cm and 0.25% to 3.0% respectively. For each CGS and SU combination, the variation from the reference calculation was determined for a range of dose volume metrics (D99, Dmean and Dmax), plan quality indices-conformity index (CI), and gradient index (GI), total monitor units (MU), dose to the organ at risks (OARs), and plan optimization time. The reference calculation was also evaluated using different beam energies and number of arcs.

Results: The calculated variations for the range of CGS and SU values for D99, Dmean and Dmax to the target were found to be up to 5.0%, 2.5%, and 4.0% respectively. The maximum variation for CI was

9.0 while for GI was 17.0%. The total MUs varied by 18.0% and the variation of dose to the GTV-Brain was up to 3.5%. The higher variations were found only for the smaller SU values and CGS. However, the study found a significant increase of calculation time with lower SU values and CGS. Increasing the SU values and CGS results in reduced calculation time while increasing the maximum dose to the Target. Varying beam energies and number of arcs have no significant impact on dose volume metrics. However, such variations affect the CI, GI and total monitor units (MUs) up to 4.0% and 7.0% respectively.

Calculation: Both CGS and SU values have influence on the dose distribution and are dominated by the smaller values. Further investigation is required to explore all suitable dose calculation parameters for small field stereotactic treatment plans.

IV-04

Quantification of intra-fraction organs motion in MRI guided brachytherapy of cervical cancer

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Introduction: MRI guided brachytherapy of cervix cancer relies on the use of MRI for treatment planning. MRI are acquired after applicator insertion and used for contouring and planning purposes. The delineated structures are more likely to move and this motion is not accounted for at the point of treatment delivery that occurs 2-3 hours later. The purpose of this study is to quantify dosimetrically the impact of intra-fractional organs motions.

Material and Methods: A total of 12 fractions (6 consented patients) undergoing brachytherapy for cervical cancer underwent a second MRI (MRI2) about 2 hours after the initial reference MRI (MRI1) and prior to treatment delivery. A Para-axial T2 weighted MRI was acquired. The TPS EclipseTM v11.0 (Varian Medical Systems, Palo Alto, CA) was used for the treatment planning workflow. MRI2 was rigidly co-registered around the applicator to MRI1. The organs at risk (OARs) (bladder, rectum, sigmoid, small bowel) were contoured on MRI2 by a clinical expert. The high-risk clinical target volume (HR-CTV) and the intermediate risk CTV (IR-CTV) were copied from MRI1 to MRI2. The dose planned on MRI1 was copied to the new geometry defined by MRI2. Dose volume histogram (DVH) metrics were computed for the structures delineated on MRI2 and MRI1 as recommended by the EMBRACE II protocol. The minimum dose to 90% and 98% of the HR-CTV or IR-CTV denoted respectively D90 and D98 were computed. The minimum dose of the most exposed 0.1 cm3, 2 cm3, and 5 cm3 volume of the OARs denoted respectively D0.1cc, D2cc, and D5cc were computed. The percentage of dose metrics deviations (PDMD) from the reference DVH measurements on MRI1 were computed. Statistical significance of dose differences was assessed using the paired one-tailed Wilcoxon signed-rank test, with a 5% significance level.

Results: Dose deviations due to displacement and deformation were within 25% for OARs and 3% for CTVs. The highest PDMD was D98 = 1.02±1.54for HR-CTV, D98 = 0.98±1 for IR-CTV, and D0.1cc =5.4±20.49, D2cc=2.11±14.48 for the rectum in the group of OARs. The small bowel has a high negative PDMD meaning that it was better spared. The slight differences in tumor coverage are within the uncertainties due to image registrations. High intra-fractional standard deviation was obtained compared to average PDMD which may be alleviated with more patient data. The DVH metrics were statistically significantly different for HR-CTV, IR-CTV, and the bladder. Although the same bladder filling was done, the latter had a significant PDMD of D2cc=7±8.62.

Conclusion: Re-Imaging prior to dose delivery showed anatomical changes in the OARs at treatment time compared to the time of planning and this was quantifiable dosimetrically. Further investigation on more data is needed to understand these effects and allow interventions to ensure maximum target

coverage and OARs sparing when planning.

IV-05

Unlocking the Therapeutic Potential of Mangifera indica Leaf Extract Compounds: An In-Silico Exploration for Breast Cancer Inhibitors Through Quantum Mechanics, Molecular Dynamic Simulations, ADME, and Toxicity Analysis

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Background: Global health is greatly affected by breast cancer, which is one of the most common and deadly tumors in women. Its high death rate and constant progress highlight the urgent need for new therapeutic approaches. No effective antiviral drug has been created, produced, or made available through medical treatment, despite the fact that breast cancer is one of the leading causes of mortality worldwide.

Objectives: The objective of this study is to examine the possible suppressive effects of several chemicals found in Mangifera indica leaf extract on drug-resistant breast cancer protease PDB ID 3w32 proliferation.

Materials and Methods: The phytochemicals from the leaves of Mangifera indica were extracted, and in order to determine the most promising drug candidate, the phytochemicals were analyzed using the following methods: molecular modeling techniques like molecular docking and molecular dynamics (MD) simulations; Density Functional Theory (DFT) and quantum mechanics (QM) calculations; and the Absorption, Distribution, Metabolism, Excretion, and Toxicity (ADMET) method. The efficacy of the ligands against the 3w32-overexpressing breast cancer protein is investigated in detail. Important properties of molecules, including chemical potential, electronegativity, hardness, softness, and orbital energy gaps, can also be determined by quantum chemical calculations employing HOMO-LUMO analysis.

Results: The study indicates that quercetin (08), catechin (09), and elagic acid (10) are potent contenders with a high affinity for binding the breast cancer protein (PDB ID: 3w32). Research using the frontier molecular orbital (FMO) theory showed that the chemicals' low chemical reactivity matched their bioactivity. Molecular dynamics (MD) simulation trajectory analysis confirmed that the selected natural ligands had very good protein binding site stability. These three ligands meet the criteria for a potential novel inhibitor of breast cancer in addition to being more effective than the FDA-approved (Abemaciclib drug) treatment. The results show that ligand 08 strongly inhibits the desired protein's GLN791, MET793, and ASP855, ligand 09 strongly inhibits the same protein's GLN791, and MET793, and ligand 10 strongly inhibits the protein's MET793, ASP800, and GLN855 active sites. The toxicity studies confirm their low hepatotoxicity, absence of carcinogenic potential, and safety for human use.

Conclusion: Targeting the 3w32-overexpressing protein, ligands 08, 09, and 10 (derived from leaves of the Mangifera indica leaf) exhibit potential as both new treatments for breast cancer and strong anti-cancer medicines. This research could improve patient outcomes and lessen the disease's worldwide effects. It is a major step forward in creating customized breast cancer treatment plans.

Keywords: Breast Cancer, DFT, Quantum Mechanics, MD Simulation, ADME, and Toxicity.

IV-06

Training and Career for Medical Physics Graduates: Global Opportunities

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This talk provides an overview of the field of medical physics, emphasizing its central role in modern healthcare and the training and career opportunities for medical physics graduates worldwide. The lecture begins with an introduction to the basic principles of medical physics and shows the connection with the principles of general physics. The international importance of medical physicists and their indispensable contribution to the precision and safety of medical treatments are highlighted.

Statistical information on the professional group of medical physicists is presented in a global context. This is followed by a discussion and insights into the various sub-areas of the field.
The lecture pays particular attention to the important area of radiation therapy and emphasizes the imperative need for universal access to this life-saving medical treatment. The responsibilities and challenges that medical physicists face in maintaining and advancing health standards are explained and a differentiated perspective on the complexity of the profession is presented.

In addition, potential career paths and further education for medical physics graduates are discussed, considering the constantly evolving technology and educational landscape.
An assessment of the status of medical physics education in the Asia-Ocean region provides valuable insights into the progress and obstacles in these countries.

The role of international organizations in shaping the education and careers of medical physicists is highlighted, with a particular focus on the learning resources and training opportunities available to facilitate professional development.

A significant part of the lecture focuses on the South Asia region, where the South Asia Centre for Medical Physics and Cancer Research (SCMPCR) plays a prominent role. The initiatives taken by the SCMPCR to promote research, training, and collaboration in the field of medical physics are presented in detail.

IV-07

Importance of a unified medical physics syllabus in AFOMP

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A unified medical physics syllabus within the Asia-Oceania Federation of Organizations for Medical Physics (AFOMP) holds paramount importance in fostering standardized education and professional development across diverse regions. This abstract discusses the imperative need for a cohesive curriculum to ensure consistent training and knowledge dissemination among medical physicists. A unified syllabus enhances collaboration, facilitates resource sharing, and promotes a harmonized approach to addressing regional healthcare challenges. It serves as a foundation for benchmarking competencies, promoting accreditation, and fostering a sense of community among medical physicists in the AFOMP region. Additionally, a standardized curriculum aligns with international standards, contributing to the global recognition of medical physicists and ensuring a high level of proficiency in the delivery of medical physics services. The implementation of a unified syllabus in AFOMP stands as a pivotal step towards elevating the quality and effectiveness of medical physics education, ultimately benefiting healthcare systems and patient outcomes in the Asia-Oceania region.

Oral Presentation

OP-01

High-Dose-Rate Brachytherapy for Cervical Cancer Using an Artificial Neural Network

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Introduction: The study evaluated the effectiveness of single-channel and tri-channel applicators for patients with cervical cancer based on high-dose-rate brachytherapy using an artificial neural network.

Materials and Methods: The high-dose-rate brachytherapy treatment outcomes for single-channel and tri-channel applicators in cervical cancer are forecasted using an artificial neural network (ANN) model. At the time of this study, 54 cervical cancer patients were receiving external beam radiation treatment (EBRT) of 40–50 cGy in addition to chemotherapy, out of the 37 patients with the disease who were used for training and the 17 patients for testing in this model.

Results & Discussion: A model was developed to compare the treatment results of single-channel and tri-channel applicators used in intracavitary brachytherapy. With an accuracy of 83.33%, the result illustrates the ANN model for k-fold cross validation. The corresponding averages for specificity and sensitivity were 0.885 and 0.833. AUC on average was 0.824.

Conclusion: Using a model technique for artificial neural networks based on gynecological brachytherapy, a viable patient treatment strategy that yields the dosimetry output of applicators, medical physicists may identify the appropriate applicator for cervical cancer. The proposed model has the potential to accurately predict treatment outcomes for patients with cervical cancer utilizing single-channel and tri-channel applicators, based on survival data.

Keywords: Artificial neural network, high dose rate, brachytherapy

OP-02

Retrospective study of CTV-PTV margin: An institutional experience

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Background: The goal of External Beam Radiotherapy is to deliver maximum dose to target and minimum dose to Organ at Risk (OARs) structure. Due to which, a Planning Target Volume (PTV) is created by surrounding a margin with the Clinical Target Volume (CTV) to consider setup uncertainties and movement of the target. The purposes of this study were to determine the CTV-PTV margin and adopted it daily clinical practice based on the Cone Beam Computed Tomography (CBCT-3D) and Kilovoltage (KV-2D) setup images.

Methods and Materials: We have randomly selected 46 patients for the brain with 312 image fraction and 33 patients for the head and neck with 210 image fractions from Square Cancer Centre, Square Hospitals Ltd for this study. The vertical, longitudinal and lateral displacement of all acquired image positions to treatment positions were found a tabular format in the Offline Review of Eclipse (V-13.6) Treatment Planning System (TPS). The Mean and Standard Deviation (SD) has been calculated for each case individually. Later SD of Means (Systematic errors) and Root Means Square of SDs (Random errors) have been calculated. Finally, setup margin has been determined using the Van Herk formula.

Results: The CTV to PTV margin in vertical, longitudinal, and lateral directions for the Brain, and Head

& Neck, were (0.3,0.4 and 0.4 cm), (0.4, 0.6 and 0.4 cm), respectively.

Conclusion: If the determined margin is applied in the superior/inferior direction then it is possible to achieve at least 90% coverage of the CTV for at least 90% of the cases, according to the findings of this study. If this discrepancy is ignored, the actual dose distributions in the CTV and the nearby OARs will not be the same as those predicted during treatment planning, causing an underdosing of the CTV or an overdosing of the OARs.

Key words: Clinical and Planning Target Volume, Computed Tomography, Organ at Risk

OP-03

Detection of Leukemia in Microscopic Images by Using Image Processing Techniques

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Introduction: Leukemia is a one kind of blood cancer which is a malignant disease and it should be detected early stage. In this work we detected leukemia by using automatic image processing techniques from optical microscopic image of stained blood cells. Stained blood cells show different size, shape, nuclear structure and different structure of WBC than compare to the ordinary cells. Based on this difference of feature we can automatically detect if there is any presence of leukemic blood cells in the blood sample.

Material & Methods: At first 118 microscopic images of blood cells were collected from online data base and after that these images were feed into MATLAB Application, then images were read, also converted from RGB to Gray scale. The images were also segmented by using threshold method. During segmentation of images different types of statistical parameters were calculated such as mean, standard deviation etc. After that the blood cell regions were identified by calculating the geometrical features. In the next step, the normal blood cells and blast blood cells were classified. Based on this geometric feature-based classification the algorithm, which developed in our work this detected leukemia.

Results and Discussion: 118 Images of Blood Cells were feed in to MATLAB. Finally, after the operation, we got the accurate result from the 86 images. Among the 86 images; 55 images were healthy; 24 images were initial stage leukemia affected and 7 Images showed advanced stage leukemia affected.

Conclusion: In this study leukemia was detected by using the image processing techniques; which is an automation process, by using it we will get output result within a short period of time and without cost. Therefore, it will create a great impact in the healthcare sector.

Keywords: Leukemia, Image Processing, MATLAB, Image Acquisition, Image Segmentation.

OP-04

Clinical Validation of Radiotherapy Treatment Planning System for 6MV, 10MV & 15MV Photon Beams Using CIRS Thorax Phantom

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Background: Maintaining radiation dose delivery accuracy and dose computation in the medium of high-density gradient (heterogenous) is the most challenging task. The goal is to assess how far the dose measured deviates from the dose predicted by the Treatment Planning System (TPS) algorithm (AAA) using a CIRS Thorax phantom. The experiment concentrated on the dosimetry portion of the treatment planning and delivery procedures and was focused on IAEA-TECDOC-1583 recommendations.

Materials and Methods: Canon-Lightning Aquilion CT-simulator was used to scan an CIRS Thorax Phantom (anthropomorphic), and treatment plans were created on local Treatment Planning System (TPS)-Eclipse-13.6 for four distinct test cases utilizing different beam combinations (6MV,10MV&15 MV) recommended by the IAEA. The Farmer type ionization chamber (IBA FC65-P) was utilized to quantify the doses at specified points after the phantom was exposed to radiation in accordance with the treatment protocols for these test cases. The doses were displayed by an IBA DOSE-1 Reference Class Electrometer.

Results: The TPS computation algorithm for various photon beam intensities was tested in the measurements. The difference between the measured and calculated values was within the agreement requirements except few points. Satisfactory results were obtained for lung and bone substitutes (medium of high-density gradient). The number of measurements that yielded findings that did not meet the agreement criteria increased as beam energy grew. Max. Error10MV (-7.87%) > Error15MV (4.44%) > Error6MV (-3.47%) and Min. Error10MV (0.12%) > Error15MV (.02%) > Error6MV (0.05%).

Conclusion: The experiment enhanced the users' trust in the accuracy of dose calculations made with TPSs and helped them better grasp the functional features and limitations of their TPSs. It is consequently highly desired to switch to more improved algorithms as the experimental results identified errors in the existing algorithms used for the tested conditions.

OP-05

A Comparative Dosimetric Study of EGS Based Monte Carlo Simulation Code and Comparison with Anisotropic Analytical Algorithm (AAA), Acuros XB (AXB) in Inhomogeneous Medium

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Background: To deliver optimum dose to the target and minimum dose to the critical structures is the goal of radiotherapy. To achieve the goal, it requires fast and accurate dose measurement methods. The purpose of this study was to simulate dose calculation of external photon beam using EGSnrc Monte Carlo (MC) code and compare them with the measured doses of treatment planning system (TPS) in inhomogeneous medium.

Materials and Methods: Complete geometry of the Varian Clinical 2300 CD model (Linac) treatment head was designed using BEAMnrc MC Code and calculated dose using DOSXYZnrc MC Code. Percentage depth dose (PDD), beam profile was measured in 6 MV photon beam in inhomogeneous medium. BEAMnrc and DOSXYZnrc is an EGSnrc-based MC simulation code for calculating dose distributions in a rectilinear voxel phantom. These codes allowed for the simulation of radiotherapy treatment units and produced data that was matched close to realistic clinical beam.

Results: MC model for the photon beam output from the Varian Clinical 2300 CD model was validated by calculating PDD in field sizes of 5×5, 10×10, 30×30 and 5×30 cm2. The beam profile was also calculated for depths 1.5cm and 10cm on those field sizes. The simulated PDDs and beam profiles were

compared with the measured data of TPS. The obtained results found a good agreement between simulated and measured data. The average percentage deviation of PDD was 3.73% and the beam profile was less than 5% for all used field sizes.

Conclusion: All the MC simulated relative data in homogeneous and inhomogeneous media showed a very good agreement with measurement and commercially available treatment planning calculated data. The percentage depth dose (PDDs) and beam profiles were calculated using MC simulation code and compared with that measured with TPS data in inhomogeneous medium and found good agreement.

OP-06

Prevalence Of Breast Cancer Incidence in Bangladesh in Association with Risk Factors, Diagnosis and Treatment Procedures

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Background: Breast cancer is one of the most common types of cancer worldwide and continues to be a global public health concern. According to GLOBOCAN estimates, 19% of 68.7 million new breast cancer cases were diagnosed in 2022, making it the most prevalent cancer among females in Bangladesh. Even though it is now a worldwide problem, studies indicate negligence of women to do self-inspection and clinical breast examinations results in a diagnosis in the advanced stages of cancer. This study aims to identify the potential predisposing factors for breast cancer among women and to demonstrate different breast cancer types, stages, associated risk factors, and the diagnosis and treatment process for breast cancer.

Method: A structured questionnaire will be used to collect data related to factors leading to breast cancer among patients diagnosed with breast cancer. This study uses a questionnaire form to collect data from breast cancer patients from renowned hospitals in Dhaka and other areas of Bangladesh. Forty-five questionnaire forms have been collected till now and preliminary statistical analyses has been done so far.

Result and Discussion: After analyses, most highly prominent factors include increasing age, parity, and the mother's age when their motherhood started. Biomarker analysis of hormone receptors shows effectiveness in breast cancer screening, and their status may provide information to guide decisions about the therapy.

Conclusion: Findings of this study will help to enhance the knowledge of general people in Bangladesh, especially women, which will lead to the prevention and early diagnosis of breast cancer and thus reduce the mortality and prevalence rates of breast cancer in Bangladesh.

Keywords: breast cancer, stages, risk factors, diagnosis, treatment

OP-07

Specification of Setup Margin (SM) of Planning Target Volume (PTV) in Left Breast Cancer for Specific LINAC Machine

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Background of the study: During a treatment setup for a left breast patient, accuracy is a matter of must concern because of its anatomical position which is situated adjacent to the heart wall. Clinical radiotherapy procedures aim at high accuracy. However, many error sources act during treatment preparation and execution that limit the accuracy. Therefore, a safety margin is required to ensure that the planned dose is delivered to the target for all patients. This study aimed to quantify the Setup error Margin of Planning Target Volume in Left Breast Cancer Patients for a specific LINAC Machine. The real world is far away from ideal. The main expectation of radiotherapy is minimum radiation to the healthy tissue and maximum to the tumor tissue.to ensure the quality treatment it needed a proper plan to execute until the treatment procedure finished. This plan is made up of some combined steps contouring on the tumor area. The Planning Target Volume (PTV) is the geometric concept that is designed to ensure that the prescribed dose of radiation is delivered to the target.

Materials and Methods: This study has been performed based on the treatment data of 25 patients of left breast cancer. The age range of these patients is about 28-58 years. And all these patients are treated by a specific LINAC machine. The Model name of that LINAC machine is Varian Clinac DHX-4526. Data of 25 patients are collected from the Eclipse 15.6 TPS software. This study was calculated by using several margin recipes. The reason of using about seven different equations is to assume the most relatable treatment output value as provided by an update version LINAC machine. These two recipes named Stroom et al 51 and Van Herk et al are more acceptable result provider. The main parameters of this calculation are: Systematic Errors (Σ) & Random Errors (σ). Some protocols are must need to be followed to perform this type of study. In this study, ICRU 50 and ICRU 62 and On Target: ensuring geometric accuracy in radiotherapy.

Results: The PTV margin in left breast cancer patient vertical, longitudinal, and lateral directions of dose with respect to patients are respectively (0.739, 0.972 and 1.072 cm), (0.786, 1.048 and 1.156 cm).

Conclusions: The result showed the specification of setup margin for a specific LINAC model. It can be more reducible by applying DIBH technique instead of free breathing technique. As anatomically left breast is adjacent to the lung and heart, it must need to be taken on count that the nearby critical organs need to be spared to reduce the normal tissue complication.

OP-08

Comparative Dosimetric Analysis of Deep Inspiration Breath-Hold and Free Breathing Techniques in Radiation Therapy for Left-Sided Breast Cancer: A Single-Institution Retrospective Study

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Background: Radiotherapy for left-sided breast cancer can potentially lead to cardiac injury. Deep inspiration breath-hold (DIBH) technique has emerged as a cardiac-sparing approach, offering dose reduction to vulnerable cardiac structures compared to free breathing (FB) during treatment. This study aims to evaluate and compare the dosimetric differences between DIBH and FB techniques in a single institution setting.

Materials and Methods: A total of 20 patients with left-sided breast cancer, who underwent breast-conserving surgery (BCS) or mastectomy (ME) along with axillary lymph node staging, received adjuvant radiation therapy. The Real-time Position Management™ (RPM) system (Varian Medical Systems, Palo Alto, CA) was used to monitor breathing during both FB and DIBH scans via a reflective marker box placed at the level of the xiphoid process. All patients were able to hold their breath for greater than twenty seconds to accommodate the scan during DIBH. In 3DCRT, IMRT, VMAT plans heart, left anterior descending coronary artery (LAD), ipsilateral lung and contralateral breast doses,

patient anatomical factors, location of tumors and physical factors were analyzed.

Results: All dosimetric parameters for cardiac structures showed significant reduction in the DIBH group compared to the FB group except five patients. The mean heart dose (Dmean) in the DIBH group was 3.42 Gy (range 1.8-5.13) and 5.00 Gy (range 2.1-7.0) in the FB group. The average V20 for the ipsilateral lung in DIBH was 17.82Gy (range 7.80-29.7) versus 17.15 Gy (range 4.00-33.0) in FB. The Dmean for the left anterior descending artery (LAD) was 9.34 Gy (range 4.64-20.6) in DIBH compared to 13.41 Gy (range 4.05-27.89)) in FB. Increased left lung volume in the DIBH position correlated with dose sparing of cardiac structures.

Conclusions: This retrospective dosimetric analysis demonstrates that the DIBH technique provides a significant dose reduction to cardiac structures in left-sided breast cancer patients undergoing radiation therapy but a few of the patients do not significant benefit from DIBH technique due to their anatomical position. The findings of this study are important for resource allocation, as DIBH may be unnecessarily recommended for some patients with little dosimetric benefit.

Keywords: Deep inspiration breath-hold (DIBH), Free-breathing (FB), Cardiac-sparing, left anterior descending coronary artery (LAD), Breast cancer

OP-09

Clinical Feasibility Study of An Artificial Intelligence Assisted Auto-Contouring System for Radiation Therapy Treatment Planning: A Proof-of-Concept Methodology

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Purpose: Geometric metrics are often used to evaluate automated contouring methods. A dosimetric parameter analysis may be more useful in clinical practice, although it is frequently absent in the literature. The purpose of this study was to investigate the effect of state-of-the-art AI-generated anatomical delineations on dose optimization in radiation therapy (RT) for patients with prostate cancer.

Materials and Methods: The auto-contouring system was evaluated using a database of 20 computed tomography images comprising prostate structures. Clinically accepted reference plans are directly copied for dose calculation of auto contoured structure sets. Dice similarity coefficient (DSC), Hausdorff distance (HD) and Relative Volume Difference (RVD) were used to assess geometric performance of contours. Dmin, Dmean, and D0.03cc indices were used to analyze OAR dose distributions with manual segmentation as a reference. For measuring overall plan acceptability, normalized plan quality metrics were evaluated. A Wilcoxon rank sum test was computed between dosimetric metrics. Inter-observer variability was also assessed for prostate cancer site.

Results: AI-based segmentation saved more than 70% contouring time and achieved an average DSC of 0.80 for prostate with a few exceptions and the average HD and RVD were below 13mm and 0.20 respectively. The dose parameters, Dmin, Dmean and D0.03cc for the prostate patients, showed agreement between dose distributions within ±20% with some exceptions. In all situations, the difference in plan quality was less than 3.2%. The dose parameters changed slightly due to inter-observer variability. The comparison between geometric and dosimetric metrics showed no strong statistically significant correlation without a few exceptions.

Conclusions: Although auto-contouring system achieved state-of-the-art geometrical performance, human review is still unavoidable. Plans, based on auto-contouring, do not overdose nearby OARs. The auto-contouring system is recommended as a standard starting point with institutional geometric and dosimetric validation.

Keywords: Auto-contouring, radiotherapy, artificial intelligence, time savings, dosimetry.

OP-10

Identification of Skin Lesions through the Analysis of Dermoscopy Images Utilizing Convolutional Neural Network and Developing a Flask Based Artificial Intelligence Web Application

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Background and Purpose: Skin cancer, particularly Melanoma, is a rising public health concern and a leading cause of skin cancer-related deaths. Bangladesh, with its tropical climate, faces increased UV-related skin damage risks due to rapid industrialization and pollution. Limited healthcare access and low awareness compound skin cancer issues. Fortunately, early detection is crucial, and Artificial Intelligence offers a solution for accessible, high-quality care in underserved areas. This study focuses on developing a deep learning algorithm for early Melanoma detection through Dermoscopy image classification using a Convolutional Neural Network and creating a user-friendly web application for global access.

Materials and Methods: The application development process is systematic, involving problem assessment, design, implementation, and testing. It employs deep learning, specifically Convolutional Neural Networks, to accurately categorize skin lesions in Dermoscopy images into seven disease categories. The dataset, "ISIC HAM10000 Dataset" from dataverse.harvard.edu, comprises 10,015 images, with 9,914 images used for training and 101 for validation. Our custom model underwent 100 training epochs on the Google Colaboratory platform, utilizing the Adam optimizer. Data augmentation was facilitated using Image Data Generator. The application was created in Python, with the Keras library serving as the TensorFlow back-end framework.

Result and Discussion: Our distinctive model delivered a balanced accuracy of 75.7392% on the validation dataset, and the Flask web application is functioning seamlessly via the Ngrok server. By implementing custom architectures such as ResNet50 or Inception-v3, the accuracy can be elevated to a minimum of 97%.

Conclusion: We designed a model to precisely classify Dermoscopy images of skin lesions and utilized Artificial Intelligence to build a web application. This application, created with Flask and our custom model, allows users to detect melanoma skin cancer with a high degree of accuracy, accessible from anywhere with an internet connection.

Keywords: Melanoma, Dermoscopy, Python, Artificial Intelligence, Deep Learning, Convolutional Neural Network, Early Cancer Detection, TensorFlow, Keras.

OP-11

Aspects of Medical Physics in Bangladesh: A Growing Field with A Bright Future

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Background: Medical physics has been identified as one of the rapidly growing sectors in Bangladesh, which is relatively young. Some of the key aspects of medical physics in Bangladesh include the diagnosis and treatment of diseases, the development of new medical imaging and treatment technologies, and the education and training of future medical physicists. It is hoped that the field of medical physics will move towards a bright future that will develop and implement opportunities in various fields such as cancer treatment, cardiovascular disease treatment, medical imaging, and public health.

Materials and Method: The paper has been completed by using different journals and publishers, such as the Journal of Applied Clinical Medical Physics, the American Association of Physicists in Medicine (AAPM), Physics in Medicine and Biology, MEDLINE, IMEDPUB, etc., about the scope of medical physics in Bangladesh. We have also visited prominent hospitals and clinics around the country to collect data about the running machinery and monitor their activities.

Result and Discussion: From the survey, we found out that only 2 institutions in Bangladesh are offering government job postings, which are BSMMU and CMH (Dhaka). The medical physics field in Bangladesh is facing several challenges, including a lack of resources and research awareness, infrastructure, education, training, research, and development.

Conclusion: Bangladesh Medical Physics Society (BMPS) and other relevant organizations are working to address the challenges facing medical physics in the country. BMPS and other organizations are increasing funding for medical physics research and development, and they are working to promote the development of medical physics education and training programs and post-graduation job opportunities throughout the country.

Poster Presentation

PP-01

Deep learning for high risk and low risk ischemic strokes based on MRI images

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Introduction: Although MRI is a common tool for assessing ischemia stocks, it is not able to automatically distinguish stroke subtypes. Consequently, we will use deep learning to stratify ischemic strokes into high-risk and low-risk categories.

Materials and Methods: Patients with breast cancer will get an MRI at Popular Diagnostic Center in Rajshahi, Bangladesh to identify different subtypes of ischemic stroke. Baseline demographic and medical data were collected from the patient's hospital records. We used deep learning to build categorization models. A deep learning model was applied for this research.

Results & Discussion: With an accuracy of 88.57%, the result illustrates the deep learning model for k-fold cross-validation. The corresponding averages for specificity and sensitivity were 0.884 and 0.886. AUC on average was 0.906.

Conclusion: The suggested approach assessed several subtypes of ischemic stroke. The MR machine will be improved to identify ischemic stroke subtypes utilizing the relevant tumor characteristics when the proposed model is clinically implemented.

Key Words: Deep learning, high risk, low-risk, ischemic strokes

PP-02

Investigations of Aloe Vera leaves Extracted Phytochemicals to Inhibit Liver Cancer: HOMO-LUMO, Quantum Calculation, MEP, and Toxicity Analysis

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Background: The vast majority (about 90%) of primary liver cancers are hepatocellular carcinomas (HCC). Infections with hepatitis B and C, alcohol, and non-alcoholic steatohepatitis are the most common causes of HCC. Among cancers, it is the third most common cause of mortality.

Objective: The purpose of this study is to characterize the phytochemicals derived from Aloe Vera leaves and their effects on the proliferation of the hepatocellular carcinoma Hep 3B2.1-7 cell line.

Material and Methods: The protein from the HCC Hep 3B2.1-7 cell line (PDB ID: 5Z2C) was analyzed in detail using Discovery Studio, and its energy was optimized with the help of the SWISS PDB viewer. Geometry optimizations, HOMO-LUMO calculations, quantum calculations, and MEP were carried out using the Gaussian-9 program, and the phytochemicals isolated from Aloe Vera leaves were screened utilizing in-silico research. To molecular docking, the PyRx program was utilized. The 2D structure was obtained with the help of Discovery Studio software, which was also used to monitor the interaction between the ligands and proteins. To gauge the robustness of the protein-ligand complex,

a molecular dynamic simulation was performed.

Results and Discussion: Against the 5Z2C protein, 21 different phytochemicals were examined. After considering their potential docking scores and certain pharmacokinetic rules, three phytochemicals were chosen for this investigation. For helminthosporin, 10-hydroxyaloin A, and chryosphanol, the potential docking scores were -8.9 kcal/mol (>-6.0 kcal/mol), -8.8 kcal/mol (>-6.0 kcal/mol), and -8.9 kcal/mol (>-6.0 kcal/mol), respectively. All criteria for drug-likeness and drug-properties are met by the desired compounds. Furthermore, they are non-hepatotoxic and cause free from skin sensation.

Conclusions: The proposed plants have many bioactivities against different cancer proteins, and they include multiple phytochemicals, as a whole. So, the desirable phytochemicals in Aloe Vera leaves are what prevent the Hep 3B2.1-7 cell line from dividing and causing liver cancer.

PP-03

The In-silico Investigations of Averrhoa Carambola Leaves Extracted Nanocomposites to Inhibit Breast Cancer: Quantum calculations, Molecular Dynamic Simulation, ADME and Toxicity Analysis

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Background: The most common cancer in women, breast cancer is a serious health issue. The annual global cancer incidence rate is approximately 12.5%. Each year, around 1 in 8 American women and 1 in 833 American men will be affected. No effective drugs, not even chemotherapeutic treatments, have been discovered to be safe for use in humans, despite the existence of certain non-toxic biological macromolecules.

Objective: The primary purpose of this research is to evaluate the effectiveness of the nanocomposite of chemicals contained in Averrhoa carambola leaves in inhibiting the growth of the breast MCF7 cancer cell line.

Materials and Methods: This research screened 17 nanocompounds or phytochemicals from Averrhoa carambola leaves and conducted tests on the breast MCF7 cancer cell line using orbital quantum calculations, molecular docking, and pharmacokinetics modeling. Pass prediction and ADMET characteristics were performed with SWISS-MODEL, and PyMOL was utilized for alignment. The protein residues were then checked to make sure they fell inside the allowed range using a Ramachandran plot. Using molecular dynamics simulation, researchers have discovered that docking and bonding interactions between proteins and ligands result in a stable complex.

Results & Discussion: Potential docking scores of -9.7 kcal/mol (>-6.0 kcal/mol), -9.3 kcal/mol (>-6.0 kcal/mol), and -9.7 kcal/mol (>-6.0 kcal/mol) were calculated for kaempferol, quercetin, and campesterol, respectively, against the protein (PDB ID: 7NCF). It shows that these compounds can attach securely to the pockets of the protein receptors. Lipinski's Rule and pharmacokinetic properties, as well as safety against AMES and hepatotoxicity, were met by the desired phytochemicals. Neither of them had any sensitivity of the skin.

Conclusions: Several chemicals, such as kaempferol, quercetin, and campesterol, have been shown to effectively combat several types of cancer. Consequently, Averrhoa carambola leaves may provide a novel resource for the development of therapies targeting breast cancer.

PP-04

Characterizations and In-Silico Investigations of Coriandrum Sativum Leaves Extracted Nano Compounds Profiling Against Colon cancer: Quantum Calculations, Molecular Docking, MD Simulation and ADMET Analysis

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Background: Colon cancer, one of the most widespread cancers globally, is estimated to result in around 1.9 million new diagnoses in 2020. With a projected 935,000 cancer-related fatalities in 2020, it also stands as the third most common cause of cancer-related mortality. In 2023, approximately 100,000 persons are predicted to be diagnosed with colon cancer.

Objective: Considering that Coriandrum Sativum possesses various anti-cancer features, including the capacity to limit cell formation, provoke apostasies, lower inflammation, and change the immune system, the question is whether or not it may be utilized as a prophylactic tool against colon cancer.

Material and Methods: The anti-cancer potential of 14 phytochemicals from Coriandrum Sativum was examined utilizing the molecular docking approach. The target protein employed for this study was the colon cancer-associated protein with the PDB ID 2IO6. PyRx is used for docking simulations. To measure drug-likeness, the SwissADME server was employed, whereas the PKCSM server predicted the ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) features of the compounds. Additionally, molecular dynamics (MD) simulations were done to further study the stability and behavior of the protein-ligand complexes.

Results and Discussion: The findings of this molecular docking study indicate that of the 14 phytochemicals of Coriandrum Sativum, Dicoumarin, Sterol, and Catechin exhibit the best binding affinity (-9.5, -9.9, -9.7 Kcal/mol respectively) with the target protein 2IO6 for colon cancer which is superior to the binding affinity (-7.4 kcal/mol) of the drug (Capecitabine). Dicoumarin, Sterol, and Catechin complied with all the criteria to be effective against the protein, and their complexes with 2IO6 were found to be stable in MD simulations.

Conclusions: Dicoumarin, Sterol, and Catechin are the phytochemicals of Coriandrum Sativum that have the potential to be effective therapeutic agents for the treatment of colon cancer.

PP-05

GCMS Extraction Phytochemicals of Camellia Sinensis leaves to Assay Against DENV viruses: Chemical Reactivity, Quantum Calculation, MEP, and ADMET Analysis

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Background: Presently, the dengue virus is the most prevalent mosquito-borne pathogen of considerable global concern. It exacts a heavy toll, afflicting approximately 50 to 100 million

individuals worldwide and resulting in thousands of fatalities annually. The principal mosquito species responsible for transmitting dengue to humans comprise Aedes aegypti (A. aegypti), Aedes albopictus (A. albopictus), and Aedes polynesiensis (A. polynesiensis).

Objective: The main goal of this research is to analyze the efficacy of a nanocomposite including chemicals discovered in Camellia Sinensis in restricting the proliferation of both the dengue virus of the NS2a cell line.

Material and Methods: The potential anti-cancer effects of 38 phytochemicals derived from Camellia Sinensis were studied utilizing the molecular docking approach. In this investigation, the target protein chosen related to colon cancer, identified by the PDB ID 2IO6. The geometry optimizations, and chemical reactivity ware alayzed using Gaussian 9.0. The molecular docking simulations were conducted using PyRx. Pass prediction and ADMET characteristics were performed with SWISS-MODEL, and PyMOL was utilized for alignment. Additionally, molecular dynamics (MD) simulations were performed to acquire more profound insights into the stability and dynamics of the protein-ligand complexes.

Results and Discussion: A number of 38 different phytochemicals were discovered by GCMS compound extraction. These compounds underwent detailed molecular docking study, indicating that Benzamide, 3-Trifluoromethyl-N-Benzyl-N-Phenethyl-, 2,4-Bis-(4-Methoxyphenyl) -2-Methyl-2,3,4,5-Tetrahydro -1h-Benzo[B][1,4]Diazepine, And 1h-Indole, 3,3'-[1,4-Phenylenedi-2,1-Ethenediyl] Bis[1,2-Dimethyl] demonstrated significantly robust binding affinities scores of -9.3 kcal/mol (more than 6.0 kcal/mol), -8.7 kcal/mol (higher than 6.0 kcal/mol), and -9.7 kcal/mol (greater than 6.0 kcal/mol), respectively. The above three molecules satisfy the Lipinski rule. Less toxicity, ADMET characteristics and pass prediction data have seen good results.

PP-06

Machine Learning Based Risk Factors Prediction and In-Silico Exploration of Withania Somnifera Leaf Extracted Nanocomposites for Breast Cancer Inhibition

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Background: Breast cancer, a prevalent and potentially life-threatening disease, remains a serious public health problem. It is the most frequent malignancy in women globally and is treatable in ~70–80% of people with early-stage, non-metastatic disease.

Objective: The fundamental goal of this research is to identify risk factors and analyze the efficacy of the nanocomposite composed of compounds discovered in Withania somnifera leaves in reducing the proliferation of the HER2 breast cancer cell line.

Material and Methods: This research extensively analyzed Machine learning-based risk prediction and 12 nano-compounds or phytochemicals from Withania somnifera leaves and conducted various analyses to determine their interactions with the HER2 breast cancer cell line. Orbital quantum computations, molecular docking, and pharmacokinetics modelling were applied in this work. Pass prediction and ADMET profiling were accomplished using SWISS-MODEL, while PyRx was applied for docking. A Ramachandran plot was employed to check that protein residues fell within the allowed range. Additionally, molecular dynamics simulations were done to expose the stability of complexes generated by docking and bonding interactions between the examined chemicals and proteins.

Results and Discussion: HER2 cell line influenced 18% of the breast cancer and docking scores for Withanolides, Withangulatin A, and withanone against the protein receptor (PDB ID: 4qna) were significantly favourable, with values of -9.9 kcal/mol, -10.5 kcal/mol and -10 kcal/mol, respectively. These scores are above the threshold of -6.0 kcal/mol, indicating that these chemicals may efficiently create persistent connections within the protein receptor's binding pockets. Additionally, Lipinski's Rule compliance and excellent pharmacokinetic characteristics were observed for these selected phytochemicals. They also displayed safety profiles regarding AMES and hepatotoxicity, with no reported skin reactions for these drugs.

Conclusions: Several bioactive molecules have exhibited promising potential in treating various cancers. Consequently, Withania somnifera serves as a helpful resource for creating innovative therapies targeting breast cancer.

PP-07

Quantum Calculations, ADMET Analyais, and In-Silico study of Pleurotus tuber-regium (Mashroom) Extracted Phytochemicals to Inhibit MDA-MB-468 Cell Line of Breast Cancer

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Background: Breast cancer is currently the most prevalent form of cancer among women across the country, accounting for 24.5% of new cases and contributing to 15.5% of cancer-related fatalities in recent years. The statistics suggest that around 1 in 8 women will confront a breast cancer diagnosis at some moment in their life, and the prevalence of this disease is on the rise.

Objectives: The purpose is to examine the anti-cancer capabilities of Pleurotus tuber-regium in the context of breast cancer. Given the costly nature and certain limits of present cancer treatments, there is a demand for novel, cost-effective, and efficient approaches to cancer therapy. In this context, phytochemicals emerge as a viable path, since they can be employed directly in medical therapies or act as foundational components for the production of effective medications.

Material and Methods: A selection of five different phytochemical derivatives from P. tuber-regium, namely Alpha-Ergostenol, Stigmasterol, Cholesterol, Ergosta-4,6,8(14),22-tetraen-3-one, and Lupeol, underwent in-silico analysis to evaluate their potential as anti-cancer agents compared to the FDA-approved breast cancer drug Amidronate. This exhaustive computational exploration encompassed quantum calculations, ADMET and Lipinski analysis, molecular docking studies, and molecular dynamics (MD) simulations conducted on these compounds about the breast cancer protein 4DEA.

Results and Discussion: The highest docking scores of -9.0 kcal/mol, -9.3 kcal/mol, -10.1 kcal/mol were attained by the ligands Alpha-Ergostenol, Ergosta-4,6,8(14),22-tetraen-3-one, and Lupeol against the target protein 4DEA, corresponding to this molecular docking investigation. The ligand's docking scores were superior to the preferred drug Amidronate (-4.6 kcal/mol). Our result demonstrates that the top three which had the potential anti-cancer properties showed stronger binding affinity, and less toxicity compared to the drug, Amidronate for the treatment of breast cancer.

Conclusions: Due to the significant anti-cancer capabilities of the phytochemical substances present in Pleurotus tuber-regium, it may be beneficial in the progression of breast cancer preventative therapy.

PP-08

A Review of Electronic Brachytherapy- Present and Future Directions

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Introduction: In the past decade, electronic brachytherapy (EB) has emerged as an attractive modality for the treatment of skin lesions and intra-operative partial breast irradiation, as well as finding winder applications in intra-cavity & interstitial sites. In this review paper, electronic brachytherapy present and future directions BT has advanced dramatically in the last decade due largely to improvements in applications, imaging, treatment planning and use of clinical trials. In addition, current research in brachytherapy technology continues to charge how we deliver this treatment modality. The future of BT lies in the ability of new technologies to overcome real or perceived barriers. Purpose of this study was to review the electronic brachytherapy present and future directions.

Materials and Methods: The study has been completed by using different publications which were PubMed, MEDLINE, BMC-Part of springer Nature, Google Scholar and IMEDPUB Itd with the following EBT and IORT. The number of publications is finally used to be completed for the project work.

Result and Discussions: This review discuss the practical convenience of EB strongly suggested that it become an established option for selected patients, not only in radiotherapy departments but also in a range of operative theaters and clinics around the world.

Conclusion: EB is a promising technology to replace present brachytherapy procedures. One of the limiting factors that impede the use of EB for interstitial application is the source dimension. It is highly anticipated that the design of miniaturized X-ray tube closer to the dimension of an Ir-192 wire is not too far away, and the new era of EB has just begun.

Keywords: Brachytherapy, Electronic Brachytherapy, Intra-beam.

PP-09

Dosimetric Evaluation of VMAT Plans using 6MVFF and 10MVFF Energies in the Management of Carcinoma Cervix Patients: A Comparative Study

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Background: Carcinoma cervix is a common cancer in women worldwide with a high morbidity rate. Volumetric Modulated Arc Therapy (VMAT) is considered superior to other techniques with multiple arcs and energies. Aim of the present study was to compare the dosimetric impact of different photon beam energies in the treatment of carcinoma cervix and to develop clinically acceptable plans with suitable photon energy.

Materials and Methods: VMAT plans were generated for 6MV and 10MV photon energies with Eclipse treatment planning system (TPS) for eight patients reported with cervix carcinoma. VMAT plans were evaluated in terms of planning target volume (PTV) coverage, dose to organs at risk (OARs), conformity index (CI), homogeneity index (HI), total number of monitor units (Mus). Dose distribution to the target and the organs at risk (OARs) were compared for all techniques.

Results and Discussion: Almost parameters showed no statistically significant difference between two different energies. CI for 10 MV (1.12) was better than 6MV (1.13) but not significant. Mean

bowelD30Gy dose for 10MV and 6MV are respectively 24.62 Gy, 24.70 Gy. Mean blader (D35Gy) dose for 10MV and 6MV are respectively 47.66 Gy, 47.56 Gy. Compared with 6MV VMAT plans, 10MV VMAT reduced the average number of Mus.

Conclusions: Both 6MV and 10MV VMAT plans are recommended for cervix carcinoma. Based on this study, 6 MV photon beam is a good choice, as it does not deliver additional exposure to patients caused by photoneutrons produced in high energy beam.

PP-10

Dosimetric Evaluation of Treatment Plans of 3DCRT, IMRT, and VMAT in Rectum Cancer

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Background: Radiation therapy is an important treatment option for rectal cancer, with the potential to improve outcomes and survival for patients. However, radiation therapy can also cause side effects due to damage to nearby healthy tissues and organs. The purpose of the study is to evaluate the treatment plans dosimetrically for rectal cancer using three different radiation therapy techniques:(3DCRT), (IMRT), and (VMAT). The study also aimed to evaluate the organs at risk (OARs) during radiation therapy treatment for rectal cancer.

Method: In this plan, protocols of filling the bladder after eating 500 ml of water were used, the patient waited 30 minutes at the end of the interval when the patient received radiation therapy each day. This study included a retrospective analysis of treatment plans for 5 patients (3DCRT, IMRT, and VMAT treatment plans were taken for each patient) and a total of 15 treatment plans for rectal cancer.

Result and Discussion: The dosimetric evaluation of treatment plans showed that IMRT and VMAT provided better target coverage and dose conformity compared to 3DCRT. The OARs were also better spared using IMRT and VMAT compared to 3DCRT, with lower radiation exposure to the bladder, small bowel, rectum, and femoral heads. These results suggest that IMRT and VMAT may be preferred treatment options for rectal cancer, as they provide better treatment outcomes with minimal risk of side effects. Finally, the result shows that VMAT is slightly better target coverage and healthy tissue sparing than IMRT.

Conclusion: The management of OARs is an important aspect of radiation therapy for rectal cancer, and ongoing research is focused on developing new approaches to improve treatment outcomes and minimize the risk of side effects. The findings of this study support the use of IMRT and VMAT as preferred treatment options for rectal cancer.

PP-11

The Application of Gel Dosimeters and Comparison with other Dosimeters in Radiotherapy: A Literature Review

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Introduction: A major challenge in radiotherapy treatment is to deliver precise dose of radiation to the tumor with minimum dose to the healthy normal tissues. Recently, gel dosimetry has emerged as a powerful tool to measure 3D dimensional dose distribution for complex delivery verification and quality assurance. The dosimeters act both as a phantom and detector. The aim of the study is to know the application of gel dosimeters in radiotherapy and find out the comparison with 1D and 2D dimensional dosimeters.

Methods and Materials: The study is found from gel dosimeter literatures. Secondary data and images have been collected from different sources such as different guidelines, books, the internet etc.

Result: Analyzing, verifying, and comparing data from TPS is determined that gel dosimeter is a very powerful tool to measure 3D dimensional dose distribution. TPS calculated data were in good agreement with the dose distribution measured by the ferrous gel. The overall uncertainty in the ferrous-gel dose determination was reduced using an optimized MRI acquisition protocol and a new MRI scanner. The method developed for comparing measuring gel data with calculated treatment plans, the gel dosimetry method was proven to be useful for radiation treatment planning verification. In 1D and 2D film the depth dose and lateral for RMSD are 1.8% and 2% and (Di-Dj) max is 2.5% and 8%. On the other side 2D+ (3D) film gel and plan gel for RMSDstruct and RMSDstoch are 2.3% & 3.6% and 1% & 1%, and system deviation are -0.6% and 2.5%. The result is confirmed that 2D+ (3D) film dosimeter is better than the 1D and 2D dosimeter.

Discussion: Gel dosimeters is a quality control and quality assurance tool which will be used as the future clinical application.

Keywords: Gel dosimeters, 1D and 2D dosimeters, QC, detector & phantom, RMSD.

PP-12

A Prospective Study of VMAT versus IMRT for Preoperative Rectal Cancer: A Dosimetric Analysis

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Introduction: The study investigated a dosimetric comparison between intensity-modulated radiation therapy (IMRT) and volumetric-modulated arc therapy (VMAT) treatment plans in rectal cancer.

Method: Ten patients with rectal cancer previously treated with short course radiotherapy (25 Gy in 5 fractions) with X6 flattening filter free (FFF) beams using 9-Field IMRT and 2-Arcs VMAT were selected for this study. For each patient, plans were regenerated using 5-Field, 7-Field, 9-Field, 11-Field IMRT and 1A, 2A, 3A VMAT for X6, X10 and mixed X6 & X10 energies with the Eclipse TPS. Dose distributions to the target and the organs at risk (OARs) were compared for all techniques. Monitor units (MUs) were also assessed.

Results: For both IMRT and VMAT plans, dose distribution to the target varied up to 2.6%. For X6, the mean Homogeneity Index (HI) improved by 47.3% but MUs increased by 28.3% for 9F-IMRT compared to 5F-IMRT. Although MUs decreased by a mean 6.7% with X10 and mixed X6 & X10, HI fell by 6.0% for 9F-IMRT compared to X6. For X6, HI and MUs increased by 37.6% and 7.0% respectively for 2A-VMAT compared to 1A-VMAT. With 2A-VMAT for X6, HI was higher by 12.3% and MUs lower by 5.7% than X10 and mixed X6 & X10. The differences between 7F, 9F and 11F-IMRT and between 2A and 3A-VMAT were not significant. No considerable difference was observed for dose distribution to the target between 9F-IMRT and 2A-VMAT. However, a significant increase of MUs (72.7%) with 9F-IMRT was found. Regardless of techniques, energy, number of fields and arcs, OAR doses varied by no more than10.0%.

Conclusion: Both 9F-IMRT and 2A-VMAT plans are recommended for short course treatment of rectal cancer. However, the improved delivery efficiency of VMAT, as revealed through significant reduction of MUs, makes it more practical for patient treatment in this context.

PP-13

Evaluate the Shielding Thickness of Primary and Secondary Barriers for the New LINAC Bunker at the INMP, AERE, BAEC, Bangladesh

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Introduction: This study showed that the LINAC machine for radiotherapy technique requires the shielding calculation of the LINAC Bunker. This LINAC machine is used to treat cancer patients in the photon of a maximum of 18 MV. As the particle energies are in the MV range, special measurements and calculations need to be considered for designing the LINAC bunker. Otherwise, the dose limit for the public and radiation personnel will exceed the limit of the protocol. This study has been performed at the Institute of Nuclear Medical Physics (INMP), AERE, Saver, Dhaka. The design of these LINAC rooms is different compared with the general projects cause two LINAC machines are installed alongside each other. These several sources of ionizing radiation are too harmful if the shielding calculations considered with a little ignorance. The purpose of the study is to attenuate radiation from LINAC Machine in where existing thickness is evaluated by calculated thickness.

Methods and Materials: This study provides essential guidelines for proper facility planning, Room design feature and shielding design, radiation protection, and work practice. Calculations were done assuming concrete as the shielding design. We proposed a shielding calculation model that decouples the concepts of occupancy factor, workload, use factor, and target dose when determining primary and secondary barrier thickness. All the equations for shielding calculation are according to NCRP-151, NCRP-49& SRS-47.

Results and Discussion: The patient numbers and occupancy factors are considered as variables in this calculation IMRT & 3DCRT shielding calculation. Maximally 18MV linear accelerator is considered for the photon beam here. We got the values of the calculations: workload-450Gy/week; WQA-112.5Gy/week; Total Workload, W-563Gy/week and we evaluated the exiting value and calculated value.

Conclusion: As physicists, our aim for us is to consider and calculate the shielding to protect the public and radiation personnel. This paper has discussed what measures should have been taken to protect occupational workers and the public from LINAC radiation hazards. These LINAC are located inside the bunkers. The main purpose of the bunker is to absorb the radiation produced by the LINAC, such that the people outside the bunker are not affected by the ionizing radiation.

PP-14

Comparative Analysis and Machine Learning Predictions of Cervical Cancer Incidence: A Multi-National Study

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Purpose: Cervical cancer continues to be a pressing global health issue, with varying incidence and survival rates across countries. This multi-national, multi-faceted study aims to address this variability through a detailed comparative analysis and machine learning-based predictions, focusing primarily on Bangladesh.

Materials and Methods: The research employs a dual data collection strategy: primary data is gathered from Bangladesh through a structured questionnaire, while secondary data is collected from countries including the USA, Europe, Pakistan, India, Nepal, Bhutan, Sri Lanka, and Afghanistan. Initial comparative analysis using Python-based statistical methods reveals significant differences in variables such as age, tumor size, treatment duration, and survival rates across these countries. Subsequently, machine learning algorithms are applied to the Bangladesh-specific data to predict future trends in cervical cancer incidence.

Results: The study aims to provide a comprehensive understanding of the factors influencing cervical cancer rates across countries and to offer predictive insights that could guide healthcare policies and resource allocation in Bangladesh and potentially other countries.

Conclusion: Recommendations from the study may assist in reducing the burden of cervical cancer in Bangladesh.

PP-15

Comparative Analysis and Machine Learning Prediction Oral Cancer Epidemiology: A Multi-National Study

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Purpose: Oral cancer poses a significant public health challenge in Bangladesh, as well as in South Asian countries. This study delves into the predatory analysis of oral cancer in Bangladesh, a pressing public health issue.

Materials and Methods: Through a comprehensive examination of epidemiological data, risk factors, screening, and treatment methods, we aim to illuminate the current status of oral cancer in Bangladesh and predict its future trends utilizing machine learning. Primary data from Bangladesh and secondary data from South Asian countries and other continents are being collected, focusing on demographic characteristics, clinical features, and risk factors such as alcohol consumption, smoking, and family history of cancers. Utilizing Python for data analysis, a comparative assessment will be carried out to identify prevalent patterns and trends in oral cancer incidence and its associated factors.

Results: The outcome of the study will provide in-depth insights into the demographic and clinical features of oral cancer in Bangladesh, including screening frequency, abnormal results, survival data, and treatment duration. Furthermore, a comparative analysis of screening programs in Bangladesh and other South Asian countries will be undertaken to evaluate their effectiveness. The ensuing discussion will encompass findings, their alignment with prior research, and their implications for oral cancer prevention and treatment. The study will also address limitations and provide suggestions for prospective research.

Conclusion: The study contributes valuable knowledge to the realm of oral cancer in Bangladesh and South Asia, offering insights for policy and practice, and culminates with recommendations for future strategies to mitigate the burden of oral cancer in the region.

PP-16

Comparative Analysis on Biodegradable Granular Bone Substitute with in Situ Antibiotic and Growth Factor Releasing Capability

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Introduction: A well designed controlled drug delivery to the bone can overcome some of the problems of conventional therapy and enhance the therapeutic efficacy of a given drug such as antibiotic or growth hormone. This work aims to provide a comparative analysis of advantages, methods of preparation, mechanism, routes of administration and healing efficacy of biodegradable polymeric bone substitute with relevant antibiotics and growth factors.

Materials and Methods: Bone structure, bone remodeling and bone regeneration was studied to gather the concept of bone substitute fabrication. Various methods were reviewed for the fabrication of biodegradable granular bone substitute. Different fabrication methods include different techniques, such as solvent-casting, particulate-leaching, gas foaming, fiber mesh/fiber bonding, phase separation, emulsion freeze drying, solution casting, freeze drying, and solid freeform (SFF) fabrication etc. Drug delivery methods were analyzed that includes targeted systems as well as systems that provide controlled release of the drug. Diverse encapsulation techniques have been studied including double emulsion method, spray coating, spray drying, spray chilling, liposome entrapment, simple and complex coacervation, inclusion complexation, emulsion polymerization, centrifugal and rotational suspension separation, thermal and ionic gelation, emulsion phase separation, liophilization, cocrystallization etc. to identify the best encapsulation method. The double emulsion method was found to be one of the most popular and easiest emulsion methods.

Results: Polymers and their solubility in various solutions have been investigated. The antibiotics and associated polymers are listed. Several growth factors including their mechanism of action have been reported. Investigations regarding antifungal and anticancer drugs are summarized. Bioceramics and their physical properties, production method and properties of biopolymers have been researched.

Discussion: Different methods have their unique and individual characteristics to fabricate bone substitute and incorporate drug or any therapeutic agent. Some methods are good for large scale production whereas some methods may be more economical while others are proved to be more efficient in drug encapsulation.

Keywords: bone substitute, drug delivery, fabrication, encapsulation, biopolymers.

PP-17

Electronic Brachytherapy - The New Era of Entering into Sophisticated Cancer Treatment in Bangladesh

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Electronic Brachytherapy (eBT) represents a revolutionary advancement in the field of radiation therapy, offering a highly effective and more accessible treatment option (miniature x-ray sources, which operate at low kilovoltage energies <100kV and minimal shielding requirements) for cancer patients. This study explores the emerging era of eBT in Bangladesh, shedding light on the impact of this cutting-edge technology on cancer care within the country.

The adoption of eBT in Bangladesh signifies a noteworthy stride toward providing state-of-the-art cancer treatment to a broader patient demographic. Currently, only two units of the Xoft (iCAD) Axxent Electronic Brachytherapy are fully operational in Bangladesh. One unit is in Gonoshasthaya Nagar Hospital, Dhanmondi and another one is in Gazi Cancer Care Center, Mohakhali. By offering a more affordable and portable alternative to traditional brachytherapy, eBT addresses the limitations of conventional radiotherapy equipment. This technology enables healthcare providers to administer precise and targeted radiation therapy for a variety of cancer types, improving patient outcomes and

minimizing side effects. However, steep dose gradients and increased sensitivity to inhomogeneities encounter accurate dosimetry.

PP-18

Evaluation of radiation protection knowledge and practices among radiotherapy professionals

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Introduction: Radiotherapy has made significant progress over the years, establishing itself as an essential strategy for cancer treatment. Nonetheless, these advancements have increased the difficulties of radiation protection, necessitating the continued involvement of healthcare professionals. Our study was designed to examine healthcare professionals' knowledge of radiation protection and to establish the availability of individual and collective safety equipment in radiotherapy services.

Materials and Methods: A descriptive cross-sectional survey took place between April 16 and August 30, 2023, among medical and paramedical staff working in the radiation departments of three Moroccan university hospitals. We generated the global knowledge score (GKS) for each healthcare professional participant in our study and used non-parametric tests to look for statistical relationships.

Results: At the end of the survey, 173 workers were included. 32.2% were manipulators, 28.2% were radiotherapists, 22.7% were medical physicists, and 16.9% were nurses. The average age was 37.8 years, with a range of 23 to 61, and there was a clear male majority, with 75.6% of participants being men. Regarding knowledge, the average total score was 5.3 out of 10, with minimal scores of 3 and a maximum of 9. It should be emphasized that this total knowledge score varied significantly by profile ($p = 0.000$) and employment sector ($p = 0.022$). It is also worth noting that communal protective measures were accessible, although personal protective equipment was insufficient.

Conclusions: Radiation protection knowledge among radiotherapy workers is weak, and radiation protection resources are restricted. As a result, radiation workers must get training and awareness courses to increase their understanding and management of radiological dangers.

Keywords: Radiation protection, knowledge, radiotherapy professionals, Morocco.

PP-19

The integration of artificial intelligence in radiotherapy: A study of medical physicists' knowledge, acceptability, and expectations in Morocco

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Introduction: The use of artificial intelligence in radiotherapy constitutes a significant medical achievement. This technology is still in its early stages in Morocco but is arousing growing interest, particularly among medical physicists. As a result, the purpose of this research is to acquire a better understanding of Moroccan medical physicists' current knowledge, attitudes, and expectations about the use of artificial intelligence in radiotherapy.

Materials and Methods: A descriptive cross-sectional survey was undertaken among medical physicists practicing in the radiation departments of four Moroccan university hospitals from January 20 to July 20, 2023. Each participating physicist received an overall knowledge score, and non-parametric tests were employed to investigate the statistical associations in our survey.
Results: By the end of the survey, 25 medical physicists had participated. The average age was 35.2 years, ranging from 24 to 55 years, and 78.1% were male. Regarding their expertise, the global mean

score was 4.3 out of 10, with scores ranging from 2 to 7. It is noteworthy to highlight that the overall knowledge score varied significantly by gender ($p = 0.000$) and amount of schooling ($p = 0.012$). It is also worth mentioning that 84.0% of participants reported a need for training to learn how to apply artificial intelligence systems in radiotherapy.

Conclusions: Artificial intelligence in radiotherapy is still unknown to medical physicists. Despite their favorable attitude concerning the integration of artificial intelligence in this profession, it is critical to address their ongoing training needs to bridge this knowledge gap and improve the quality of patient care.

Keywords: Artificial intelligence, medical physicists, knowledge, Morocco

PP-20

Patients' views on the integration of artificial intelligence in radiotherapy

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Introduction: The increasing implementation of artificial intelligence in healthcare, particularly in radiotherapy, represents a significant development. This fusion of technology and medical care opens the door to more personalized and precise treatments. Understanding how patients perceive this improvement, however, is critical. This study explores their perspectives on applying artificial intelligence to radiotherapy, attempting to unearth their concerns and expectations in pursuing a more ethical and compassionate medical approach.

Materials and Methods: A structured questionnaire comprising 23 questions was employed to gather the viewpoints of patients currently receiving radiotherapy regarding the incorporation of artificial intelligence in this field. This survey was distributed among individuals undergoing radiotherapy from January 16, 2023, to July 30, 2023. The questionnaire encompasses five primary areas: comprehension of artificial intelligence in radiotherapy, expectations and perceived benefits, concerns and fears, acceptance and trust, and preferences for interaction with artificial intelligence. Additionally, a correlation analysis was conducted between these themes and demographic data.
Results: By the completion of the survey, 132 patients had participated. The average age was 62.1, ranging from 23 to 86, with women accounting for 69.3% of the population. It reveals that patients have a negative view of artificial intelligence in radiotherapy. Furthermore, a significant correlation was found between patients' degree of education and their support regarding the application of this technology in this setting.

Conclusions: Integration of artificial intelligence in radiotherapy offers a significant step forward for patients, but their comprehension and acceptance of this technology remain essential. Education plays a crucial role in dispelling anxieties and encouraging increased patient engagement, which is critical to reaping the advantages of this innovation in their health care.

Keywords: Artificiel intelligence, patients, opinions

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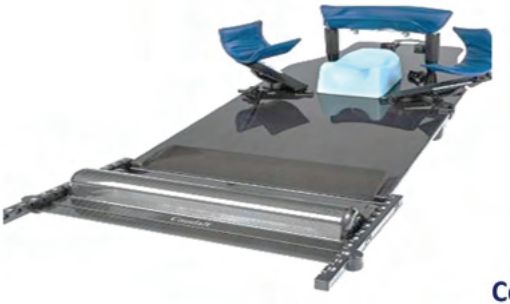

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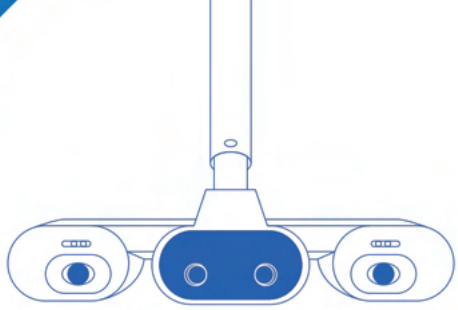

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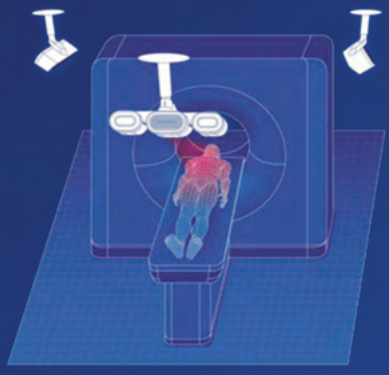

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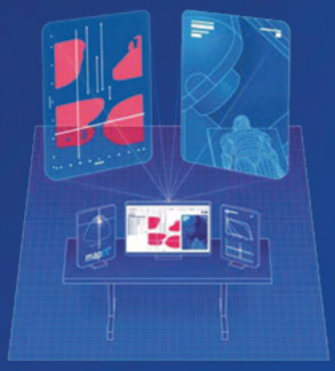

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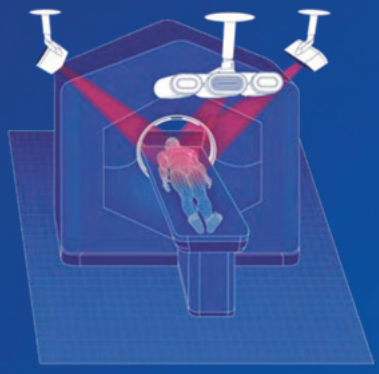

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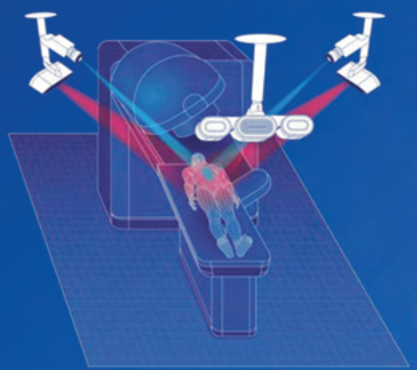

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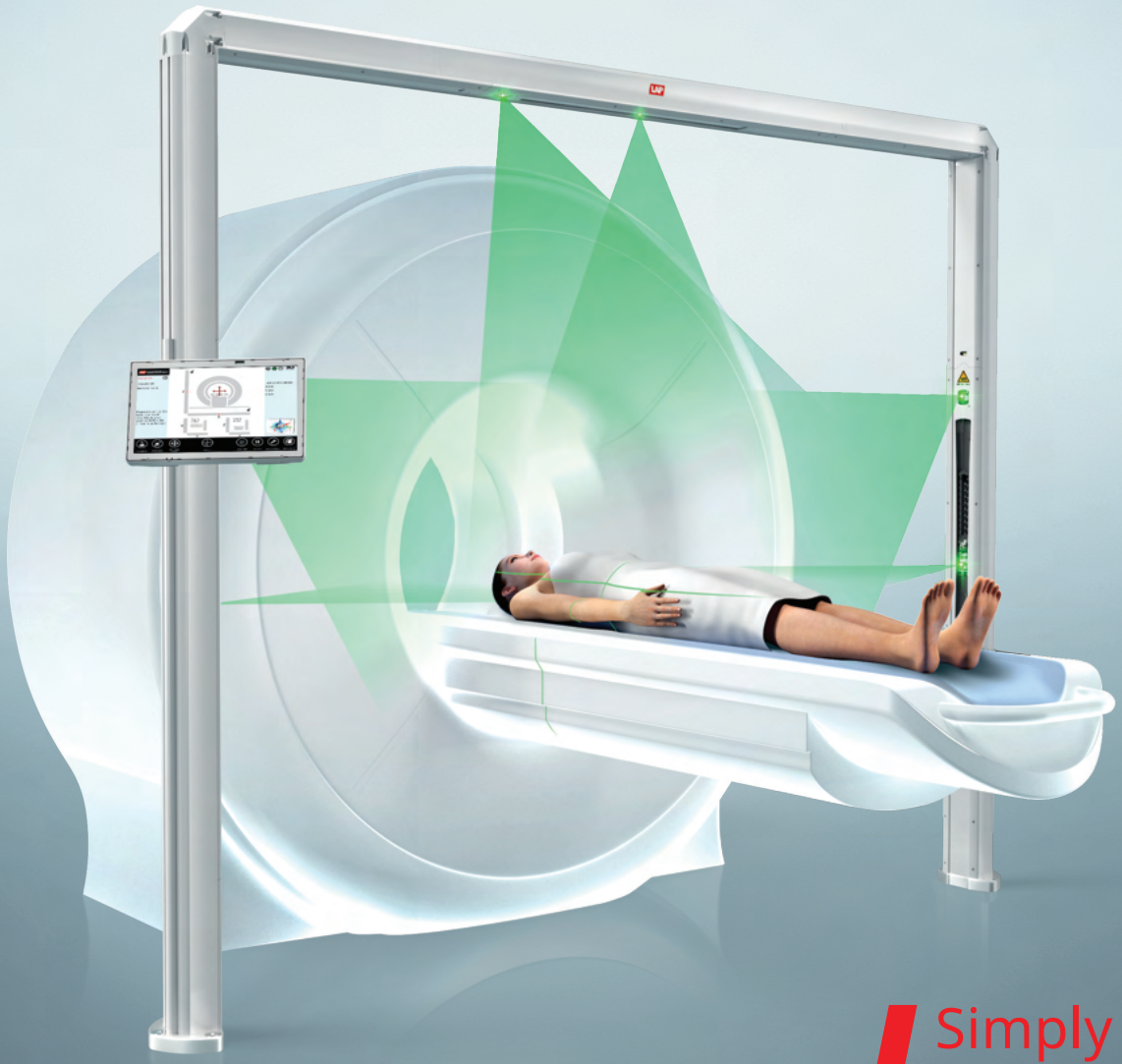

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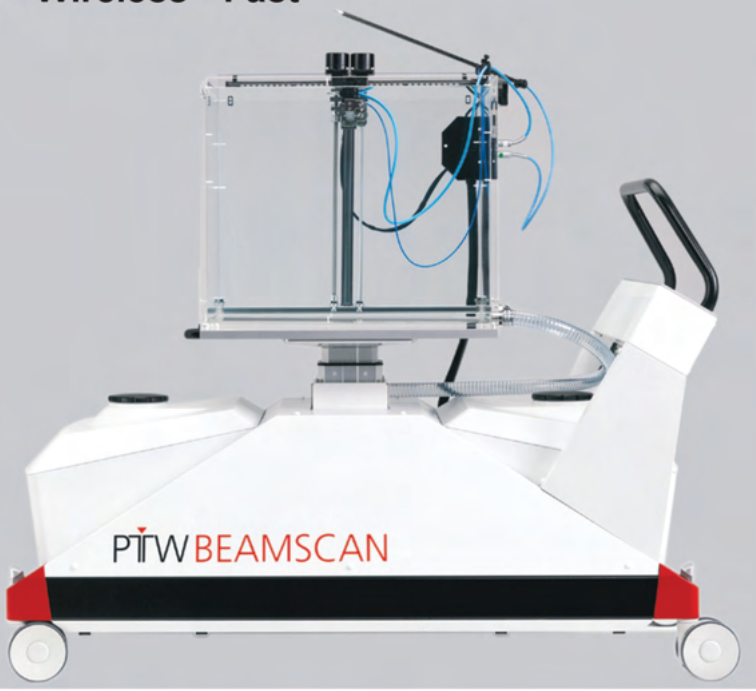

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