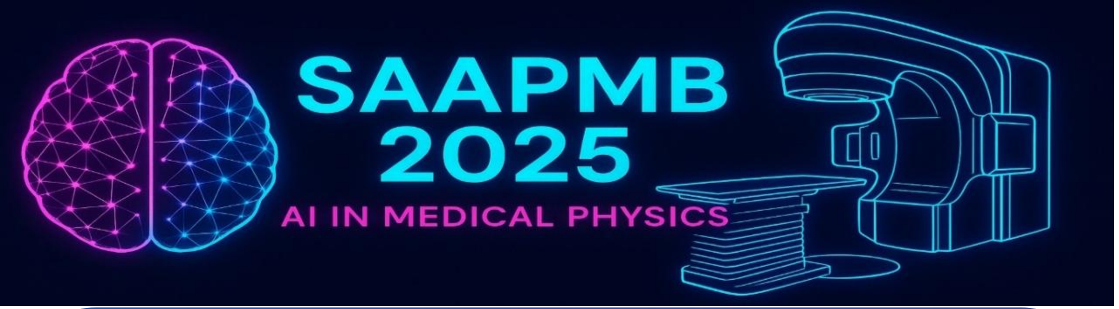


61st NATIONAL CONGRESS

SOUTH AFRICAN ASSOCIATION OF PHYSICISTS IN MEDICINE AND BIOLOGY

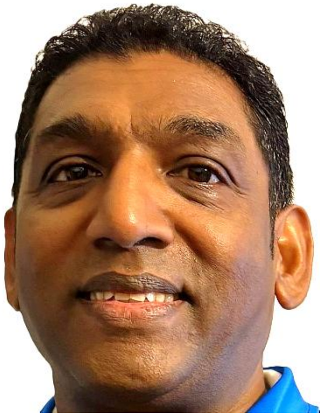
SAAPMB2025

14 – 17 OCTOBER 2025

GATEWAY HOTEL UMHLANGA DURBAN

INDEX

CONGRESS CHAIR
Dr Graeme L Lazarus



A very warm welcome to the 61st congress of the South African Association of Physicists in Medicine and Biology (SAAPMB).

A special word of welcome to the 5 invited speakers who have travelled across continents to share their knowledge, experience and vision with us. Your contributions enrich our scientific program and allow us to gain global perspectives on how artificial intelligence is advancing Medical Physics. We are honoured by your presence.

Our heartfelt appreciation goes out to the various companies that have participated by way of exhibition and/or sponsorship. I urge all delegates to ensure that they give these companies their due attention.

I extend my gratitude to the members of the Organising Committee. Your dedication and tireless efforts behind the scenes have ensured that we deliver a successful and memorable congress.

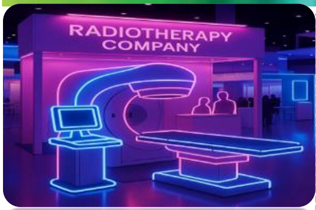
Artificial Intelligence is rapidly becoming part of our reality. AI is transforming the way we approach imaging, contouring, treatment planning, treatment delivery and quality assurance.
As Medical Physicists, we need to ensure that AI systems are safe, transparent, and validated, and that their use remains firmly guided by our expertise.

As we embark on the sessions ahead, I encourage you to engage fully, ask questions, share your insights, and challenge ideas.

I wish you a fruitful and inspiring congress.

SPONSORS AND EXHIBITORS

VENUE LAYOUT



EXB 9
Prime Equipment

EXB 8 Tecmed
Trade presentation

EXB 7 Intamed
Trade presentation

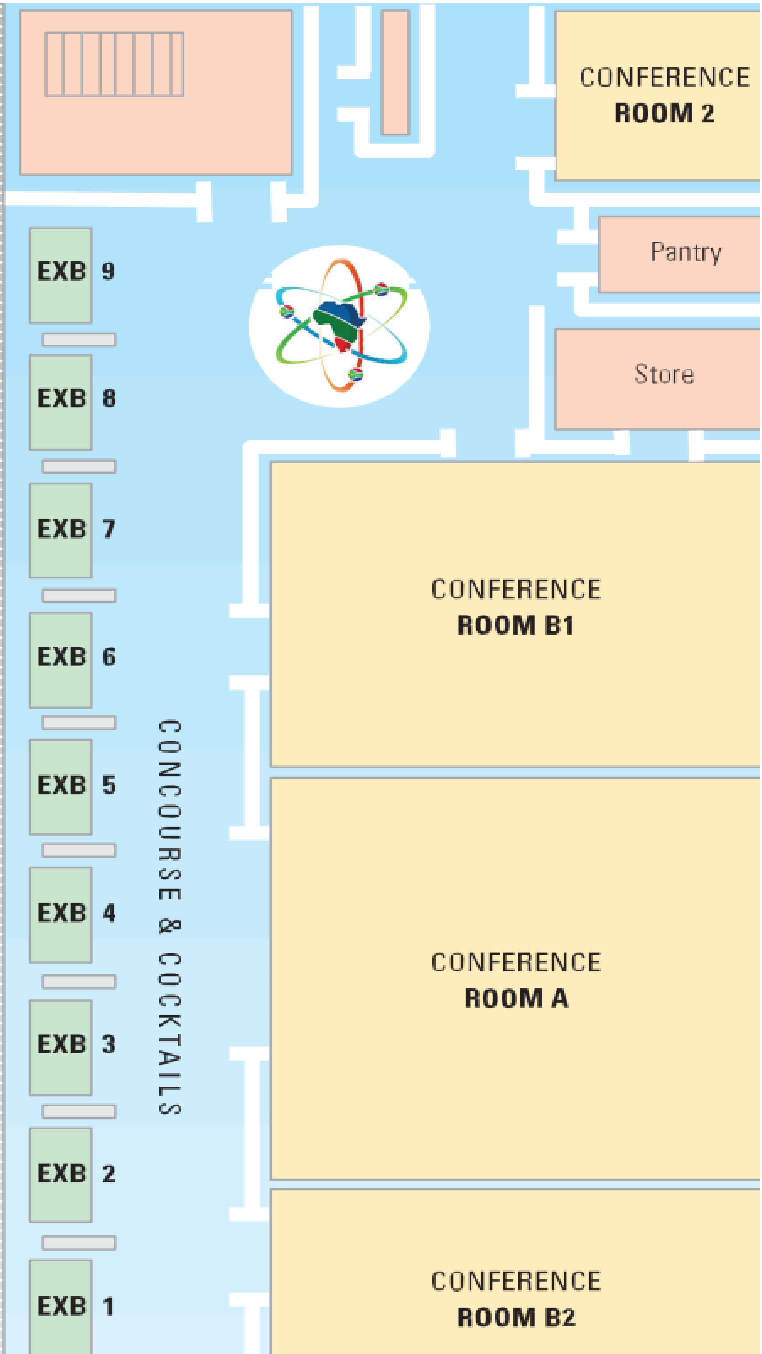
EXB 5 & EXB 6
Axim
Trade presentation
Name tags & Lanyards

EXB 4 Elekta
Gala dinner sponsor

EXB 3 AziMed
All teas x 4 days

EXB 2 Varian
Trade presentation

EXB 1 FlowBiomed
Trade presentation



INTERNATIONAL FACULTY
Prof Laurence Court

Laurence Court is a professor in the Department of Radiation Physics at the University of Texas MD Anderson Cancer Center.

He earned his PhD in medical physics from University College London, where he specialized in digital mammography system design. After spending six years in industry, he relocated to the United States and began working as a clinical physicist - first at the Dana-Farber Cancer Institute in Boston, and later at MD Anderson, where he has now been for 15 years.

He currently serves as Service Chief for the Physics Breast Service and is also the Director of the Radiation Planning Assistant (RPA) Project. This initiative focuses on developing and deploying auto-contouring and radiotherapy planning tools to support clinical teams in low- and middle-income countries (LMICs).

The project's flagship tool, available at rpa.mdanderson.org, received FDA 510(k) clearance in 2023 and was launched in South Africa in 2024. The team now plans to expand to additional countries, using real-world feedback to refine the system and better address the needs of local healthcare teams and patient populations.

Prof Monica Serban

Dr. Monica Serban is a clinical medical physicist at the Princess Margaret Cancer Centre and Assistant Professor in the Department of Radiation Oncology at the University of Toronto. She completed her Ph.D at Aarhus University in Denmark, where her research focused on image-guided brachytherapy for cervical cancer, including applicator optimization and treatment planning.

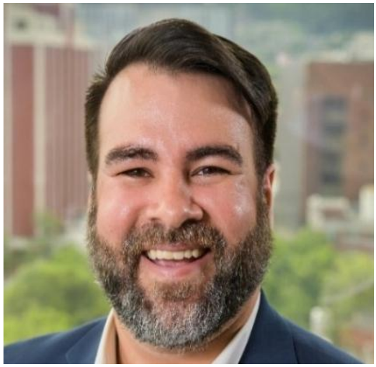
Dr. Serban has been a certified medical physicist since 2007 and previously held clinical positions at Maisonneuve-Rosemont Hospital and the McGill University Health Centre in Montreal. Her clinical work spans CT-based electron treatments, MR-guided brachytherapy, advanced external beam planning techniques, and automation in radiotherapy planning.

Her current research focuses on gynecologic brachytherapy, with specific interests in outcome modeling, dose accumulation, re-irradiation, and the application of AI to deformable image registration.

Dr. Serban plays an active role in graduate medical physics and radiation oncology education and is the course co-director of the ESTRO course on MRI-guided brachytherapy in gyaecological cancer.

INTERNATIONAL FACULTY

Prof Carlos Cardenas



Dr. Carlos Cardenas is an Associate Professor and Director of Automated Treatment Planning in the Department of Radiation Oncology at the University of Alabama at Birmingham (UAB) and also serves as the Director of Artificial Intelligence Research and Development for the Marnix E. Heersink Institute for Biomedical Innovation at UAB.

His research centers on leveraging artificial intelligence and medical image analysis to streamline and enhance radiotherapy treatment planning. In particular, he has contributed significantly to automated planning tools - helping translate these AI-driven methods into clinical use to improve efficiency and quality of care.

Dr. Cardenas has co-authored more than 100 peer-reviewed publications on the development, validation, and implementation of AI-based solutions in medical imaging and radiotherapy.

INTERNATIONAL FACULTY

Prof Jan Seuntjens

Dr. Jan Seuntjens is a Belgian-Canadian radiation physicist and Head of Medical Physics at the Princess Margaret Cancer Centre. He is Professor in the Departments of Radiation Oncology and Medical Biophysics at the University of Toronto and holds the Orey and Mary Fidani Chair in Radiation Physics.

He is Fellow of the AAPM, the AIMBE, th

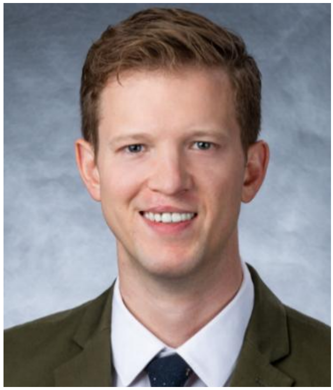
Seuntjens co-authored the Attix second edition classic dosimetry textbook named “Fundamentals of Ionizing Radiation Dosimetry”. He chairs AAPM Science Council and has been active on numerous AAPM committees over the past 25 years.

Seuntjens has co-authored over 270 peer-reviewed publications and books and was co-recipient of two AAPM Farrington Daniels awards and two COMP Sylvia Fedoruk awards for best paper in medical physics.

Current research interests lie in novel compact accelerator technology for proton/particle therapy democratization and the use of data, AI and modeling techniques for cancer treatment outcome prediction.

INTERNATIONAL FACULTY

Prof Tucker Netherton



Dr. Tucker Netherton is an Assistant Professor in the Department of Radiation Physics at MD Anderson Cancer Center in the United States. His clinical expertise is focused within the head and neck, lymphoma, melanoma, and sarcoma (HLMS) group. He also leads the development and deployment of AI-based clinical tools for the department.

His research primarily focuses on creating AI solutions to improve treatment planning, reduce errors, and enhance efficiency in radiation oncology. He is involved in the design and development of the FDA 510k-cleared Radiation Planning Assistant (RPA), an AI-powered platform democratizing high-quality treatment planning for resource-constrained clinics globally.

SAAPMB PRESIDENT
Mrs Nanette Joubert

It is my privilege on behalf of the Council and the Association to welcome you to the 61st annual congress of the South African Association of Physicists in Medicine and Biology in Umhlanga, KZN.

A special word of welcome to the 5 international speakers that will be presenting at the congress as well as at the specialised sessions on "AI in Medical Physics", which is the theme of the congress. We are honoured to have you as our guests and are pleased to have academics of your calibre sharing your knowledge and expertise with us.
I would like to extend our thanks and appreciation to the organising committee for keeping up the traditions, values and quality of this annual congress.

To our trusted sponsors – thank you for your generous and continued support, both at the congress and in the clinical field and industry, including sponsoring the training of medical physics interns.

I recently came across a congress programme from 1990 – the 30th SAAPMB meeting. I want to quote an extract from the president's report: "Research in the fields of medical and health physics is greatly stimulated by the exchange of personal experiences and research results among scientists working in their particular fields of interest. Individual contact is of exceptional importance in those rapidly developing areas of high technology which we find in hospitals and industry. It is true of course that much of our everyday work is applied and rather oriented towards the solution of local problems. Even this should act as a uniting factor as we attempt to find out how others have solved these and other problems." – Dr EJ van der Merwe, SAAPMB President 1990. In 1990, I was just starting my primary school career... so, to read these words and see the

contents of presentations and discussion at that congress, was heartwarming. Much of our daily work is still aligned to that from 35 years ago. So, let's not lose hope. We've come a long way, but more important, let's not lose sight of where we want to go; supporting members of the Association and building on physics in medicine and biology in South Africa.
I would like to give specific thanks to everyone who are presenting on their daily work, as that includes research as well.

The SAAPMB currently has a total of 243 members, which includes 149 full members, 38 associate, 28 student, 17 institutional, 4 retired, 4 corresponding and 3 honorary members. SAMPS currently has 136 full members, SARS 65, and SARPS 100. For all societies, member numbers have increased from last year.

During 2024 and 2025 the SAAPMB Council worked on a number of projects, which includes updates and changed to the Constitution and website. Council also supported and want to thank SAMPS and the SASQART developing team for their word work and success on updating the SASQART guidelines, and publishing in SAJO. A lot of research and work has been done on the Association's emblem, to preserve its heritage. But to grow with modern times, ideas for an additional modern logo are being investigated. A bid to host the 28th ICMP in South Africa was presented, but unfortunately, we did not win it this time.

I would also like to give a word of thanks and appreciation to the current council members for their support and hard work during the term, as well as to the Heads of the societies. I appreciate the support and the individual work on your portfolios and societies. I will be retiring as President at the AGM. Thank you for entrusting me with this prestigious position and allowing my inputs as part of the SAAPMB Council. I wish the succeeding president all the best in the endeavours of the Association.

The next SAAPMB congress will be in Cape Town, hosted by Groote Schuur Hospital/ University of Cape Town, and we look forward to welcoming you in the Mother City. *Through sciences (comes) the enlightment of medicine.*

SAMPS CHAIR: Prof Christoph Trauernicht

Firstly I would like to thank the SAMPS executive committee for their work in the last year. In particular, I'd like to single out Cobus Smit, who has diligently served as secretary to the society and whose contribution has been remarkable.

There have been a number of positive developments in the last year:

1) The medical physics scope of profession was re-worked and will have to work its way through the correct channels to eventually replace the existing scope of profession
2) The SASQART guidelines were updated and published in the South African Journal of Oncology. They are available to download at **https://doi.org/10.4102/sajo.v9i0.329**
3) The nuclear medicine equivalent of SASQART is, at the time of writing, in the final stages of revision.
4) No progress was made on private medical physics fees, but a number of physicists have shown interest to be on a task group to explore the options.
5) A legal opinion on the legality of the SANAS license conditions in diagnostic radiology has been requested. SAMPS has been trying to reason with the regulator for a change in these license conditions for a number of years, arguing that the conditions interfere with the scope of profession and require an additional accreditation, apart from registration with the Health Professions Council of South Africa. According to the Health Professions Act, nobody is allowed to work in a field where a scope of profession was published, without being registered by the HPCSA to do so.

6) A bid to host the 2027 International Conference on Medical Physics was unsuccessful. It will be held in Abu Dhabi.

It is encouraging to see that the HPCSA has done accreditation visits at all training facilities in the country. There is a big concern about the lack of funded intern posts in most provinces in the country.

My term as SAMPS chairperson will come to an end at the conference. I wish the new chairperson all the best in the coming year.

SARPS CHAIR: Mr Lutendo Nethwadzi

Chairperson:	Mr Lutendo Nethwadzi
Secretary:	Mr Thokozani Mkhize
Member:	Ms Thendo Alidzulwi
Member:	Dr Tobias Kotzé
Member:	Mrs Nanette Joubert

It is a great pleasure to welcome you to the 61st Annual Congress of the South African Association of Physicists in Medicine and Biology (SAAPMB), proudly hosted by the Department of Medical Physics at Inkosi Albert Luthuli Central Hospital.

This year's congress convenes at a moment of global scientific significance. SARPS is proud to mark its active participation in the International Radiation Protection Association (IRPA), contributing to the establishment of a Task Group focused on education and training in radiation protection. This IRPA Task Group comprises of 50 representatives from radiation protection societies across the world, including South Africa, Nigeria, Ghana, Cameroon and Netherlands. To date, three Working Groups have been formed, with key initiatives such as webinars and training programs for radiation protection already underway.

At the heart of SARPS's 2025 strategic plan is a commitment to increasing visibility and awareness within the radiation science community through robust outreach programs. A cornerstone of this effort is our ongoing collaboration with the Society of Radiographers of South Africa (SORSA). SORSA formed a dedicated task team that already met four times this year to explore the development and publication of Diagnostic Reference Levels (DRLs). This is an interdisciplinary team effort with medical physicists and radiographers working together. Although the specific field was initially undefined, the establishment of DRLs in CT is now the primary focus. The South African Health Products Regulatory Authority (SAHPRA) was also identified to participate in this DRL research initiative. Ethics approval still needs to be obtained, data will be collected retrospectively, and training on the standardized spreadsheet for data collection still needs to be provided.

Mr Sithole from SAHPRA has initiated discussions on DRLs and presented SAHPRA's plan to implement DRLs for diagnostic and interventional procedures across Gauteng hospitals, starting with CT, mammography, and fixed fluoroscopy. Expansion to other provinces is anticipated, though feedback to questions raised during his presentation is still pending. SARPS continues to encourage engagement in DRL projects, including those in nuclear medicine focused on extremity doses for staff.

SARPS will also be represented at the 2025 SORSA and International Association of Forensic Radiographers (IAFR) Congress in Cape Town from 5–7 September. In efforts to foster collaboration with SAHPRA, SARPS explored the possibility of including a SAHPRA member in its executive committee. However, it was agreed that SAHPRA would serve in an advisory capacity to preserve committee neutrality and ensure smooth collaboration via the SAHPRA Technical Advisory Committee on Radiation Protection.

Further contributions from SARPS include efforts to define the scope of medical physics under radiation protection, with emphasis on personnel dosimeter education and analysis. Last year, SARPS participated in the SASCI (South African Society for Cardiologists and Interventionalists) Workshop for final year cardiology registrars in Cape Town, where Dr Kotzeé delivered a presentation on Radiation Protection in Interventional Radiology.

Looking ahead, the purpose of the draft ICRP Publication 157 titled "Ethics in Radiological Protection for Patients in Diagnosis and Treatment" is to propose a practical application of values for medical radiological protection professions. This publication identifies the shared values, defines a common language between biomedical ethics and radiological protection, and describe the ethical implications of actions. Additionally, the IAEA Radiation Protection in Medicine Conference will be held from 8–12 December 2025 in Vienna, Austria.

It is my sincere hope that every medical physicist embraces the spirit of "We shape the future" and continues to ignite, inspire, and empower through research, teaching, and outreach. Together, we can elevate the role of SARPS in advancing radiation safety and protection across clinical settings in South Africa.

In alignment to strengthen South Africa's voice withing the international radiation protection community, SARPS committee also believes it is timely to reach out to the South African Radiation Protection Association (SARPA) to reignite the South African Radiation Protection Coordinating Body (SARPCOB). Revitalising SARPCOB will ensure stronger national coordination and provide a unified platform for IRPA-related initiatives.

On behalf of SARPS members, I extend heartfelt gratitude to the SAAPMB 2025 Local Organising Committee, chaired by Dr Graeme Lazarus, for curating an exciting and impactful programme. I also thank the SAAPMB Council, Division and Forum Chairs, and all contributors behind the scenes who made this congress possible.

To our invited speakers and delegates, I wish you a stimulating and memorable conference. May your time with us spark new ideas, collaborations, and purpose.

Welcome to Inkosi Albert Luthuli Central Hospital. Welcome to Durban, KwaZulu-Natal.

I look forward to a memorable conference!

SARS CHAIR: Prof Alistair Hunter

The society remains small but active. Centres are Western Cape at Groote Schuur Hospital/ University of Cape Town, Tygerberg Hospital/ Stellenbosch University and Ithemba LABS with pockets at the Universities of the Free State, Witwatersrand, Pretoria and Western Cape. Substantial progress has been made regarding the development of HPCSA internship programs in radiobiology. The criteria for registration are at an advanced stage, having been approved in principle by the Committee for Medical Science (CMS) of the HPCSA and have been distributed to stakeholders for last comments. Both SARS and SAAPMB have formally expressed their support and we are confident that internships will be possible in the near future. We must express our gratitude to Graeme Lazarus, who is our representative at the CMS who has actively assisted in the facilitation of the process. We remain concerned regarding the inadequate provincial commitment to provincially funded posts, which may limit the initiation of internships. However, it is possible that this may stimulate post development if provincial authorities are to fulfil their HPCSA training obligations.

Laboratories continue to perform well with active programmes and increasing student numbers at Ithemba and Stellenbosch. During the 2024/2025 year, several students have been or are currently being trained at the honours (4), Masters (3) and PhD levels (3). Projects have included investigations of hypofractionation, cancer therapeutics, effects of radiation on tumour vasculature and motility, effects of radiofrequency radiation on radiosensitivity, and aspects of space science. Numerous contributions have been made by members to training courses in radiobiology for science students, registrars in radiation medicine, medical physicists, RTTs and radiation protection groups. Contributions have also been made to CMSA examinations.

TUESDAY 14th OCTOBER

08:30 - 09:00	**REGISTRATION**			**TEA/COFFEE**
09:00 - 10:00				
10:00 - 10:15	**Session A** Dr Graeme L Lazarus			**WELCOME ADDRESS**
10:15 - 10:45		**A1**	Prof Monica Serban	Modern Interstitial Brachytherapy for Gynaecologic Cancers
10:45 - 11:30		**P1**	Mrs M D du Toit	Introducing an intelligent software system based on Complex Adaptive Systems (CAS) theory at Tygerberg Hospital's Medical Physics Division
		P2	Ms J Olivier	Beam model comparisons between AAA and AXB Eclipse algorithms to Elekta Synergy measured beam data
		P3	Mr Jake Blank	Radiotherapy Dosimetry Audit at Tygerberg Hospital in Compliance with the ARCHERY Research Study
		P4	Mr Jake Blank	Building a Low-Field Magnetic Resonance Scanner
		P5	Mr Samkelo Mngqete	A Practical Approach to Reirradiation: Insights from Netcare Alberton Hospital
		P6	Mr Vuyisile Jonas	Effects of Iteration and Blur Filters on PET imaging of Tiny Stuctures
		P7	Mrs Haafizah De Waal	Film Dosimetry and Dose Mapping of an X-ray Blood Irradiator
		P8	Mr Musa Maluleka	Activation of the p53 Pathway Enhances DNA Double-Strand Break Response in Glioblastoma and Medulloblastoma Cells Treated with Photon Irradiation and AMG232
		P9	Ms Banele Ndlovu	The Effect of South African Indigenous Medicinal Plants on Radiation-Induced Alterations in Skin
11:30 - 12:00		**A2**	Prof Jan Seuntjens	Reference dosimetry and quality assurance aspects of complex radiation therapy delivery
12:00 - 13:00	**LUNCH** ***(SARPS AGM - BREAKAWAY ROOM CYCAD A)***			
13:00 - 13:15	**Session B** Mr Lutendo Nethwadzi	**B1**	Dr Lourens Strauss	Reach for the Chi(X): Exploring an alternative metric for dose comparison
13:15 - 13:30		**B2**	Mr Hein Fourie	Quantitative 4D-CT reconstruction dependency on acquisition periodicity
13:30 - 14:00		**B3**	Prof Jan Seuntjens	Career paths in Medical Physics: training strategies for health professionals, innovators and scientists
14:00 - 14:15		**B4**	Prof Debbie van der Merwe	Update to the Scope of the Profession of Medical Physics in South Africa *(ETHICS)*
14:15 - 14:30		**B5**	Mr Thuso Ramaloko	Road to 7th fully fledged Medical Physics department in South Africa
14:30 - 14:45		**B6**	Mrs Nanette Joubert	Training and post numbers in South African Medical Physics departments
14:45 - 15:15		**B7**	Mr Gerrit Hombrink	Sponsored by Intamed/Brainlab: Improvements in patient disease management with the support of AI solutions.
15:15 - 15:45	**TEA/COFFEE**			
15:45 - 17:45	***SAMPS AGM (MAIN HALL UMDONI 2)***			
18:00 - 23:30	**MEET & GREET COCKTAIL FUNCTION - POOL VENUE - GATEWAY HOTEL**			

WEDNESDAY 15th OCTOBER

08:00 - 08:15	Session C	Mrs Nanette Joubert	C1	Mr Wilhelmus Petrus Struweg	TPS Validation and Beam Stability Over Time on Halcyon: 7 Years at 2 Sites
08:15 - 08:30			C2	Mr Benedetto Savides	Commissioning and clinical use of Hypersight
08:30 - 08:45			C3	Mr Hector M. Leboea	The Monte Carlo Simulations of the Photon Beams Used in External Beam Radiotherapy
08:45 - 09:00			C4	Mr Nicolas Rovetto	A Full Width at Half Maximum (FWHM) based approach to treatment planning system validation for precise stereotactic radiotherapy
09:00 - 09:15			C5	Prof Christoph Trauernicht	The IROC virtual treatment planning system audit
09:15 - 09:30			C6	Mr Nyiko Mabasa	Virtual EPID Standard Phantom Audit (VESPA) for remote IMRT and VMAT credentialing of Addington Hospital
09:30 - 10:00			C7	Dr Lourens Strauss (Tecmed)	Sponsored by Tecmed: Raising the Bar: Quality Assurance in the Era of Adaptive Radiotherapy
10:00 - 10:30	**TEA/COFFEE**				
10:30 - 11:30	Session D	Mr Hein Fourie	D1	**RADIOBIOLOGY**: Registration in clinical practice, clinical training programmes and posts in clinical practice and research. Mr Hein Fourie, Netcare Medical Physics SoC & SARS Secretary – Session Chair Prof Alistair Hunter, Radiobiologist, Groote Schuur Hospital & SARS Chairperson – panellist Dr Randall Fisher, iThemba LABS - panellist Dr Kamo Ramonaheng, Medical Physicist, NuMeRI - panellist Dr Seshini Naidoo, Radiation Oncologist, Inkosi Albert Luthuli Central Hospital - panellist Dr Graeme Lazarus, Inkosi Albert Luthuli Central Hospital - panellist	
11:30 - 11:45			D2	Ms Xanthene Miles	Modulatory effects of the MDM2 inhibitor AMG 232 on the p53 pathway and radiation response in glioblastoma and medulloblastoma cell lines
11:45 - 12:00			D3	Mr Jake H. Blank	Comparison of Kidney Dosimetry for Lutetium-177 Therapy Using MIRDsoft and OpenDose Platforms
12:00 - 12:30			D4	Mr Andre Luis Secco Mattesco	Sponsored by SNC/AXIM: Optimizing the Machine Quality Control Routine with the SunCHECK™ Platform
12:30 - 13:30	**LUNCH** ***(HOD MEETING - BREAKAWAY ROOM CYCAD A)***				
13:30 - 14:00	Session E	Mr Hector Leboea	E1	Mr Yassar Rather	Sponsored by Varian: Varian RAD and Maxim QA
14:00 - 14:15			E2	Ms Zandri Van der Westhuizen	Gaussian Convolution in EPIQA: How much is 'TOO MUCH'?
14:15 - 14:30			E3	Ms Lerato Mohlafase	Performance evaluation of ionization chambers and microdiamond detector in small field penumbra measurements
14:30 - 14:45			E4	Mrs Juanita van Staden	Evaluation of Bolus Materials in ICON Radiotherapy Units
14:45 - 15:00			E5	Ms Chante Jooste	Commissioning of the Elekta Synergy Agility Linear Accelerator on Eclipse TPS: A Dosimetric Comparison of AAA and Acuros XB
14:45 - 15:00			E6	Mr Itumeleng Setilo	Development of Web-Based DICOM RT Mode Patient Tracking System for Treatment Continuity When Server is Offline
15:00 - 15:30	**TEA/COFFEE**				
15:30 - 16:00	Session F	Dr Tobias Kotze	F1	Mr Thokozani Mkhize	Sponsored by Flowbiomed: UNICHECK - The Daily QA Solution
16:00 - 16:15			F2	Mr Andre Luis Secco Mattesco	Justifying QA Investment in Radiotherapy: Clinical Impact, Patient Safety, and Economic Value
16:15 - 16:30			F3	Ms Loren Campbell	Different Beasts: Comparing Practical Safety Considerations for Iodine-131 and Lutetium-177 Therapies at Groote Schuur Hospital
16:30 - 16:45			F4	Mrs Talitha Bekker	Brand New Sealed Sources: To wipe or not to wipe?

THURSDAY 16th OCTOBER

08:00 - 08:15	**REGISTRATION**			
08:15 - 08:30	**WELCOME AND INTRODUCTION**			
08:30 - 09:00	**Session G** Dr Graeme L Lazarus	G1	Prof Monica Serban	From Planning to Practice: Automating and Standardizing SFRT Delivery
09:00 - 09:15		G2	Mr Stoltz Ahg	A comparison between 3DCRT, IMRT and VMAT for breast radiotherapy
09:15 - 09:30		G3	Mrs Elaine Smith	Dosimetric comparison between 2D and 3D planned intracavitary brachytherapy for cervical cancer at Groote Schuur Hospital
09:30 - 09:45		G4	Mrs Monique Du Toit	The role of the medical physicist in cervical brachytherapy at Tygerberg hospital
09:45 - 10:00		G5	Ms Mpho C. Mnguni	Investigation of Dosimetric Impact from Positional Deviations of the Radioactive Source Within the Ring Applicator During Gynaecological Brachytherapy
10:00 - 10:05		P10	Mrs Riana Jackson	Taking a deep breath: The use of the deep expiration breath hold technique in the Stereotactic Body Radiotherapy Treatment of a lung lesion - A case study
10:05 - 10:10		P11	Mr Emilio John	Clinical experience and review using Cone-Beam Computed Tomography planning (CBCTp) on the Halcyon with Hypersight
10:10 10:45	**TEA/COFFEE**			
10:45 - 11:15	**Session H** Prof Debbie vd Merwe	H1	Prof Monica Serban	Dose Accumulation in Multi-Modality Radiotherapy: Integrating EBRT, BT, and Re-Irradiation Scenarios
11:15 - 11:45		H2	Prof Jan Seuntjens	Democratization of Proton Therapy for Cancer Therapy
11:45 - 12:15		H3	Prof Tucker Netherton	What is AI?
12:15 - 12:45		H4	Prof Carlos Cardenas	Everyday use of AI (and the clinic)
12:45 - 13:45	**LUNCH *(SAAPMB COUNCIL MEETING - MAIN HALL UMDONI 2)***			
13:45 - 14:00	**Session I** Mrs Monique du Toit	I1	Mr Willem Boonzaier	Domain Adaptation for Adult Glioma Segmentation in Sub-Saharan Africa: An Ensemble of nnU-Net v2 and MedNeXt – Team South Africa's Contribution to BraTS Africa 2025
14:00 - 14:15		I2	Ms Iris Theron	Implementation of AI at ICON SA: MPs and RTs perspectives
14:15 - 14:30		I3	Ms Andrea Marais	Implementation of the Radiation Planning Assistant (RPA) for clinical use
14:30 - 14:45		I4	Mr Willem Boonzaier	Opportunities and Obstacles in Implementing AI in Healthcare Across Africa: Insights from the SPARK Program.
14:45 - 15:30	**Session J** Prof Laurence Cour	**DEBATE 1**		AI can do QA better than physicists? POINT: Prof Christoph Trauernicht COUNTERPOINT: Dr Lourens Strauss Comments from the panel: Profs Tucker Netherton, Jan Seuntjens, Carlos Cardenas Comments and questions from the audience
15:30 - 16:00	**TEA/COFFEE**			
16:00 - 17:30	***SAAPMB AGM (SECOND HALL UMDONI 1)***			
18:00 -23:45	**GALA DINNER - MAIN HALL UMDONI 2 - GATEWAY HOTEL**			

	FRIDAY 17th OCTOBER			
08:00 - 08:30	*SAAPMB COUNCIL MEETING (SECOND HALL UMDONI 1)*			
08:30 - 09:15	Prof Jan Seuntjens	K1	Prof Tucker Netherton	Ethics in AI
09:15 - 10:00		K2	Prof Laurence Court	Risk in Deployment of AI
10:00 - 10:30	TEA/COFFEE			
10:30 - 11:15	Session L Prof Laurence Court	L1	Prof Carlos Cardenas	Clinical implementation of AI
11:15 - 12:00		L2	Prof Jan Seuntjens	AI for outcome prediction
12:00 - 12:45		L3	Prof Tucker Netherton	Future of AI (new technologies, changes in workforce, change in workflows)
12:45 - 13:30		DEBATE 2	AI will replace Oncologists in the next 5 years POINT: Mrs Nanette Joubert COUNTERPOINT: Dr Shona Bhadree Comments from the panel Comments and questions from the audience	
13:30 - 13:45	OFFICIAL CLOSURE			

Abstracts of the 61st Annual Congress of the South African Association of Physicists in Medicine and Biology (SAAPMB)

Durban, South Africa, 14 – 17 October 2025

(In order of presentation delivery)

A1. Modern Interstitial Brachytherapy for Gynaecologic Cancers

Professor Monica Serban
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P1. Introducing an intelligent software system based on Complex Adaptive Systems (CAS) theory at Tygerberg Hospital's Medical Physics Division

Mrs M D du Toit
Tygerberg Hospital and Stellenbosch University

Introduction

An intelligent software system based on Complex Adaptive Systems (CAS) theory is introduced for application in radiotherapy imaging. This system can mine large-scale medical datasets, reconstruct images by adapting to dynamic variables, and distinguish between normal and abnormal patterns through continuous learning and adaptation. Two patents were granted in South Africa (2003, 2020) for this unique CAS-based architecture, and two patents were published in the United States (2013, 2022).

Methods

The system is able to function as an adaptive control mechanism within a clinical environment. It is able to receive data from multiple sources, learn from this evidence, and modify its behaviour in real time. Unlike conventional CAS implementations, it is able to observe its own internal behaviour to maintain stable hyperstructures within internal models. The AI software is deployed on an NVIDIA DGX Station A100 at Tygerberg Hospital, leveraging its 64-core processor to support complex computational tasks required for radiotherapy imaging.

Results
The first clinical research application will focus on organ-at-risk (OAR) delineation in high-dose-rate (HDR) cervical brachytherapy. The CAS system is able to generate delineations that will be compared with existing manual delineations from an MSc study, with the aim of improving contouring accuracy and efficiency.
Conclusion
This patented CAS-based architecture is able to enhance adaptive decision-making and image analysis in radiotherapy. Under the guidance of the Agents Laboratory, it is expected to be
implemented across multiple imaging protocols in clinical oncology practice.

P2. Beam model comparisons between AAA and AXB Eclipse algorithms to Elekta Synergy measured beam data

J Olivier, Chante Jooste, Andrea Marais, Christoph Trauernicht

Introduction
The aim of this study was to validate the calculated Anisotropic Analytical Algorithm (AAA) and Acuros XB (AXB) 18 MV photon beam models in the Eclipse treatment planning system
(TPS) to measured beam data of an Elekta Synergy linear accelerator.
Methods
Percentage depth doses (PDDs) and profile measurements were acquired in a water phantom for standard field sizes between 4 and 40 cm^2, measured at depths from 0 cm to 30 cm, as
required for Eclipse beam modelling. Measured beam data were used to model the 18 MV photon beam in Eclipse for both AAA and AXB algorithms. The calculated PDDs and profiles from both algorithms were then compared in ScanDoseMatch software to measured data using gamma analysis at criteria of 3%/3 mm, 2%/2 mm, and 1%/1 mm.
Results
For PDDs, AXB achieved 100% pass rates for all three gamma criteria, except at 4 cm^2 1%/1mm, with a 99.7% pass rate, and AAA achieved 100% pass rates at all criteria, except 1%/1 mm, with a 94.9% pass rate

for the 6 cm^2 field. Profile comparisons showed good agreement, with AAA averaging 95.7%, and the AXB averaging 94.9%, with most of the discrepancies occurring in the penumbra region. Overall, AXB showed better calculations for PDDs, while AAA showed better calculations for profiles.

Conclusion

The results confirm that the 18 MV beam models was successfully validated in Eclipse, with the gamma analysis showing good agreement between TPS models and measured data. End-to-end testing will be conducted for further beam model validation.

P3. Radiotherapy Dosimetry Audit at Tygerberg Hospital in Compliance with the ARCHERY Research Study

Jake Blank
Division of Medical Physics, Tygerberg Academic Hospital

Introduction

A prerequisite to implementing the artificial intelligence-based Radiation Planning Assistant (MD Anderson Cancer Center, University of Texas, Houston, Texas, USA) in the Radiation Oncology department at Tygerberg Hospital was to participate in a dosimetric audit on the output of the linear accelerators (LINACs) in the department. An independent dosimetric audit served as a check that the calibration of the LINAC is within acceptable limits, specified to be ±5% by Radiation Dosimetry Services, MD Anderson Cancer Center.

Methods

Three lithium fluoride thermoluminescent dosimeters (TLDs) were preloaded into each phantom (Radiation Dosimetry Services). Each phantom was irradiated with 300 monitor units using a field size of 10 cm by 10 cm. The phantom's platform was set-up on the treatment couch at a source-to-surface distance of 100 cm. The phantom was placed on top of the platform. Eight beam modes were evaluated for three LINACs, with a new phantom used for each measurement.

Results

The percentage difference of a Synergy (Elekta, Stockholm, Sweden) LINAC with 6 MV, 10 MV and 18 MV were -0.3%, 1.7% and 1.7%, respectively. For a TrueBeam (Varian Medical Systems, Palo Alto, CA, USA) LINAC with 6 MV, 6 MV flattening filter free (FFF), 10 MV FFF and 15 MV the percentage difference was 0.7%, 0%, 1.7% and -0.7%, respectively. For 6 MV FFF from a Halcyon (Varian Medical Systems) LINAC the percentage difference was 0%.

Discussion

Beam dosimetric output were all within acceptable limits.

Conclusion

Independent dosimetry audits are a fundamental component of best practice in radiotherapy.

P4. Building a Low-Field Magnetic Resonance Scanner

Jake Blank
Division of Medical Physics, Tygerberg Academic Hospital

Introduction

Low-field magnetic resonance imaging (MRI) scanners are a promising solution for the increasing demand on MRI scanners in South Africa. Low-field MRI scanners are more affordable, lighter weight and portable systems compared to conventional high-field MRI scanners. As part of the So Low consortium workshop held at the University of Cape Town, a team assembled an open-source low-field MRI scanner (ONE version 2, developed by the Open Source Imaging Initiative, Berlin, Germany) over a two week period.

Methods

A permanent magnet bore was constructed using a randomly optimised magnet array designed to achieve a field strength of 50 mT. The scanner was built using the guidance provided by the open-source documentation, which included sorting the permanent magnets, constructing the magnet housing, wiring gradient and radiofrequency coils, integrating all coils into the scanner system, adding shielding to the scanner, mapping the magnetic fields, integrating an electronic control system and finally capturing the first MR images with the system.

Results

A functional MR image was obtained at the conclusion of the two-week build.

Discussion

The successful build of low-field MRI scanner highlighted challenges, such as, achieving optimal image quality, managing magnetic field inhomogeneities, and developing reliable shielding.

Conclusion

This project confirms that assembling a fully functional low-field MRI scanner using open-source components and instructions is achievable and could support the development of locally manufactured imaging solutions in South Africa.

P5. A Practical Approach to Reirradiation: Insights from Netcare Alberton Hospital

Samkelo Mngqete
Netcare Limited

Introduction

Re-irradiation refers to the delivery of radiation to an area that has previously received radiation, either due to local recurrence or the emergence of new tumours. It is a growing trend in modern radiotherapy. It is recognised as a viable treatment option for managing local recurrences and metastatic disease. Despite its rising use, it presents notable clinical and dosimetric challenges due to the increased risk of toxicity in previously irradiated tissues. A multidisciplinary team, comprising oncologists, treatment planners (dosimetrists), and medical physicists, must work closely together to ensure the safety and effectiveness of re-irradiation.

Aim and Objective

This work aims to outline a structured workflow process and practical strategies for the safe and effective implementation of re-irradiation.

Methods

DICOM data (Images, RT plan, Dose, Structures…) from the initial treatment were registered with the current CT scan data. Biological dose metrics were calculated by converting the
physical dose to an equivalent dose (EQD2), enabling the assessment of cumulative dose.

Results

Clinical case scenarios are presented to illustrate the re-irradiation workflow process. Examples show how maximum/ near-maximum OAR doses from previous treatments were used to
establish adjusted OAR dose limits. The process demonstrates how cumulative dose evaluation informs safe re-irradiation for current planning.

Conclusion

Safe and effective re-irradiation requires careful assessment of cumulative doses to OARs across multiple treatment courses. The methods illustrated show the importance of multidisciplinary collaboration in the re-irradiation setting.

P6. Effects of Iteration and Blur Filters on PET imaging of Tiny Structures

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[2]Yenzakahle MPI

Background

Accurate contrast recovery (CR) in PET imaging is vital for small lesion detection, but sensitive to reconstruction parameters like iteration count, subset number, and Gaussian filtering.

Objective

To assess how variations in reconstruction parameters affect CR for small lesions using a NEMA phantom and Siemens Biograph 64 PET/CT.

Methods

PET data were reconstructed using combinations of iterations (2, 3, 8), Gaussian filters (4 mm, 4.5 mm, 5 mm), and 21 subsets. CR values were calculated for spheres ranging from 10 mm to 37 mm.

Results

At 2 iterations with a 5 mm filter, CR for the 13 mm sphere dropped below the minimum SUVpeak threshold. Reducing the filter to 4 mm caused overcompensation, with smaller spheres exceeding maximum acceptable CR values. A 4.5 mm filter slightly improved balance, but the 13 mm sphere remained below acceptable SUVpeak levels, and further filter reduction risked excessive CR in the 10 mm sphere. Using 8 iterations and a 4.5 mm filter led to several spheres surpassing CR limits and produced noisy images. A moderate combination (3 iterations, 4.5 mm filter) showed improved balance for SUVmean and SUVpeak but still exceeded CR limits for SUVmax in some spheres. Image noise remained an issue.

Conclusion

Small variations in reconstruction parameters markedly impact CR, especially for lesions under15 mm. High iteration counts and minimal filtering improve CR but increase noise and risk overestimation. A combination yielding an iteration-subset product around 60 (e.g., 3x21) may offer a balanced compromise. Careful adjustment of parameters is crucial to preserve diagnostic image quality while avoiding a filter distortion.

P7. Film Dosimetry and Dose Mapping of an X-ray Blood Irradiator

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Introduction

This study aimed to calibrate EBT-XD Gafchromic film using a high dose rate (HDR) system to verify dose delivery and uniformity in an X-ray blood irradiator (XBI).

Methods

EBT-XD films were irradiated with doses ranging from 20Gy to 50Gy using an HDR afterloader, equipped with an Iridium-192 source. Net optical densities (netODs) were measured 24 hours post-irradiation using a densitometer. A calibration curve correlating netOD with dose was then established. Radiation levels around the XBI room were first assessed, followed by irradiation of additional films within the XBI. The resulting netOD values were converted to dose using the established calibration curve. Spatial dose uniformity within the XBI canister was then evaluated through two-dimensional dose mapping.

Results

Radiation levels in controlled and uncontrolled areas ranged from 0.03µSv/h to 0.72µSv/h and 0.15µSv/h to 0.23µSv/h, respectively. Films irradiated in the XBI showed measured doses
between 25.78Gy and 42.69Gy. Dose mapping showed that central regions received 39.79Gy to 41.19Gy, while peripheral areas exhibited higher dose values of 44.3Gy to 47.03Gy.

Discussion

Radiation levels in both controlled and uncontrolled areas remained within acceptable limits. Measured doses in the XBI exceeded nominal values due to the energy-dependence of the film. Dose mapping showed the lowest and most uniform doses centrally and higher doses peripherally, consistent with irradiator geometry and scatter effects.

Conclusion

The findings highlight the critical role of energy-specific calibration in achieving accurate film dosimetry. Despite over-response at lower energies, the observed dose distributions matched the expected physical and geometric setup of the irradiator.

P8. Activation of the p53 Pathway Enhances DNA Double-Strand Break Response in Glioblastoma and Medulloblastoma Cells Treated with Photon Irradiation and AMG232

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Abstract
DNA double-strand breaks (DSBs) are critical lesions induced by ionising radiation and are central to the effectiveness of radiotherapy in brain tumours. This study examines DSB induction and repair kinetics in glioblastoma and medulloblastoma cells following photon irradiation in combination with AMG232, a selective MDM2 inhibitor that reactivates the p53 tumour suppressor pathway. TP53 wild-type and mutant cell lines derived from both tumour types were treated with 0, 1, or 2 Gy X-ray radiation, with or without AMG232, and analysed at six post-irradiation time points: 30 minutes, 2, 4, 8, 12, and 24 hours. DNA damage was assessed using the γH2AX foci assay to quantify DSBs and monitor their repair over time. Doubling time was also evaluated at 24 hours to assess the impact of treatment on cell proliferation. The combined treatment resulted in delayed foci resolution and persistent DNA damage, particularly in TP53 wild-type cells, indicating enhanced radiosensitisation through p53 activation. These findings demonstrate the potential of AMG232 to potentiate radiotherapy in both glioblastoma and medulloblastoma by modulating DNA damage responses in a p53-dependent manner.

P9. The Effect of South African Indigenous Medicinal Plants on Radiation-Induced Alterations in Skin

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Abstract
Exposure to radiation from sunlight, space travel, or radiotherapy can cause various skin problems, including erythema, wounds, infections and cancer. There is a growing need to find alternative treatments for radiation-induced skin damage, as current

therapies have been associated with an increased risk of infections and folliculitis. Studies show that sulfhydryl compounds, such as thiols, present in medicinal plants can act as radioprotectors by minimising radiation-induced damage to normal tissues. Despite this, limited research has been conducted on the radioprotective effects of plants, particularly in South Africa (SA), a country renowned for its vast array of plants traditionally used to treat various skin ailments. These plants reportedly have radioprotective abilities as they are rich in chemical constituents that have antioxidant activity, such as phytochemicals and flavonoids. This study aimed to evaluate the wound healing and radioprotective potential of South African indigenous plants on the skin. *Adansonia digitata*, *Galenia africana* and *Tulbaghia violacea* were selected for further investigation as they possess sulfhydryl groups and exhibited rapid wound healing potential. The main objectives for this study included 1) investigating the
antioxidant properties of three selected plant extracts, 2) investigating the underlying wound healing mechanisms of plant extracts on skin cell models and 3) assessing specific cellular biomarkers quantifying the protective effect of indigenous plants in irradiated skin cell culture models. This study will help in the development of new, effective, and non-toxic treatment options for radiation-induced wounds.

A2. Reference dosimetry and quality assurance aspects of complex radiation therapy delivery

Professor Jan Seuntjens
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B1. Reach for the Chi(χ): Exploring an alternative metric for dose comparison

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Introduction

Advanced radiotherapy techniques produce complex plans, requiring strict Quality Assurance (QA) to verify the accuracy of dose distributions. QA procedures usually involve comparison of planned dose to measurement or software recalculation, using the well-established Gamma(γ)-analysis metric. However, this usually requires dedicated software which can be computationally expensive and influenced by user-controlled settings. The Chi(χ)-analysis is one fast and easy to calculate alternative, also delivering more insight. This work investigates the accuracy and applications of the Chi(χ)-analysis.

Methods

Software was developed to perform both γ- and χ-analyses in Matlab. Various dose distributions were produced from a clinical Head&Neck cancer treatment plan to investigate the effect of spatial resolution, calculation algorithm, reference/evaluation choice, and varying offsets in Multileaf Collimator position and Gantry Angle. Pass rates for both methods were calculated in the patient volume and per clinical structure, 3D maps compared visually and calculation times recorded.

Results

Pass rates were very similar between methods with a maximum difference of 2%. Calculation times for the χ were faster, ranging from 0.04-0.3s vs 30-160s.

Discussion

χ pass rates were predominantly higher except where the reference and evaluation sets were swapped, and a consistent trend observed. The effect of spatial resolution, algorithm and offsets were similarly observed in both methods. Differences were mainly seen in high dose gradients and the patient surface.

Conclusion

The χ-analysis method delivered results comparable to the standard much faster. The simplicity makes it easy to implement and can be a valuable analysis tool especially in research environments or where commercial software is unavailable.

B2. Quantitative 4D-CT reconstruction dependency on acquisition periodicity

Hein Fourie

Introduction

To evaluate how variations in CT acquisition periodicity—defined by the reported respiratory cycle duration—affect 4D-CT image reconstruction quality, using the Varian Real-Time Position Management (RPM) system in a controlled phantom setup.

Methods

A Catphan® 604 phantom was moved sinusoidally using a gating phantom with a 3.5-second cycle and 20 mm amplitude. CT scans were acquired with a GE Revolution Ascend scanner using three acquisition periodicities: 2.5, 3.5, and 4.5 seconds. 4D-CT images were reconstructed using the GE Advantage 4D software. Quantitative metrics (geometry, contrast resolution, slice thickness, and CT number accuracy) were assessed using Varian Eclipse software on average (AVG), maximum-intensity projection (MIP), and minimum-intensity projection (MinIP) sets.

Results

Acquisition matching the motion period (3.5 s) captured a complete breathing cycle, while shorter (2.5 s) and longer (4.5 s) cycles led to under- and oversampling, respectively. Geometry distortion was most evident along the motion direction. All AVG images showed extended target lengths (~59 mm) compared to static 3D-CT (~34 mm). Contrast resolution remained consistent across periodicities; however, CT number accuracy degraded in AVG images, particularly for high- and low-density materials. Noise was reduced in AVG images due to averaging effects. MIP and MinIP images selectively preserved high- or low-density contrast, respectively.

Conclusion

Accurate respiratory period estimation is important for 4D-CT acquisition, but modest deviations (±1 s) do not significantly impact image quality. For clinical use, conventional 3D-CT scans remain preferable for dose calculations due to more accurate CT numbers, while AVG and MIP/MinIP projections offer valuable complementary data for motion-informed target delineation.

B3. Career paths in Medical Physics: training strategies for health professionals, innovators and scientists

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B4. Update to the Scope of the Profession of Medical Physics in South Africa *(ETHICS)*

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Introduction
Regulations defining the scope of practice of medical physicists were promulgated in 1988 and a request was received by SAMPS from the Medical Science Committee of HPCSA that these are considered for update.
Methods
A task group was created to review and update the professional scope in accordance with developments and practice in the field and national regulatory requirements. In addition, the HPCSA regulations defining the scope of the medical science profession and published standards of proficiency from other international entities were taken into consideration, including the IAEA Human Health Series No. 25 of 2013.

Results
Following a request from the SAMPS EXCO, a multidisciplinary team of registered medical physicists was constituted who drafted and reviewed the scope through a round robin process.

Discussion
A draft scope has been developed wherein the overarching medical physics activities pertaining to the areas where ionising and applicable non-ionising radiation is used in the medical practice of clinical radiation oncology, nuclear medicine, and diagnostic and interventional radiology, are listed. These activities are indicative of the medico-legal responsibilities, and the competencies expected of registered practitioners.

Conclusion
The draft amended scope of the medical physics profession is tabled for approval at the SAMPS AGM 2025. This presentation opens the opportunity for any further input, comments and discussion prior to finalization and submission to the HPCSA through SAMPS EXCO.

B5. Road to 7th fully fledged Medical Physics department in South Africa

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Abstract
South Africa currently have six Medical Physics departments that was aligned with six South African university medical schools. These six Medical Physics departments were founded before democratic dispensation and by then South African population was less than 44 million. Three University medical schools were accredited after 1994, but without Medical Physics departments and bringing number of medical schools in South Africa to nine.
South African population is 65 million as per 2024 Statistics South Africa Sensus. The aim of this presentation is to bring to the attention of South African Medical Physicists Society the need to encourage all new medical schools to include Medical Physics department to avoid unnecessary confusion in producing future Medical Physicists.

7th Medical Physics department: North West University Desmond Tutu medical school was launched in Potchefstroom campus in 2025 and will commence with undergraduate program in 2028. This school received Health Professional Council of South Africa (HPCSA) accreditation in 2024, and this accreditation includes all health science departments (viz, Medical Physics, Radiobiology, Medical Genetics, etc.). Since Medical Physics department need independent internship HPCSA accreditation from school theoretical program, we used University of Witwatersrand to apply our autonomous Medical Physics internship, and we were accredited to train internship in 2025.

B6. Training and post numbers in South African Medical Physics departments

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Introduction

Various academic hospitals and universities in South Africa are involved in training of medical physicists, ranging from undergraduate programs to PhD qualifications. Interns successfully completing the internship can register with the HPCSA for independent practice in Medical Physics, and are eligible for appointment in any of the disciplines in Medical Physics, namely Diagnostic Radiology, Nuclear Medicine and Radiotherapy; they can also follow careers either in the private or government/academic sector. The aim of this investigation was to determine the number of students and interns trained per institution, and how many remain in Medical Physics.

Methods

Heads of Departments of Medical Physics departments at teaching/training institutions were asked to take part in a voluntary survey. Data collected included the number of students

admitted into Hons programs, the number of interns admitted into internship programs, number of paid internship positions, number of HPCSA approved internship posts, number of students graduating with a Hons degree in Medical Physics, and the number of interns successfully completing the internship. Where possible, data on where newly qualified medical physicists are appointed will be added.

Results

The data collected from the survey demonstrated the density distribution of the location of Medical Physics trainees and graduates.

Conclusion

The information on the distribution of training numbers in Medical Physics give perspective on the status of Medical Physics training and job security in South Africa.

B7. Improvements in patient disease management with the support of AI solutions.

Gerrit Hombrink
Sponsored by Intamed/Brainlab

C1. TPS Validation and Beam Stability Over Time on Halcyon: 7 Years at 2 Sites

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Background

The Varian Halcyon platform offers rapid deployment through pre-commissioned beam models, yet clinical validation remains essential. This study investigates the accuracy of the first Halcyon system commissioned in sub-Saharan Africa using a pre-loaded treatment planning system (TPS) beam model following relocation to a new site in 2025, and evaluates its beam stability over a 7-year operational period.

Methods

TPS data were generated using Eclipse v17.0 with AAA calculations on a 40×40×40 cm phantom. These were compared to 2025 beam measurements acquired using a PTW Beamscan and SemiFlex 3D chamber setup, and retrospectively to 2018 commissioning data. Profiles were assessed using 1D gamma analysis (local, 2%/2 mm, 10% threshold) and PDDs were analyzed via 1D gamma analysis (local, 2%/2 mm).

Discussion

The high gamma pass rates validate the dosimetric reliability of Halcyon's pre-commissioned beam model post-relocation. Minor deviations for small fields are consistent with expected low-dose region behaviour and remain within clinical tolerance.

Conclusion

The Halcyon demonstrated excellent agreement between measured and TPS-calculated data, as well as remarkable beam stability over seven years. These findings support its safe redeployment and long-term clinical reliability, confirming that pre-loaded beam data can be trusted across institutions without compromising treatment quality or requiring full recommissioning.

C2. Commissioning and clinical use of Hypersight

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Yenzakahle MPI

Introduction

Hypersight is one of the latest developments in radiotherapy allowing for offline adaptive radiotherapy on the Halcyon and moving one step closer to fully adaptive radiotherapy. It does this by offering both a larger kV imaging panel (43 cm X 86 cm) as well as accurate Hounsfield units (HU). An investigation was conducted to determine the accuracy of the HU's, as well as the HU stability of the unit. Additionally, a small-scale study was conducted at BGOC comparing the dose distribution on 11 patient plans using select ICRU dose statistics metrics including D_{2cc}, D_{mean}, D_{max}, HI and CI.

Method

The accuracy of the HU's of the Hypersight unit were evaluated using a Diagnomatic Pro CT MkII phantom with dedicated electron density inserts. These values were evaluated for accuracy both against the data sheet for the phantom as well as comparatively against the HU values of the CT used for planning in the department. The stability of the unit was assessed in the short-term using consecutive daily measurements, and then in the intermediate term using monthly measurements. Patients scanned on a GE Discovery PET CT (with flat top) for radiotherapy planning, were planned for clinical treatment on the Halcyon at BGOC. On the first fraction of the treatment, the patient IGRT scans were reconstructed using iCBCT Acuros to provide accurate HU. These scans were then registered to the planning scan and the planning structure set copied to the IGRT scan. Without adjustment of the contours the plan was also copied to the IGRT scan and the dose distribution calculated with no reoptimization of the plan. The dose statistics for these dose distributions were compared to the statistics for the original CT planning scans and the differences quantified.

Conclusion

Hypersight produces stable, if not 100% accurate HU's and is suitable for dose calculation and radiotherapy planning. It provides comparable HU's and spatial resolution when compared to traditional radiotherapy planning CT, enabling it's use for
offline adaptive radiotherapy, more efficient patient throughput and more accurate radiotherapy treatment delivery. Comparable results were also obtained from the recalculation of treatment plans on Hypersight images.

C3. The Monte Carlo Simulations of the Photon Beams Used in External Beam Radiotherapy

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Abstract

This study focused on the development and evaluation of accurate Monte Carlo (MC) models for the Elekta Versa HD linear accelerator used in external beam radiotherapy. The primary
objective was to model photon beams for various energies, including 6 MV, 6 MV Flattening Filter-Free (FFF), 10 MV, 10 MV FFF, and 18 MV. Accurate modeling of radiation transport

and energy deposition is paramount for effective treatment planning, especially for advanced techniques such as Intensity Modulated Radiation Therapy (IMRT), Volumetric Modulated
Arc Therapy (VMAT), Stereotactic Radiosurgery (SRS), and Stereotactic Body Radiation Therapy (SBRT).

Monte Carlo simulations were conducted using EGSnrc software, employing BEAMnrc to model the treatment head and source, and DOSXYZnrc for calculating dose distributions in a water phantom. The treatment head components, including target, primary collimator, flattening filter, monitor chambers, Elekta Agility Multi-Leaf Collimator (MLC), and secondary collimator jaws, were recreated from vendor specifications. Model accuracy was assessed by comparing calculated beam parameters, including percentage depth doses (PDD), lateral profiles, beam quality index, and output factors, with measurements from a PTW
BEAMSCAN 3D water phantom. Initial electron beam parameters, including energy, radial distribution, and angular spread, were optimized to match calculated PDDs and lateral profiles to measurements. This optimization used gamma criteria of 2% dose difference and 2 mm distance to agreement (2%/2mm), with a 1%/2mm criteria for higher agreement levels. For FFF beams, initial discrepancies required incorporating a 5 mm tungsten filter into the model to improve beam characteristics.

Results showed varying agreement across beam energies and field sizes. The initial electron energies were 6.4 MeV for 6 MV, 9.8 MeV for 10 MV, and 13.6 MeV for 18 MV. The spot sizes were 0.10 cm (in-plane) and 0.20 cm (cross-plane) for 6 MV, 0.15 cm (in-plane) and 0.20 cm (cross-plane) for 10 MV, and 0.05 cm (in-plane) and 0.10 cm (cross-plane) for 18 MV. The angular spreads were 0.6°, 0.1°, and 0.5° for 6, 10, and 18 MV. PDDs and lateral profiles for FF beams showed agreement with measured data within 2%/2mm across field sizes.

However, output factors showed significant discrepancies for the smallest field size (1 cm × 1cm) across FF energies: 24% for 6 MV, 36% for 10 MV, and 51% for 18 MV, due to a lack of lateral electron equilibrium. The beam quality index differences for FF beams were minor (±0.8%). For FFF beams, initial simulations showed significant differences in PDDs and profiles beyond d_{max} and off-axis regions. After including a 5 mm tungsten filter, the FFF models improved substantially, achieving a 99.1% gamma pass rate at 2%/2mm. Output factors for 1 cm × 1 cm field size still showed overestimation (18.4% for 6 MV FFF, 24.6% for 10MV FFF), while larger FFF field sizes improved to within ±2.8% and ±5.0%. The beam quality index differences for FFF beams were reduced after adding the tungsten filter.

This study successfully demonstrated the development of Monte Carlo dose distribution calculations through the precise characterization of linear accelerator components and
optimization of initial electron beam parameters. Although the developed Monte Carlo models for Elekta Versa HD photon beams are partially suitable for further investigations, such as
patient-specific quality assurance and complex measurement geometries, further validation of small field size output and correction factors is needed for full suitability.

C4. A Full Width at Half Maximum (FWHM) based approach to treatment planning system validation for precise stereotactic radiotherapy

Nicolas Rovetto

Introduction

Accurate small-field characterization is critical for high-precision techniques such as Stereotactic Radiosurgery (SRS). This study evaluates the utility of Full Width at Half Maximum (FWHM)
measurements for validating Treatment Planning System (TPS) data, with a focus on detector-dependent variability in small-field dosimetry.

Methods

Beam profiles and percent depth dose (PDD) data were acquired for field sizes from 1×1 cm² to 4×4 cm² using three detectors—PTW Semiflex 3D, PinPoint 3D, and microDiamond—and compared to Monaco TPS Monte Carlo-generated data. A deconvolution algorithm was applied to measured profiles to mitigate volume-averaging effects, and the decrement line method was used to assess isodose widths.

Results

FWHM comparisons revealed increasing deviations between TPS and measured data as field size decreased, with the microDiamond showing the largest discrepancies. Deconvolution reduced detector blurring but did not consistently improve agreement with TPS due to its dependence on Semiflex-based commissioning data. PDD-informed isodose widths showed better consistency across detectors.

Discussion

Detector choice significantly affects beam characterization and TPS agreement in small fields. Deconvolution clarified profile shape but highlighted limitations in TPS modelling tied to original commissioning data.

Conclusion

FWHM and isodose width analysis, alongside deconvolution, can strengthen TPS validation and QA processes. These methods underscore the need for careful detector selection during commissioning to ensure accuracy and safety in small-field radiotherapy.

C5. The IROC virtual treatment planning system audit

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Introduction

Tygerberg hospital has started using the Radiation Planning Assistant (RPA), developed by the Court Laboratory at MD Anderson Cancer Center. As part of the initial verification process of this automated contouring and treatment planning tool, a dosimetric audit (poster by Blank et al.) and a virtual treatment planning system audit are done.

Method

The department sent through initial data for an Elekta Synergy linac (6, 10 and 18 MV photons) with treatment planning done on Monaco (version 6.01), and also data for the Halcyon (6 MV FFF) and Truebeam (6, 6FFF, 10FFF, 15 MV) linear accelerators on Eclipse (Version 17.0). Data included calculated monitor units and point doses for given scenarios for open and wedged fields, as well as off-axis ratios. Additional data from the treatment planning system was also requested, as well as the spreadsheets used for absolute dose calibration.

Results

A 36-page report on the results with recommendations was sent to Tygerberg hospital. These included a review of the calibration worksheet, which picked up that while the worksheets were technically correct, some shortcoming could add risk to the calibration process; for example, the value of the raw electrometer reading was not visible, preventing visual confirmation of its correctness. The review also picked up that the MLC transmission for the 15 MV beam was lower than expected, which could affect IMRT/VMAT plan calculation accuracy.

Discussion and Conclusion

This was a very useful exercise. The report recommendations were implemented.

C6. Virtual EPID Standard Phantom Audit (VESPA) for remote IMRT and VMAT credentialing of Addington Hospital

Nyiko Mabasa
Department of Medical Physics, Inkosi Albert Luthuli Central Hospital, Durban, South Africa

Introduction:

Dosimetric auditing is a key component of radiotherapy quality assurance (QA), ensuring accurate dose delivery and patient safety. Traditionally, audits involved sending anthropomorphic phantoms with dosimeters to treatment centers for planning and irradiation before returning them for analysis. The newer approach introduces using virtual phantoms, eliminating the need for complex onsite physical phantoms

Purpose:
The study aimed to implement and evaluate the VESPA framework at Addington Hospital to determine its feasibility and clinical value in strengthening the hospital's radiotherapy QA framework.

Methods:
The current project at Addington Hospital is in progress. The standardized CT data was provided to the center, the validation plans, IMRT and VMAT treatment plans were generated and delivered. The relevant TPS data and EPID images have been sent for analysis. The results are being assessed using gamma analysis across multiple criteria, from 3%/3 mm to 2%/0.5 mm. For benchmarking, the outcomes will be compared to the already published VESPA audits.

Results:

Data collection and analysis are currently in progress. Based on published audits, VESPA typically demonstrates high gamma pass rates (>95% at 3%/3 mm) with decreasing agreement at stricter levels (2%/2 mm and below). Complete results will be available at the time of presentation.

Conclusion:
VESPA is a resource-efficient alternative to traditional phantom-based audits, with prior studies supporting its effectiveness. Its evaluation at Addington Hospital is expected to show its practicality in a resource-limited setting, strengthening QA processes and aligning them with international standards.

C7. Raising the Bar: Quality Assurance in the Era of Adaptive Radiotherapy

Dr Lourens Strauss
Sponsored by Tecmed

D1. South African Radiobiology Society (SARS) AGM and Plenary session

D2. Modulatory effects of the MDM2 inhibitor AMG 232 on the p53 pathway and radiation response in glioblastoma and medulloblastoma cell lines

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Background and Aim
p53 is a key tumour suppressor activated by cellular stress and involved in radiation responses such as cell cycle arrest, DNA repair, and apoptosis. Targeting the p53–MDM2 interaction may
enhance radiosensitivity. This study assessed the radiosensitizing potential of the MDM2 inhibitor, AMG232, combined with photon or proton irradiation in p53 wild-type and mutant
Glioblastoma (GB) and Medulloblastoma (MB) cell lines.
Methods
The therapeutic and radiosensitizing effects of AMG232 were evaluated in p53 wild-type A172 (GB) and ONS-76 (MB) and p53 mutant U215 (GB) and DAOY (MB) cell lines. This includes
effects on cell cycle arrest and apoptosis. Cell lines were treated with AMG232 for 2 hours pre-irradiation and irradiated with 0, 2 or 8 Gy 230 MeV proton or 60Co radiation.
Results

Upon AMG232 therapy, a significant reduction in the percentage of cells in the G0/G1 phase (p=0,0003) was observed in the wt GB cells with an increase in G2/M arrest and a decreased G0/G1 population observed in p53 mut GB cells after combined AMG232 therapy with 2 Gy irradiation. In contrast, the G2/M arrest was significantly higher upon combined treatment (2 Gy protons with AMG232) compared to 2 Gy protons only in the wt MB cell line and not in the mut DAOY. 8 Gy photons induced a significant increase in apoptosis in all 4 cell lines with no significant effects upon combination with AMG232.

Conclusions

These results show some differences in cellular responses between GB and MB wild-type and mutated cell lines upon radiation and AMG232 therapy. Further studies are needed with

isogenic p53-modified models to fully elucidate the mechanisms underlying these effects and optimise the therapeutic potential of AMG232 in combination with RT.

D3. Comparison of Kidney Dosimetry for Lutetium-177 Therapy Using MIRDsoft and OpenDose Platforms

Jake H. Blank, Christoffel Jacobus van Reenen[1,2] and Christoph J. Trauernicht[1,2]

[1]Division of Medical Physics, Tygerberg Academic Hospital,

[2]Division of Medical Physics, Stellenbosch University

Purpose

Accurate internal dosimetry is essential for optimising radiopharmaceutical therapy with lutetium-177 (^{177}Lu), particularly in safeguarding dose-limiting organs such as the kidneys.This study presents a comparative analysis of renal absorbed dose estimates using two dosimetry methodologies: MIRDsoft (Society of Nuclear Medicine and Molecular Imaging

Committee), a patient-specific curve-fitting software based on the Medical Internal Radiation Dose (MIRD) formalism and OpenDose, an open-source module on 3DSlicer (https://www.slicer.org) designed for voxel-based dosimetry.

Method

Single photon emission computed tomography and computed tomography (SPECT-CT) images acquired at serial time points succeeding 177Lu therapy were evaluated for a sample of patients. The kidneys were delineated automatically using a deep learning model based on the nnU-Net framework. Time-activity curves for kidneys were generated. Absorbed dose estimates to the left and right kidneys were calculated using both MIRDsoft and OpenDose and compared between the two platforms.

Results

Preliminary results indicate that the absorbed doses to the kidneys obtained from MIRDsoft and OpenDose are comparable. The voxel-based dosimetry approach of OpenDose also reflected spatial variations in activity distribution within the kidneys.

Discussion

Further investigation is necessary to validate these trends across a larger patient dataset.

Conclusion

Artificial intelligence-assisted segmentation using nnU-Net combined with voxel-based dosimetry in OpenDose offers a faster and more individualised absorbed dose estimates for ^{177}Lu therapy.

D4. Optimizing the Machine Quality Control Routine with the SunCHECK™ Platform

Andre Luis Secco Mattesco
Sponsored by SNC/AXIM

E1. Varian RAD and Maxim QA

Yassar Rather
Sponsored by Varian

E2. Gaussian Convolution in EPIQA: How much is 'TOO MUCH'?

Van der Westhuizen Z
Yenzakahle Medical Physics Inc, Life Hilton Radiotherapy Department

Introduction
The aim of the study was to evaluate the effect of varying sigma values on the gamma agreement index of patient specific quality assurance analysed using the gaussian convolution tool in EPIQA. Through applying a Gaussian function on the image acquired on the epid the resolution discrepancy between the two systems could be mitigated. The level of smoothing that could be applied without jeopardizing the legitimacy of the QA was observed.
Methods
Epiqa was used to evaluate patient specific QA results for seven plans with three different treatment areas. These three areas had varying field sizes, number of arcs and modulation factors. The gaussian convolution tool in Epiqa was used to evaluate the effect of increasing sigma values on gamma agreement index. The sigma value indicates the degree with which the acquired Epid image is smoothed. The modulation factor for the plans was observed and whether there is a correlation between increasing modulation factor and sigma response.
Results
My comparisons found that the application of a sigma value of 2-3mm showed the maximum gamma agreement after which the gamma analysis pass rate plateaus and further smoothing resulted in decreased agreement between the Epid image and TPS dose. This value is however not set and is specific to each arc in each of the plans. No relationship between the modulation factor and most applicable sigma value was observed.
Conclusion
Employing Gaussian convolution in EPIQA is a useful tool for patient specific quality assurance to help get a better agreement between your TPS and EPID in terms of resolution. The sigma value used for smoothing the plans is user dependent and should be done cautiously to prevent jeopardizing the validity of the results.

E3. Performance evaluation of ionization chambers and microdiamond detector in small field penumbra measurements

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Abstract
In small-field radiotherapy, accurate characterization of the penumbra is critical for precise dose delivery, particularly in treatments like stereotactic radiosurgery (SRS), where steep dose gradients are required to spare surrounding healthy tissues. The objective of this study was to quantify the penumbra region in small radiation fields to improve dose delivery accuracy and minimize unnecessary exposure. Three detectors—the Semiflex 3D ion chamber, PinPoint 3D ion chamber, and microDiamond detector—were used to measure beam profiles for field sizes ranging from 1×1 cm² to 4×4 cm² using 6MV photon energy. These measured profiles were compared against data from the Monaco treatment planning system (TPS) to evaluate consistency and detector performance. For larger field sizes (4×4 cm² and 3×3 cm²), the Semiflex 3D detector showed the smallest deviations from TPS data, with errors of 14.5% and 14.3%, respectively. The Pinpoint 3D and microDiamond detectors exhibited larger deviations, with microDiamond showing the greatest discrepancies (30.7% and 34.5%). In the 2×2 cm² field, Semiflex maintained a deviation of 14.9%, while Pinpoint 3D and microDiamond showed errors of 28.1% and 38.4%. For the smallest field (1×1 cm²), all detectors underestimated penumbra width: 11.3% (Semiflex 3D), 27.1% (Pinpoint 3D), and 32.7% (microDiamond). Despite strong overall correlations between measured and planned profiles, noticeable deviations were observed, particularly in smaller fields. The Semiflex 3D, with the largest collecting volume, showed the best agreement with TPS data across all field sizes. This study highlights the importance of detector selection in small-field dosimetry and underscores the need for accurate penumbra quantification to ensure optimal treatment outcomes.

E4. Evaluation of Bolus Materials in ICON Radiotherapy Units

Juanita van Staden

Introduction

This study evaluates the bolus materials utilized in ICON Oncology departments. A survey identified the types of bolus materials commonly used across different ICON radiotherapy departments.

Methods

Bolus materials of 5 mm and 10 mm thickness (where sufficient material was available) were prepared from the most commonly used materials. A Perspex Head and Neck phantom, courtesy of Tshwane University of Technology, was CT scanned with all prepared bolus materials. The scans were imported into Eclipse, where 3D, IMRT, and VMAT plans were created and applied to each scan and compared to a scan with only virtual bolus applied. The mean thickness and Hounsfield Units (HU) for each scanned bolus were measured on Eclipse and compared. The HU for the virtual bolus was set to 0. A point dose measurement comparison was conducted between the thickness of the bolus and the equivalent depth in Perspex using a Farmer chamber inside a Perspex phantom with Perspex sheets of variable thickness.

Conclusion

The study concluded that all bolus materials used in ICON are adequate, with some being more suitable for specific treatments than others. The importance of correct bolus placement was emphasized. Effective communication between pre-planning, planning, and treatment radiation therapists is crucial for the accurate treatment of patients.

E5. Commissioning of the Elekta Synergy Agility Linear Accelerator on Eclipse TPS: A Dosimetric Comparison of AAA and Acuros XB

Chante Jooste, Jessica Olivier, Andrea Marais, Chris Trauernicht, Tamzyn Payne, Jake Blank, Ricus van Reenen, Mohlapoli Mohlapholi

Introduction

An Elekta Synergy Agility linear accelerator was commissioned for clinical use on Eclipse treatment planning system (TPS) for 10 MV photon beams. The aim of this study was to compare the dosimetric performance of Eclipse algorithms such as the Anisotropic Analytical Algorithm (AAA) and Acuros XB (AXB) using end-to-end testing.

Method

Various test cases (T1-T15) based on IAEA TECDOC-1583 and TRS-430 were planned in Eclipse. The CIRS thorax phantom model (002LFC) was used to simulate heterogeneous regions, including soft tissue, lung, and bone. A 0.6 cc PTW Farmer ionization chamber (TW 31003) was placed in each medium to measure absolute dose. Additionally, Eclipse was integrated with Mosaiq to allow for direct transfer of treatment plans to the Elekta linac.

Results

Under standard reference conditions, AAA showed less than 1% deviation between calculated and measured doses. In the heterogeneous phantom, AAA yielded good agreement for soft tissue (<2%) and bone (1.91% error, within the 3% threshold). The lung region also passed with a deviation of 0.75%, remaining within the 4% agreement criterion. AXB results are currently being analysed and will be included for comparison.

Discussion

AAA provided acceptable accuracy across all tissue types. This indicates that AAA can be considered clinically reliable under standard and heterogeneous conditions. AXB is expected to further enhance dose calculation accuracy due to its advanced dose-to-water calculation model.

Conclusion

The Elekta Synergy Agility linac was successfully commissioned in Eclipse. While AAA performs within clinical tolerance, AXB may offer better performance in regions where tissue heterogeneity presents greater planning challenges.

E6. Development of Web-Based DICOM RT Mode Patient Tracking System for Treatment Continuity When Server is Offline

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Introduction

Server failures from cyberattacks or technical issues can disrupt radiation therapy delivery and risk losing patient treatment data. We developed a web-based system that captures daily treatment data to ensure continuity of care when primary servers are offline.

Methods

A PostgreSQL-based system was implemented to collect end-of-day data including RT plans, structure sets, setup images, and treatment records. This repository resides on a dedicated workstation that can be connected to the linear accelerator network during server downtime. The system maintains complete patient treatment information collected from daily exports. When the primary server fails, this database is connected to provide all necessary data for continued treatment delivery via a web interface accessible from treatment consoles.

Results

The system enables seamless treatment continuation during server outages. By maintaining current RT plans and complete treatment histories, therapists can proceed with normal workflows after connecting the backup system to the network. Daily data collection ensures up-to-date information for all active patients. The repository provides access to treatment parameters, setup images, and allows real-time fraction recording during the downtime period. When the primary server is restored, the treatments delivered during the outage will be imported back to maintain complete records.

Conclusion

This backup system provides a practical solution for server downtime scenarios. Daily data capture combined with on-demand network connectivity ensures treatments can continue normally when primary servers fail, eliminating treatment delays and preserving data integrity.

F1. UNICHECK - The Daily QA Solution

Thokozani Mkhize
Sponsored by Flowbiomed

F2. Justifying QA Investment in Radiotherapy: Clinical Impact, Patient Safety, and Economic Value

Andre Luis Secco Mattesco

F3. Different Beasts: Comparing Practical Safety Considerations for Iodine-131 and Lutetium-177 Therapies at Groote Schuur Hospital

Loren Campbell[1], Daniella Violante[1,2]
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[2]University of Cape Town, South Africa

Introduction

At Groote Schuur Hospital (GSH), iodine-131 (I-131) is primarily used in thyroid carcinoma and hyperthyroidism treatment, while lutetium-177 (Lu-177) is used in the treatment of prostate cancer and neuroendocrine tumours. The aim of this study was to evaluate and compare the clinical safety considerations of I-131 and Lu-177 in therapeutic Nuclear Medicine at GSH.

Methods

A comparative assessment was conducted on differences in dosimetry, workflow efficiency, radiation safety protocols, and regulatory requirements pertaining to I-131 and Lu-177 therapies at GSH. Using observations of departmental workflow practices and challenges during clinical implementation, opportunities for workflow optimisation and safety protocol updates were identified.

Results

Relative to Lu-177, the higher gamma energy emission incidence of I-131 decay necessitated stricter inpatient isolation and radioactive waste storage protocols to adhere to regulations and

maintain radiation safety. Biological expulsion of I-131 through urine, sweat and saliva presented greater risks of contamination of patient linen and food items, often requiring prolonged waste storage of patient items. In contrast, Lu-177, primarily expelled through urine, resulted in minimal contamination of patient items, but however presented greater contamination risk during preparation and intravenous administration steps. Staffing

challenges for both therapies emphasised the need for continued radiation safety training for nursing in order to improve and maintain workflow efficiency and safety.

Conclusion

The findings support updating of current clinical protocols to improve workflow efficiency, as well as radiation safety for staff, patients and public. Recommendations include radionuclide-specific radiation safety training for nursing staff, ward space optimisation, and regular radiation surveys to flag potential contamination.

F4. Brand New Sealed Sources: To wipe or not to wipe?

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Introduction
It is not a SAHPRA regulatory requirement to perform wipe tests on new sealed sources if the accompanying certificate states that wipe tests were performed before dispatch. The aims of this study were to investigate the necessity to perform wipe tests on new sealed sources before being used clinically; and to investigate whether workflow optimisation was required in the hotlab, from wipe test results.
Methods
Wipe tests were performed on new sealed sources delivered to the Nuclear Medicine Department, Groote Schuur Hospital, according to SAHPRA Guidelines. Wipe tests were performed on a Co-57 source and Ge-68 sources. A well-type auto gamma counter was used to analyze the wipe test samples and obtain energy spectra to aid with identification of possible contamination.
Results
A marginal amount of Co-57 contamination was detected on the Co-57 source, confirmed by the distinct photopeak at ~120keV. The Ge-68 sources failed wipe testing. Three distinct photopeaks were observed at ~60keV, 100keV and 200keV – not characteristic of Ge-68. Because the Ge-68 wipe tests were performed in a hotlab where Lu-177 is used, the photopeaks were investigated, and were characteristic of Lu-177.
Conclusion
The conclusion was two-fold. Since Co-57 contamination was detected on the Co-57 flood source, it suggests the sensibility to perform wipe

tests on new sealed sources on receipt. Secondly, it was recognized that the workflow in the hotlab for Lu-177 work required optimization to minimize contamination risk.

G1. From Planning to Practice: Automating and Standardizing SFRT Delivery

Professor Monica Serban
Princess Margaret Cancer Centre, Toronto
Department of Radiation Oncology, University of Toronto

G2. A comparison between 3DCRT, IMRT and VMAT for breast radiotherapy

Stoltz Ahg

Introduction

Breast cancer is one of the most commonly diagnosed cancers amongst women in low to middle income countries (LMIC). Optimised planning and treatment strategies are needed. This study investigates adopting inverse planning techniques: intensity modulated radiotherapy (IMRT) and volumetric modulated arc therapy (VMAT), in the LMIC environment for large patients.

Focus is also placed on determining the requirements to teach these techniques in an LMIC setting.

Methods

Four inverse planning strategies were investigated: IMRT two fields, IMRT four fields (IMRT4F), VMAT with half arcs and VMAT butterfly (VMATBF), for a cohort of 15 left and 15 right sided disease patients with separation >25 cm. The clinically contoured planning target volume (PTV) and an isodose-generated PTV (Auto-PTV) were compared with a mean target

dose of 40.05 Gy in 15 fractions. The Varian Eclipse v15.6 planning system was used with the Acuros algorithm on a Varian Halcyon 2.0 linear accelerator. Plan quality was assessed with dose metrics, and best strategies were derived for left and right sided treatments. Plan generation times were recorded.

Results

Plan quality improved substantially with experience. At least 20 plans were needed to train a novice to produce clinically acceptable plans. Auto-PTV was not inferior to manually contoured PTV and enabled inverse planning without oncologist contouring. IMRT, IMRT4F, and VMAT plans were all clinically acceptable. IMRT4F was the most optimal strategy for both sides.

Conclusion

Optimising breast radiotherapy in LMICs to include advanced inverse planning is feasible. Clinically acceptable plans can be generated from Auto-PTVs by planners with limited experience.

G3. Dosimetric comparison between 2D and 3D planned intracavitary brachytherapy for cervical cancer at Groote Schuur Hospital

Elaine Smith

Introduction

The standard for intracavitary brachytherapy (ICBT) has shifted toward 3D image-based planning using CT or MRI, allowing for improved visualization of target structures and OARs, as well as optimized dose distributions through dose-volume histogram evaluation. However, implementation in resource-constrained environments remains challenging due to limited access to imaging and trained personnel. This study aimed to conduct a dosimetric comparison of 2D-based and optimized 3D-based ICBT plans for cervical cancer patients at GSH.

Methods

160 CT datasets from 40 high-dose-rate ICBT patients (7Gy x4 to Point A) using a tandem- and-ovoid applicator were retrospectively analyzed. In Phase 1, the target and OAR structures were delineated, and dose distributions were evaluated. In Phase 2, 3D optimized plans were generated, prioritizing OAR sparing. Paired samples t-tests were used to compare D90, D100 for CTV, and D0.1cc, D1cc, and D2cc for the bladder, rectum, and sigmoid.

Results

Statistically significant differences ($p<0.001$) were observed for all parameters when comparing 2D to 3D plans. OAR mean doses showed reductions in 3D plans: bladder D2cc decreased from 6.57Gy to 4.45Gy, rectum D2cc from 3.82Gy to 2.36Gy, and sigmoid D2cc from 4.80Gy to 3.62Gy. Following a conservative approach to normal tissue sparing resulted in less optimal target coverage. D90 for CTV decreased from 5.26Gy to 4.16Gy.

Conclusion

This comparison confirms the advantage of 3D image-based ICBT over 2D-based ICBT in terms of OAR sparing. A limitation of 3D ICBT lies in the quality of structure delineation. Accurate contouring of the CTV and OARs is critical for plan optimization and safe dose escalation.

G4. The role of the medical physicist in cervical brachytherapy at Tygerberg hospital

Monique Du Toit

Introduction

Tygerberg has theatre access with an anesthetist on a Monday, and a brachytherapy suite with an Ir-192 HDR afterloader, tandem-ring applicators, in-house 3D-printed cervical sleeves and a CT scanner.

Objective

To discuss the role of the medical physicist in the cervical brachytherapy workflow at Tygerberg hospital according to the AAPM MPPG part B publication on minimum standards of brachytherapy treatment processes.

Methods

Cervical brachytherapy workflow includes:

- In-theatre placement of cervical sleeve after dilatation under sedation
- Patient imaged at the CT to verify the sleeve placement
- Applicator inserted at the CT and images taken
- Images sent to planning system and OAR and HR priority CTV added
- Patient plan prepared using the EQD2 spreadsheet to stay within OAR constraints and reach the desired tumour control dose.

• Patient treated with applicator placed in position into the sleeve every alternative day until 4 treatments completed – mild oral sedation before each treatment
• Patient dose report with EQD2 values

Results

Physics involvement throughout the workflow is needed. 3D printed S-tubes by physics allow patient throughput to reach 10 patients per week. The setup of EQD2 spreadsheet ensure a
brachy plan that incorporate the dose received from external treatment and serve with the optimization of the brachy plan.

Conclusion

To ensure a smoot workflow during cervical brachytherapy the input of the medical physicist is of utmost importance. Constant involvement to improve the process now lead to investigate AI generated OAR delineation and provide an adaptive plan for each fraction given.

G5. Investigation of Dosimetric Impact from Positional Deviations of the Radioactive Source Within the Ring Applicator During Gynaecological Brachytherapy

Mpho Confidence Mnguni, L. Ntombela
Steve Biko Academic Hospital, Medical Physics Department

Background

High-dose-rate (HDR) brachytherapy using ring applicators plays a vital role in the treatment of gynecological malignancies. Its clinical effectiveness relies heavily on accurate positioning of the
radioactive source within the applicator. However, positional deviations from the intended dwell positions can occur due to applicator geometry and mechanical resistance, potentially resulting in suboptimal dose delivery to the target and increased exposure to nearby organs at risk(OAR). This aims to investigate the extent of source positional deviations and to evaluate the potential dosimetric impact.

Methods

A simulation-based approach will be used to model various degrees of radial source deviation (1–3 mm) within standard ring applicators using the Oncentra Brachy treatment planning system. CT datasets from treated patients will be used to create reference and deviation plans. Deviations will be calculated mathematically and applied to simulate realistic displacement scenarios. Dose-
volume histogram (DVH) parameters including D90 for the target and D2cc for OARs will be assessed to compare planned versus simulated dose distributions.

Results

Positional deviations of 1–3 mm from the intended dwell positions within the ring applicator resulted in dosimetric changes, including a reduction of up to 12% in D90 for the clinical target volume and an increase of over 10% in D2cc for OARs.

Discussion

Understanding and quantifying source deviations in ring applicators is critical for ensuring the accuracy and safety of HDR brachytherapy.

Conclusion

The findings underscore the critical importance of precise source positioning and applicator verification in HDR brachytherapy.

P10. Taking a deep breath: The use of the Deep Expiration Breath Hold technique in the Stereotactic Body Radiotherapy treatment of a lung lesion, a case study [73]

Jackson R
IntelliRad, Hopelands Cancer Centre

Objectives: The patient, a 66-year-old female with stage llA small cell lung cancer was not a candidate for a lobectomy due to insufficient pulmonary reserve. The patient had a large focal mass like lesion in the lower lobe of the right lung. Due to the position of the lesion, and the patient's compromised lung capacity, it was decided that the patient would be treated with stereotactic body radiotherapy. The challenge was to treat the lesion to the maximum dose, without compromising the patient's lung capacity or causing her any undue distress.

Design & method: After being coached in both the DIBH and DEBH techniques, the patient reported that she was more comfortable with the DEBH technique as she felt that it did not place as much pressure on her breathing capabilities. A contrasted three-phase planning scan (inspiration, expiration and a free breathing scan) was used by the treating oncologist to verify the tumour volume, before confirming that the DEBH scan was to be used for planning and treatment. The patient was planned on the Eclipse for the Varian Halcyon machine, using 8 SRS arcs to a total dose of 54Gy in 3#. The Varian Identify system was used to position and monitor the patient's breathing throughout the treatment. As the Halcyon does not currently support beam-stop capabilities, the radiotherapists managed and controlled the beam on time manually.
Results: The patient was positioned and treated successfully with the patient spending an average of 31 minutes in the treatment room (including positioning, CBCT, and treatment) daily.
Conclusion: The use of the DEBH technique allowed the patient to maintain a comfortable breath hold position, without placing any stress on her already limited lung capacity. The Identify SGRT system made the monitoring of the patient's position and breath hold throughout the treatment easier, removing the need for physical tattoos and breath monitoring apparatuses being placed on, or near the patient.

P11 Clinical experience and review using Cone-Beam Computed Tomography Planning (CBCTp) on the Halcyon with Hypersight [74]

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Hopelands Cancer Centre & Busamed Gateway Oncology Centre

OBJECTIVES: To highlight our clinical experience and advantages using CBCTp on a Halcyon with Hypersight and challenges faced along the way.
DESIGN & METHOD: The integration of Cone Beam Computed Tomography planning (CBCTp) with Hypersight technology allows planning scans to be done on the Halcyon. This study was conducted at Busamed Gateway Oncology Centre. Our Initial focus was on palliative cases which needed urgent intervention and treatment. Once the staff

became proficient with the CBCTp procedure, planning scans were performed on patients requiring radical treatment and uncontrasted scans. It was also used for patients that require offline adaptive planning due to anatomical changes, such as weight loss or tumour shrinkage. The study aimed to improve workflow efficiency, gather feedback from radiotherapists and physicists, reduce patient wait times before starting treatment, and enhance treatment accuracy through offline adaptive planning.

RESULTS: The use of CBCTp allowed our department to service more patients per week, which resulted in patients commencing treatment faster, utilizing both the Hypersight and CT scanner for planning scans. The department are given approximately 9 slots per week for planning scans, this limits the days in which patients can be scanned. CBCTp has allowed us to bridge that gap and increase our available scan slots to approximately 15 scans per week. The study also showed a decrease in wait time for patients who are currently on treatment between rescan to restart of treatment with CBCTp allowing a patient to be rescanned immediately on the machine as soon as weight loss or tumour changes is noted. Patients booked for rescans using traditional CT scanning restart treatment in approximately 4 days from the date weight loss or tumour changes are noted, whereas patients rescanned using CBCTp restart treatment within 1-2 days of weight loss and tumour changes noted. This provides a better outcome of the treatment by reducing the delay in restarting treatment. The extended field of view (FOV) offered by Hypersight allowed for better visualization of tumour shrinkage, enabling precise target adjustments and optimized dose distribution. The incorporation of metal artifact reconstruction algorithms improved image clarity in patients with implants, reducing distortions and enhancing target and organ-at-risk delineation. Challenges noted include adaptation and learning curve of initial patients, patients requiring contrast during scan and a known issue with the Acuros reconstruction algorithm whereby relative gas motion in internal anatomy presents as streaking artifacts which can lead to inaccurate Hounsfield units.

CONCLUSION: The use of CBCTp technology has increased our workflow efficiency by reducing patient wait times by up to 50% and providing immediate rescan capabilities for patients found to have weight loss and tumour changes. This provides the foundation for an overall improved outcome of treatment. The ability to do planning scans on the Halcyon has increased our scanning capacity with limited CT scanner slots available. Despite initial challenges, drawbacks and limitations of Hypersight, the clinical benefits the technology provides outweigh this. Further refinement and research are required to fully maximise the potential of the Hypersight technology.

H1. Dose Accumulation in Multi-Modality Radiotherapy: Integrating EBRT, BT, and Re-Irradiation Scenarios

Professor Monica Serban
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Department of Radiation Oncology, University of Toronto

H2. Democratization of Proton Therapy for Cancer Therapy

Professor Jan Seuntjens
Princess Margaret Cancer Centre, Toronto
Department of Radiation Oncology and Medical Biophysics, University of Toronto

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H3. What is AI?

Professor Tucker Netherton
Department of Radiation Physics, MD Anderson Cancer Centre, United States

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H4. Everyday use of AI (and the clinic)

Professor Carlos Cardenas
Department of Radiation Oncology, University of Alabama at Birmingham, United States

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I1. Domain Adaptation for Adult Glioma Segmentation in Sub-Saharan Africa: An Ensemble of nnU-Net v2 and MedNeXt – Team South Africa's Contribution to BraTS Africa 2025

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Introduction

Gliomas comprise ~80% of malignant primary brain tumors and are a leading cause of primary brain cancer mortality. Accurate glioma segmentation from multiparametric MRI (mpMRI) is vital for prognosis, treatment planning, and response monitoring. Manual segmentation is resource intensive and variable, motivating robust automated solutions.

Aim

To quantify the domain gap between Global North (GLI) and Sub-Saharan African (SSA) glioma mpMRI datasets and develop practical domain adaptation strategies for automated segmentation in Africa.

Methods

We used BraTS 2025's GLI and SSA adult glioma datasets. After assessing the domain gap both qualitatively and quantitatively, we explored hyperparameter tuning, architecture modifications, transfer learning, data augmentation, and model ensembling. MedNeXt and nnU-Net v2 served as our base architectures. Performance was evaluated using Dice score and 95th percentile Hausdorff distance.

Results

A 40.65% average drop in image contrast was observed in SSA images versus GLI. SSA data also exhibited motion (7.9%), magnetic field bias (9.6%), noise (2.1%), and slice thickness artefacts (99.2%). Transfer learning yielded the best performance across both architectures with no statistical significance to training only on the SSA dataset. While augmenting GLI data to mimic SSA characteristics showed slightly reduced Dice scores, the difference was not statistically significant either. Ensembling best-performing MedNeXt and nnU-Net models did not improve
accuracy further.

Conclusion

We identified substantial domain gaps between GLI and SSA datasets and evaluated feasible adaptation strategies while quantifying the benefits of each. We give 3 feasible solutions for auto segmentation of glioma in SSA environments for varying degrees of needs and resources.

I2. Implementation of AI at ICON SA: MPs and RTs perspectives

Iris Theron

Introduction

The development and improvement of artificial intelligence (AI) and its uses in healthcare has increase rapidly with its promise of increase in accuracy, effectiveness, and quality patient care. Radiotherapy is no exception, with more AI tools commercially available and clinically implemented for the various steps of the radiotherapy process. The aim of the study is to gain insight into medical physicists (MPs) and radiotherapists (RTs) perspectives on AI in radiotherapy, its clinical application, the perceived impact of its use and related learning needs.

Methods

An online survey, available from 7 July 2025 to 1 August 2025, was sent to all RTs and MPs (approximately 170) in ICON SA. The descriptive cross-sectional survey was based on surveys from
similar international studies published in literature and approved by the ICON research committee. The responses to the survey are anonymous but the demographical data obtained from the survey could be used to

evaluate a statistically significant association between the responder's age and perspective.

Results

The survey responses will be summarized and stored in Microsoft Excel by Google Forms. Google Forms creates frequency distributions and visual graphs to represent the relative frequency of responses to the numerical, descriptive and close-ended rating scale and multiple-choice questions.

Conclusion

Research has not been done on this topic in South Africa and with a sample group of this extent, the findings of this study would add valuable information to the existing international research. The study will be concluded by 30 September 2025 and formal results will be available to be presented.

I3. Implementation of the Radiation Planning Assistant(RPA) for clinical use

Andrea Marais

Introduction

The Radiation Planning Assistant (RPA) is a web-based AI software, which can create radiotherapy treatment plans. This study aims to assess the reliability of RPA-generated plans and evaluate their potential for integration into the clinical workflow to improve the efficiency of patient treatment planning.

Methods

Treatment plans of 18 patients previously treated for head and neck cancer were compared to plans generated by the RPA. The original contours created by the hospital were used for consistency. Only the treatment plans generated by the RPA for both Halcyon and TrueBeam systems were assessed. Qualified staff (Oncologist Dr. Kailin Naidoo) reviewed these plans to

determine whether they met the predefined clinical goals. The project supervisor was Medical Physicist Ricus van Reenen.

Results

Of the 18 plans generated, two were rejected. Of the 16 remaining, three were clinically acceptable without changes. Two plans required major changes which involved either under coverage of a PTV or extremely high doses in an OAR. Eleven plans required minor changes, typically due to global PTV over-coverage resulting in unnecessary OAR dose. Acceptable PTV conformity was achieved in 83% of all cases.

Conclusion

The RPA is a tool that can be used to ease some workload faced by staff, but it cannot replace staff members. Most issues identified in this study could potentially be resolved by adjusting
the optimizer's priority settings for critical structures and updating the library cases available for the user to choose from.

I4. Opportunities and Obstacles in Implementing AI in Healthcare Across Africa: Insights from the SPARK Program.

Willem P.E. Boonzaier[1], Farhana Moosa[6], Kagiso Lebang[2], Hanifa Jabaar[6], Aondona Iorumbur[4], Udunna Anazodo[3], Confidence Raymond[4], and Dong Zhang[5]

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Introduction

Artificial intelligence (AI) holds great promise for improving radiology and medical imaging services across Africa by enhancing diagnostic accuracy, efficiency, and access. However,
implementation faces unique regional challenges, including limited availability of annotated imaging data, infrastructure constraints, variability in imaging equipment, and broader

socioeconomic barriers to technology adoption.

Methods

In early 2025, I participated in the SPARK (Sprint AI Training for African Medical Imaging Knowledge Translation) program as part of Team South Africa. This initiative equips African professionals with practical skills for developing and applying AI tools suited to local contexts. Training included expert-led lectures and team-based challenges, finalising in participation in the international Brain Tumour Segmentation (BraTS) Challenge, part of the 2025 Medical Image Computing and Computer Assisted Intervention Conference.

Results

Team South Africa placed 4th in the SPARK heart failure prediction challenge and 3rd in the brain tumour classification challenge. We also received one of three prestigious SPARK Mentorship Awards, recognising excellence, perseverance, and collaboration. The team is currently competing in the BraTS Africa Challenge, with research on domain specific adaptations for adult glioma segmentation on MRI for Sub Saharan African populations, with final results expected later in 2025. Across all challenges, we consistently ranked in the top 15%, demonstrating strong regional capacity.

Conclusion

AI implementation in Africa must be guided by local realities and led by regional expertise. SPARK has empowered us with the skills and support needed to develop safe, effective AI solutions. Team South Africa's success highlights the continent's growing potential to drive innovation in medical imaging.

K1. Ethics in AI

Professor Tucker Netherton
Department of Radiation Physics, MD Anderson Cancer Centre, United States

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K2. Risk in Deployment of AI

Professor Laurence Court

Department of Radiation Physics, University of Texas MD Anderson Cancer Centre, United States

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L1. Clinical implementation of AI

Professor Carlos Cardenas
Department of Radiation Oncology, University of Alabama at Birmingham, United States

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L2. AI for outcome prediction

Professor Jan Seuntjens
Princess Margaret Cancer Centre, Toronto
Department of Radiation Oncology and Medical Biophysics, University of Toronto

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L3. Future of AI (new technologies, changes in workforce, change in workflows)

Professor Tucker Netherton
Department of Radiation Physics, MD Anderson Cancer Centre, United States

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