

South Asia Centre for Medical Physics and Cancer Research

### **A Project of Alo-BT**

SCMPCR Reports (p 2-4)

Advancing Cancer Treatment: Empowering Professionals through Special Techniques of Radiation Therapy

General Articles (p 5-8)

Scientific Articles (p 9-12)

at Katmandu Cancer Center.

**Resource** Constraints

### July 2023 | Volume 5 | Issue 2

MSAIA

QUALITY EDUCATION AND HEALTH SCIENCE FOR PATIENT BENEFIT

#### **Inside This Issue**

Unveiling Dose Optimisation: Lessons from a Dose Evaluation Program in Sri Lanka - Insights,

Challenges, and Remedies for Countries with

• Total Body Irradiation (TBI): A Practical Experience

Estimation of the Time of Onset of an Ischemic

Stroke Using Diffusion Weighted Magnetic

### **Editor's Notes**

SEMPER

In this SCMPCR newsletter, we're excited to share a collection of achievements and milestones that highlight progress in medical physics and cancer research. The journey unfolds with a focus on collaboration as a driving force to overcome challenges faced by medical physicists in South Asia.

The newsletter also features an insightful conversation with Prof. Volker Steil, whose experiences have significantly shaped medical physics, particularly in South Asia and Bangladesh. Prof. Steil's journey, from specialized biomedical engineering studies to pioneering efforts in cooperation and collaboration for capacity building, serves as an inspiring example of dedication and mentorship.

We also pay tribute to the visionary Prof. Dr. Harald zur Hausen, whose unwavering spirit and groundbreaking work have transformed cancer research. His relentless pursuit to uncover the role of human papillomavirus (HPV) in cervical cancer earned him a Nobel Prize and laid the foundation for life-saving advancements in cancer prevention. While his departure leaves a void, his legacy continues to inspire generations to expand their knowledge boundaries.

The newsletter sheds light on recent accomplishments of the Institute of Nuclear Medicine, Oncology and Radiotherapy (INOR) in Khyber Pakhtunkhwa, Pakistan.

Editor-in-Chief & Co-Editor-in-Chief, SCMPCR Newsletter.

Published bi-annually by SCMPCR, B-66, Rd No:E/4, Eastern Housing, Mirpur, Dhaka-1216, Bangladesh.

SUBMISSION DEADLINE FOR NEXT ISSUE: November 30, 2023

### Resonance Imaging.

- News and Events (p 13 21) • Empowering Medical Physics Services and Capacity Building in South Asia: A Story of Cooperation and Concord.
- <u>Remembering: Dr. Harald zur Hausen A Scientist</u> <u>Who Gave Hope.</u>
- International Medical Physics Week (IMPW) Celebration 2023 Workshop on Brachytherapy Treatment Techniques: Procedures and Planning
- Advancing Cancer Care: Achievements and Milestones at INOR in Recent Years

#### **Editor-in-Chief**

Dr.J.Jeyasugiththan UOC, Colombo, Sri Lanka

#### **Co-Editor-in-Chief**

Dr.Mary Joan CMC, Ludhiana, India

#### **Editors**

Dr. Md Akhtaruzzaman Ms. Bushra Intakhab Mr. Deepak Jha

#### **Editorial Board**

Dr.Kanchan Adhikari Prof. Dr. Hasin Anupama Azhari Prof. Dr. Arun Chougule Dr. Frank Hensley Dipl.-Ing. Kirsten Hierholz Dr. Syed Mansoor Naqvi Prof. Dr. Wilfred Ngwa Dr. Vijitha Ramanathan Dr. Raju Srivastava Dipl.-Ing. Volker Steil Prof. Dr. Golam Abu Zakaria



# Advancing Cancer Treatment: Empowering Professionals through Special Techniques of Radiation Therapy

The South Asia Centre for Medical Physics and Cancer Research (SCMPCR) recently conducted a hands-on training workshop titled 'Modern Quality Assurance in Modern Radiotherapy'. This four-day event brought together professionals and experts from the medical physics and oncology fields. The workshop was held at Lab-aid Cancer Hospital and Superspecialist Center in Dhaka, Bangladesh. It aimed to enhance the participant's knowledge and skills in utilizing cutting-edge radiation therapy techniques for improved cancer treatments. SCMPCR, established in 2018, has been actively working to create skilled manpower for cancer treatment in the South Asia region through various programs. One of their numerous endeavors to advance radiation oncology is the recent hands-on training session on Special Techniques of Radiation Therapy. The training addressed the crucial importance of contemporary approaches in radiotherapy with an emphasis on guality assurance.

The workshop was accredited by the International Organization for Medical



Physics (IOMP) and endorsed by the American Association of Physicists in Medicine (AAPM), further emphasizing its significance. Moreover, the PTW Dosimetry School, a global educational initiative, collaborated with SCMPCR for this course in Bangladesh, with support from PTW-India. The involvement of international organizations and collaboration with experts from different countries enriched the workshop, fostering cross-learning and knowledge sharing.

The Training Workshop was officially inaugurated with a stirring welcoming speech from Prof. Dr. Golam Abu Zakaria, Chairman of SCMPCR, with much anticipation and palpable enthusiasm. The occasion marked the start of a transforming journey and was attended by notable guests, trainers, and participants. There were Participants from different countries of the South Asia region.

Throughout the four days, participants engaged in hands-on training sessions facilitated by prominent experts in medical physics and radiation oncology. The workshop incorporated a combination of theoretical lectures, interactive discussions, and practical

### **SCMPCR** Report



demonstrations to maximize the learning experience. Attendees had the opportunity to explore cutting-edge equipment, software, and tools utilized in radiotherapy, thereby gaining valuable insights into their operation and application. The workshop likely started with theoretical lectures, where participants received comprehensive information on various aspects of radiation therapy. Two days of interesting theoretical lectures were held throughout the training period. The platform was filled with renowned



Medical Physics professionals from Belgium, Germany, and India, whose words woven a web of information and understanding. They went into the complexities of radiation physics, treatment planning, Quality Assurance Tests & Methods, etc.

During the workshop, traditional Bengali foods were served for lunch, providing participants with a taste of the local cuisine. The meals featured a variety of flavorful and aromatic dishes, reflecting the rich culinary heritage of Bengal. Participants have had the opportunity to savor traditional dishes such as rice, fish curry, vegetable preparations, Khicuri, Kacchi biriyani, and various accompaniments. The meals provided a cultural experience alongside the educational and practical aspects of the workshop, allowing participants to indulge in the flavors of Bangladesh. As the third day of the training dawned, excitement reached its peak. The participants stepped into a world where theory melded seamlessly with practice. They used contemporary radiation equipment while being guided by skilled experts. The Lab-aid Cancer Hospital deserves special recognition for its outstanding assistance in supplying us with the most recent technology. The practical training sessions commenced with a focus on special techniques that are revolutionizing cancer treatment. The workshop's practical training served as a catalyst, propelling the participants into a realm of expertise and proficiency. The workshop promised to be an extraordinary journey, blending theory and practice in an immersive learning experience.

The workshop's final day comprised a discussion and examination session, allowing participants to seek clarification and deepen their understanding of the concepts covered. This interactive session served as a platform for participants to engage with the trainers and consolidate their knowledge. Following the examination, a feedback session was held, enabling participants to share their experiences and suggestions for improvement. SCMPCR valued the feedback and committed to incorporating it in future workshops, ensuring continuous enhancement.

The closing ceremony of the workshop was a moment of celebration and reflection. Participants, trainers, and organizers gathered to commemorate the successful completion of the program. Certificates of completion were awarded to the participants, recognizing their dedication and commitment to improving their skills in the field of radiation therapy. To recognize

outstanding performance, a special prize was awarded to the first-place holder among the examinees, adding an extra touch of excitement and encouragement to the event.

After the official program ended, the foreign participants had the opportunity to explore the vibrant city of Dhaka. Eager to experience the local culture and

### SCMPCR Report





immerse themselves in the city's charm, they ventured out to various attractions. Some visited the renowned Book Fair, indulging in the literary treasures and cultural exchange it offered. Others explored the bustling Basundhara City shopping complex, delighting in the diverse array of shops and experiences available.

The hands-on training workshop on Special Techniques of Radiation Therapy organized by SCMPCR was a resounding success. By equipping cancer professionals with practical skills and knowledge of modern quality assurance techniques in radiotherapy, SCMPCR is actively creating a skilled workforce for cancer treatment. Such initiatives contribute to the advancement of radiation oncology and ultimately lead to improved patient care.

Through their national and international collaborations, SCMPCR continues to foster knowledge exchange, empowering professionals to utilize state-of-the-art techniques and technologies in their quest to combat cancer effectively. With each workshop, SCMPCR paves the way for progress in the field of radiation therapy, ultimately benefiting patients and advancing the fight against cancer.



Duminda Satharasinghe Department of Nuclear Science, University of Colombo, Sri Lanka email: duminda@nuclear.cmb.ac.lk

## Unveiling Dose Optimization: Lessons from a Dose Evaluation Program in Sri Lanka—Insights, Challenges, and Remedies for Countries with Resource Constraints

This article presents the valuable insights obtained from a dose evaluation program that was implemented in the field of diagnostic radiology in Sri Lanka, a developing country in Southeast Asia. It also sheds light on the challenges faced in achieving comprehensive dose optimization and proposes remedies, particularly considering the limited human and technical resources available in developing countries.

# Introduction to dose evaluation and optimisation

Diagnostic Reference Levels (DRLs) are essential tools in med-ical imaging, serving as benchmarks to optimize radiation doses while maintaining image quality for patients [1]. These reference levels represent the dose received by typical patients undergo-ing specific radiological examinations or interventional procedures. DRLs are established based on extensive data collection and analysis from various medical facilities, ensuring that radiation doses are kept as low as reasonably achievable (ALARA) without compromising diagnostic accuracy. By implementing DRLs, healthcare providers can ensure the safety of patients and medical staff, minimize unnecessary exposure to ionizing radiation, and contribute to the ongoing enhancement of radiation safety protocols in medical practice.

Nevertheless, the initial implementation of a dose evaluation program poses considerable challenges, especially in countries with limited technical and human resources. Sri Lanka, however, has achieved a significant milestone by becoming the first country in South East Asia to successfully establish DRLs for a wide array of radiological procedures, encompassing Adult and pediatric computed tomography and mammography. This article aims to shed light on the obstacles encountered during this ambitious endeavor and the strategies employed to overcome them. By sharing this valuable experience, Sri Lanka hopes to assist and support sister countries in the region, facilitating the adoption and successful establishment of DRLs in their own healthcare systems. This article highlights the key findings and takeaways from a significant dose evaluation program conducted in Sri Lanka, a vibrant developing nation in Southeast Asia [2,3]. In this article, you will gain valuable understanding of the DRL process, explore the obstacles confronted in its implementation, and discover potential solutions tailored to developing countries grappling with limited resources.

# Insights from the Dose Evaluation Program of Sri Lanka:

The dose evaluation program in Sri Lanka aimed to assess the radiation exposure levels in diagnostic radiology and understand how to optimize doses for patients without compromising diagnostic image quality. Led by a team of dedicated researchers from the University of Colombo, the study collected data from various medical facilities across the country covering adult and pediatric CT procedures. Furthermore, comprehensive coverage has been ex- tended to interventional radiological procedures, mammography, and PET-CT procedures, with ongoing evaluations currently un- derway.

**The crucial insights revealed from the results:** Prior to delving into the primary challenges encountered by researchers, it is imperative to emphasize some crucial discoveries from the dose evaluation program. These findings can be summarized as follows:

- Variation in Radiation Doses: The evaluation uncovered a wide range of radiation doses delivered to standard size patients for similar diagnostic procedures. Such disparities emphasized the need for standardization to ensure uniformityand safety.
- Lack of Dose Awareness: Surveys revealed that a significant number of healthcare professionals lacked full awareness of the potential risks associated with radiation exposure and related concepts on radiation protection. Raising awareness and promoting proper training in dose management emerged as crucial steps in the journey towards optimization.
- **Technological Challenges:** The study identified the lack of advanced imaging equipment in some medical facilities, hindering the implementation of low-dose protocols.

Sri Lanka

Addressing these technological shortcomings became imperative for sustainable progress.

# Challenges in Achieving Comprehensive Dose Optimization

The path to comprehensive dose optimization in developing countries is not without obstacles. Several challenges came to light during the program:

- **Resource Constraints:** Developing nations often encounter challenges due to their limited human and technical resources, hindering the establishment of comprehensive dosemanagement programs. The scarcity of dose measuring tools, calibrating devices, phantoms, and adequately trained staff stands as significant obstacles in implementing effectivedose evaluation programs.
- Accessibility and institutional corporation: Insufficient awareness regarding the significance of dose evaluation programs has resulted in a lack of participation from medical imaging centers in these initiatives. This hesitancy is frequently fueled by concerns that undergoing evaluation couldpotentially trigger an audit.
- **Regulatory Frameworks:** Regulatory frameworks are of paramount importance in guaranteeing the secure and well-managed utilization of radiation-emitting technologies, in- cluding those employed in medical imaging and procedures. These frameworks encompass a spectrum of laws, regulations, guidelines, and oversight mechanisms strategically formulated to safeguard public health, avert avoidable radiation exposure, and foster conscientious conduct within the sector. Nevertheless, in many developing nations, regulatory bodies tend to prioritize licensing and accreditation, often allocating less attention to crucial aspects such as dose monitoring and evaluation, as well as quality control and assurance.

### **Proposed Remedies for Developing Nations:**

The researchers behind the dose evaluation program also put forth potential remedies to address the challenges and pave the way for dose optimization in developing countries:

- Training and Education: Allocating resources to ongoing education and training initiatives for healthcare professionals can result in increased familiarity with dose optimization methods and optimal protocols. The uplifting of awareness, in turn, fosters increased collaboration during dose evaluation programs.
- **Collaboration and Knowledge Sharing:** Establishing collaborations with international organizations and sharing knowledge with countries that have successfully implemented dose optimization strategies can be highly beneficial.

- **Technology Assistance:** Aid from international partners in acquiring and maintaining state-of-the-art imaging equipment, dose measuring equipment can play a pivotal role in improving dose management.
- Advocacy for Policy Changes: Advocating for comprehensive regulatory frameworks that prioritize patient safety and dose optimization will facilitate positive change.

# Modified guideline to establish DRL for countries with resource restraints

Drawing from our unique experiences and the valuable lessons we have learned, we have compiled a concise guideline to address resource constraints in establishing DRL. However, we strongly recommend studying the more comprehensive guidelines provided by esteemed international organizations like ICRP, IAEA, and the European Commission on DRL Establishment before implement- ing the modifications outlined below.

- Facility selection: As per the recommendations of ICRP, it is advised to en- compass at least 30-50% of a country's total medical practice while defining DRLs. This poses a greater challenge for countries with a large number of diagnostic facilities. Nevertheless, at the outset, it is sufficient to cover as much these initial DRLs may not fully reflect the entirety of the country's medical practice, they can raise awareness and en- courage more facilities to participate in recurrent attempts to refine and enhance the implementation. In the case of highly specialized practices like pediatrics, it is acceptable to initially concentrate on major centers that exclusively provide pediatric care.
- **Procedure selection** Focusing primarily on procedures that deliver high radiation doses, such as CT scans and fluoroscopy, is always appropriate. Additionally, giving special attention to mammography is important due to its involvement in scanning a highly radiation-sensitive organ, thebreast. Furthermore, it is crucial to concentrate on both adult and pediatric populations, with pediatric individuals being considered the most radiation-sensitive group of humans. Therefore, delaying optimization in this context would not be appropriate, and timely implementation is necessary to ensure their safety.
- Data Collection Techniques: When it comes to defining DRLs, authors from different countries have employed varying techniques, though adhering to common guidelines. The process of data collection was largely retrospective in nature, with data sourced from existing records stored in local storage media, Picture Archiving and Communication Systems (PACS), national dose data registries, and physical record books. The data retrieval was conducted through paper-based questionnaires sent to responsible individuals in medical institutions. Some surveys used on-site data collection methods to ensure

comprehensive and accurate data, particularly for smallerscale DRL processes involving a few centers. The Sri Lankan attempt was solely onsite, where a group of researchers visited each center and collected data. However, the availability of patientmorphometric data was limited to age and gender. The most ideal standardization for patients would include additional parameters, with weight being a crucial one.

- Patient Standardization Approaches: Establishing standardized patients is key to dose comparisons. While weight restrictions are used for adults, in children, body weight varies significantly across ages. Therefore, pediatric DRLs often involve multiple age or weight categories to define standard patients accurately. Recent trends have shown a preference for age stratification due to its retrospective analysis convenience. However, considering additional factors like weight and height is necessary to ensure precise dose optimization. However, the age is adequate measure of patient standardisation for initial attempt of doseevaluation.
- DRL Quantities: Selecting appropriate dose metrics for DRLs is indeed crucial, and having relief accounted for equipment with automatic dose data display facilities can be beneficial. Such facilities are commonly available in CT scans, where the Computed Tomography Dose Index volume (CTDIvol) is displayed after each scan and recorded in the dose report. Although CTDIvol does not precisely represent the dose received by individual patients considering their body habitus, it still provides an opportunity for protocol optimization. However, for X-ray equipment, obtaining direct dose values ismore challenging, as many devices do not have built-in DAP (Dose-Area Product) meters. In such instances, an external DAP meter with universal railings can be purchased, but it would require several DAP meters or significantly more time if a single meter is used to cover the whole country, making it impractical. As an alternative, estimating Entrance Skin Dose (ESD) based on tube output is considered ideal. However, this method also requires making several assumptions and necessitates measuring the body part thickness, adding some complexity to the process. Despite the challenges, finding a reliable and practical method for dose estimation is essential to ensure radiation safety and the successful implementation of DRLs for X-ray procedures.
- Appropriate comparisons to identify the practices require optimization: The final step prior to dose optimization involves appropri- ate comparison and identification of procedures that require optimization. Several countries have made significant efforts to establish DRLs for CT scans and, to a lesser extent, for X-ray, fluoroscopy, interventional, and mammography procedures. These DRLs are typically categorized based on

### **General Article**

factors such as age, weight, and thickness of the body part being examined (in mammography). However, for meaningful and accurate comparisons, it is essential to standardize patient groups. This means following a common standard adult definition across all countries, regardless of individual definitions of a standard adult popula-tion. Alternatively, if standardizing based on age is not feasible, using weight as a parameter for standardization could be more appropriate in this regard. Standardizing patient groups enables better comparison of dose levels across different facilities and regions, facilitating the identification of outliers and procedures that may require optimization to ensure radiation safety. By having a consistent approach to defining patient groups, DRLs can be moreeffectively utilized as reference values to guide and improvemedical imaging practices.

• Dose optimization: It is crucial to emphasize that dose optimization does not solely depend on protocol optimization through technical parameter modifications. Eliminating malpractices and ensuring an adequate evaluation of users' knowledge and aware- ness of key concepts on radiation protection and imaging parameters are equally essential. Protocol optimization should always be backed up with image quality evaluation, and anthropomorphic phantoms serve as an ideal tool for that purpose. However, the limited availability of such phantoms can poseconstraints on protocol optimization. Nevertheless, collective efforts from Radiologists, medical physicists, and radio- graphers can overcome this limitation. Instead of relying solely on expensive tools like anthropomorphic phantoms, various techniques such as noise simulations, inhouse phantoms, and others can be employed to support the optimization process. These alternative approaches allow for more cost- effective solutions and can still yield valuable insights into image guality and dose levels.

In conclusion, achieving effective dose optimization requires a multifaceted approach, encompassing technical parameter modifications, awareness of radiation protection principles, and thorough image quality evaluation, with a willingness to explore innovative and affordable methods beyond traditional anthropomorphic phantoms.

#### conclusion:

As medical imaging technology continues to ad- vance, the establishment of standardized Diagnostic Reference Lev- els (DRLs) remains paramount to ensure patient safety and optimize radiation exposure. By proactively addressing challenges and fostering collaboration among healthcare professionals, we can pave the way for more comprehensive dose optimization, ultimately benefiting patients worldwide. With a shared commitment to radiation safety, we can embrace new techniques and technologies, driving continuous improvements in medical imaging practices and enhancing the overall quality of patient care.

#### **References:**

- Vañó, E., Miller, D., Martin, C., Rehani, M., Kang, K., Rosenstein, M., Ortiz-López, P., Mattsson, S., Padovani, R., and Rogers, A., 2017, "ICRP publication 135: diagnostic refer- ence levels in medical imaging," Annals of the ICRP, 46(1), pp. 1– 144.
- Amalaraj, T., Jeyasugiththan, J., Satharasinghe, D., and Pallewatte, A., 2023, "Dose reference level based on size-specific dose estimate (SSDE) and feasibility of deriving effective body diameter using tube current and time product (mAs) for adult chest and abdomen computed tomography (CT) procedures," Journal of Radiological Protection, 43(1), p. 011505.
- Satharasinghe, D., Jeyasugiththan, J., Wanninayake, W., Pallewatte, A., and Samarasinghe, R., 2022, "Patient size as a parameter for determining Diagnostic Reference Levels for paediatric Computed Tomography (CT) procedures," Physica Medica, 102, pp. 55–65.

**Duminda Satharasinghe** is a renowned author with a distin- guished reputation in the domain of medical radiation and radia- tion dose optimization. His research pursuits revolve around ra- diation dosimetry, radiation pro- tection, and the optimization of radiation doses. Notably, he has authored several research papers and has made significant contributions through presentations in relevant forums. In addition to his scholarly achievements, Du- minda Satharasinghe holds the position of a lecturer in med-

A Visionary Who Improved Cancer Care in Bangladesh and South Asia by Establishing Medical Physics

# The Inspiring Stories Were Penned by 46 Authors from Around the World

A Must-read for Anyone Interested in the Intersection of Healthcare and Technology

# **Bridge Builder Dr. Golam Abu Zakaria** Medical Physics International

Available Now in





**Collect Your Copy** 

# TOTAL BODY IRRADIATION (TBI): A PRACTICAL EXPERIENCE AT KATHMANDU CANCER CENTER

Deepak Jha<sup>1</sup>, Rajan Prajapati<sup>2</sup>, Kanchan Nyaichyai<sup>2</sup>, Yadu Nath Bhusal<sup>2</sup>

<sup>1</sup> Birat Medical College Teaching Hospital, Biratnagar Nepal <sup>2</sup>Kathmandu Cancer Center, Bhaktapur Nepal

Total Body Irradiation (TBI) is a special technique used in radiotherapy to treat several diseases, including multiple myeloma, leukemias, lymphomas, and some solid tumors. In combination with chemotherapy, TBI is most commonly used as a part of the conditioning regimen prior to a bone marrow transplant. The purpose of TBI is threefold: to eradicate residual cancer cells, to provide space for stem cell engraftment through bone marrow depletion, and to prevent rejection of donor stem cells through immuno-suppression. TBI-based protocols are more affordable than combination chemotherapy in Low-Middle Income Countries (LMIC) such as Nepal, provided that the center has good radiotherapy equipment. In the context of Nepal, Kathmandu Cancer Center (KCC) is the only hospital that has been providing this modality of treatment since 2017, preliminarily for immunosuppression. This article presents a brief introduction to the workflow of TBI based experience at the Kathmandu Cancer Center.

There are different techniques to deliver TBI [1]. The choice of particular techniques depends on the available equipment, photon beam energy, maximum possible field size, treatment distance, dose rate, patient dimensions, and the need to selectively shield certain body structures. Usually, anterior-posterior (AP)/ posteroanterior (PA) and bilateral (treating from the left and right sides of the body) techniques are used, of which the latter is being used at this hospital.

Patients are positioned in supine position on an extended SSD of 330 cm on a custom-made wooden couch with a Lucite sheet of 1 cm on both sides. The couch is kept on top of a trolley so as to ease the direction change of the couch. The collimator is rotated to 45 degrees to get the field size equal to the diagonal length of the square field size, hence accommodating the longest possible side. Patients are kept at 75% of the central light field size and considered dosimetric field size to account for clipping of the



collimator and penumbra. To cover the area for dosimetry, patients may have to bend their knees. The arms are positioned to cover the lungs rather than the spinal column, which is situated posteriorly.

A bilateral, parallel opposed field technique with 6 MV photon energy is used, and the couch is rotated 180 degrees between the treatments. The dose is prescribed to the mid-depth of the patient at the level of the umbilicus. The prescribed dose for every patient was 3 Gy for a complete session. One disadvantage of bilateral field technique is greater dose non-uniformity due to variation in body thickness from head to feet. Compensators are, therefore, required to achieve dose uniformity along the body axis to within 10%, although extremities and some noncritical structures may exceed this specification. To achieve dose uniformity within the limit, the empty volume between the patient and the custom-made couch Lucite walls was filled with a bag of rice. It has been observed that rice exhibits similar attenuation characteristics as human tissue [2]. Packing the patients or filling voids with these materials presents the patients as a uniform thickness. Therefore, absorption variations are minimized and accepted dose uniformity is achieved. It also acts as immobilization for the patients and simplifies the physics dosimetry. Shielding is not considered due to the low total dose being delivered.

The parameter used to characterize the x-ray beam at the standard treatment distance of 100cm may not be valid for extended treatment distances. Therefore, beam profiles and output calibration of the linear accelerator at the treatment position were measured before the treatment of the patients. Manual monitor unit calculations are done based on the data obtained from the phantom measurement in the extended SSD condition. Any metal objects on the patient's body were avoided, as they could affect the dose distribution.

Kathmandu Cancer Center, in collaboration with Civil Service Hospital, has treated more than 48 patients with total body irradiation since 2017 and continues to treat patients for their better health with the utmost care.

#### **References:**

- 1. Quast U. Whole body radiotherapy: A TBI-guideline. *J Med Phys.* 2006 Jan;31(1):5-12. doi: 10.4103/0971-6203.25664. PMID: 21206634.
- Tania, A. G.; Ketenci, F. S.; and Bolukdemir, M. H. Usage of attenuation coefficients of some tissue-equivalent materials. *Turkish Journal of Physics*. 2015 : Vol. 39: No. 1, Article 9. https://doi.org/10.3906/fiz-1406-10.

Nepal

# ESTIMATION OF THE TIME OF ONSET OF AN ISCHEMIC STROKE USING DIFFUSION WEIGHTED MAGNETIC RESONANCE IMAGING

Rajitha Nandasena<sup>1\*</sup>, Duminda Satharasinghe<sup>1</sup>, Janaka Wansapura<sup>2</sup> and Jeyasingam Jeyasugiththan<sup>1</sup>

<sup>1</sup>Department of Nuclear Science, Faculty of Science, University of Colombo, Sri Lanka <sup>2</sup>South Western Medical Center, University of Texas, USA

#### Abstract:

Ischemic stroke (IS) occurs after a sudden cessation of blood supply for the parts of the brain. If circulation is not re-established quickly, it leads to cell death. Prompt treatment with thrombolytic drugs can restore blood and improve recovery. Recombinant tissue plasminogen activator (rtPA) is licensed for use within 4, 5 hours of stroke in Europe and within three hours in the United States of America (USA). Early admission for a stroke treatment centre and quick recognition lead to successful recovery. Magnetic Resonance Imaging (MRI) is an imaging technique widely used in medicine to produce high quality images of the inside anatomy. Diffusion weighted MRI is of high sensitivity and specificity in the diagnosis of acute cerebral infarction. The aim of this study is to evaluate the feasibility of predicting the onset time of the IS using the signal intensity of the ischemic core in DWI-MRI which will be helpful to pre-assess the success rate prior to inject the thrombolytic treatment over the risk factors to obtain the maximum benefit to risk ratio. So if the time elapsed from the onset of the stroke could be presented as a MR result, it would be very useful in clinical applications of stroke management. In this study, a weak correlation was observed between the elapsed time from the onset of the stroke and the DWI signal intensity. Even though the correlation is weak, there was a decline of the DWI intensity with the time elapsed from the onset of the stroke. So, a wide frame of data is needed to make the correlation between the two variables strong.

Key words - MRI, DWI, stroke, onset time, IS

#### Introduction:

Ischemic stroke is a condition that occurs after a sudden cessation of adequate blood supply for the parts of the brain. Stroke is considered as the second most common cause of morbidity (first common cause is myocardial infarction) and it is the leading cause of acquired disability. (Tomandl 2003). Occlusion of an intracranial artery causes deprivation of oxygen and glucose in the supplied vascular territory. Cascade of events are happened at a cellular level if circulation is not re-established quickly and it leads to cell death mostly through liquefactive necrosis. Aging of

Table 1: Appearance of IS over the elapsed time from onset			
Time elapsed from the onset of IS	IS appearance		
Up to 6 hours	Early hyperacute		
6 to 24 hours	Late hyperacute		
24 hours to 1 week	Acute		
1 to 3 weeks	Subacute		
More than 3 weeks	Chronic		

ischemic strokes can be important in a number of clinical and medico legal settings. From the onset of a stroke, following differences could be observed in the affected surrounding tissues with time.

Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are often used in determining when a suspected stroke noted to visualize and diagnose it in detail. Non-contrast CT scan of brain remains the mainstay of imaging in case of an acute stroke. It is fast, inexpensive and readily available. But the drawback of CT is the limited sensitivity in the acute case. MRI is an imaging technique widely used in medicine to produce high quality images of the inside anatomy of the human body. It is a tomographic imaging technique that produces images of Nuclear Magnetic Resonance (NMR) signal as by thin slices through the subject and three dimensional advanced imaging methods. MRI is more time consuming and less available than CT but has significantly higher sensitivity and specificity in the diagnosis of acute ischemic infarction in the first few hours after onset. Diffusion weighted imaging (DWI) is of high sensitivity and specificity in the diagnosis of acute cerebral infarction (Lovblad 1998). DWI is a faim of MRI techniques based upon measuring the random Brownian motion of water molecules within a voxel of tissue. Highly cellular tissues or those with cellular swelling exhibit lower diffusion coefficients. Diffusion is particularly useful in case of cerebral ischemia. At early hyper acute stage, diffusion weighted imaging detects and displays increased DWI signal and reduced Apparent Diffusion Coefficient (ADC) values within minutes of arterial occlusion. (Srinivasan 2006, Allen 2012). This correlates well with infarct core. At this stage, the affected tissues appear normal on other sequences, although changes in flow will be detected as occlusion on Magnetic Resonance Angiography (MRA) and the thromboembolism may be detected mainly on Susceptibility Weighted Imaging (SWI). At late hyper acute stage, nearly after 6 hours of onset, high T2 signal will be detected and initially easily seen on Fluid Attenuated Inversion Recovery (FLAIR) than conventional fast spin echo T2. (Allen 2012). At acute stage during the first week the infarcted surrounding tissues continue to demonstrate high DWI signal and low ADC signal although by the end of the first week ADC values have started to increase. Hemorrhages are most easily seen on SWI which is not a good indicator of age. Those are most commonly seen after 12 hours and within the first few days and it may occur earlier than or as late as 5 days to 10. At subacute stage, ADC map demonstrates pseudonormalization typically occurring between 10-15 days (Allen 2012). As ADC values continue to rise, infarcted tissue progressively gets brighter than normal parenchyma. Importantly if parenchymal enhancement persists for more than 12 week the presence of an underlying lesion should be considered (Allen 2012). ADC values are high resulting in high signal. DWI signal is variable but as time goes on, signal progressively decreases. Prompt treatment with thrombolytic drugs can restore blood flow before major brain damage has occurred and improve recovery after stroke. (Hsu 2009).Thrombolytic drugs can also cause serious bleeding in the brain which can be fatal. Recombinant tissue plasminogen activator (rtPA) is approved for use in selected patients within 4.5 hours of stroke. (Miller 2011) There is an upper age limit of 80 years in some

Table 1: Parameters of the study				
Parameter	Meaning	Description		
t1	Date and time of onset	The time of the first sign of the subject after the stroke		
t2	Date and time of DWI sequence	The time when the DWI sequence was run in the MRI facility		
δt (minutes)	Duration of the stroke	t2-t1		
Mt	Total mean value of all ROIs	Mean intensity value of the of the all-stroke slices		
Мх	Mean value of highest mean value ROI	Highest mean intensity value out of all stroke slices		
Total P%	Enhancement percentage of total intensity of all stroke volumes	Total P% = Total mean intensity of the all-stroke slices/ Mean intensity of the reciprocal normal brain volume*100		
Max P%	Enhancement percentage of maximum intensity out of all stroke volumes	Max P% = Maximum mean intensity out of the all-stroke slices/ Mean intensity of the reciprocal normal brain volume*100		

countries and a limitation to mainly non severe stroke in others. (Miller 2011, Srinivasan 2006)

#### **Materials and Method:**

Twenty one patients, who had recent strokes, were randomly selected among those who admitted for the assessment of probable strokes at a leading private healthcare facility. SEIMENS MAGNETOM AVANTO 1.5T MRI was used for imaging the suspected stroke patients. DWI MRI protocol was used and the parameters were, TR=3500ms, TE=103ms, FOV=230mm, Slide thickness=5mm, b-value=0, b-value 2=1000, Bandwidth=1002Hz/P, Echo spacing=1.16ms, Gradient type=fast.Ethical clearance for the study was obtained from The Ethic Review Committee of the Institute of Biology Sri Lanka (ERC-IOBSL). (Registration No: ERC IOBSL 248 06 2021).

The patients with haemorrhagic stroke was excluded and restless subjects who did will not corporate to obtain DWI images were excluded. The onset of the stroke was estimated for all patients by proper inspection of patients and bystanders. Post processing of acquired DWI images was done using Matlab image processing software to outline and calculate the mean signal intensities of the stroke region. Every possible steps were taken to minimize the errors in data acquisition, selection of subjects, image processing and calculations. Images were processed by segmenting the lesion, extracting the average DWI intensity from the region of interest (ROI). Percentages of DWI signal intensities were plotted with Delta\_t, for all subjects.

The Minitab 17 statistical software was used to analyse the collected data. One-Way ANOVA was used to examine the statistical significance of the variation between the averages of the maximum intensities of the stroke volume given per time bins. The Tukey's test was used to identify the individual means of significant differences. Pearson's correlation analysis (r) was used to determine the correlations between enhancement percentages and time after the onset of stroke. The potential outliers were filtered before the analysis and box and whisker plots were used to identify them. The "r" values of 0--0.19, 0.20--0.29, 0.3--0.39 and >0.40 indicate negligible, weak, moderate and strong correlations, respectively. The "+" and "-" signs define the positive and negative direction of the given correlation.

Onset time bins (minutes)	Time ranges (minutes)	Number of events (n)	Average maximum intensity (range)
<1000	136-691	06	293.9 (211.0-398.8)
1000-3000	1112-2947	08	329.2 (236.7-467.8)
>3000	4185-7538	06	305.1 (280.0-358.8)

### **Results:**

Table 01 presents the descriptive statistics of the studied variables. The onset times were separated into three-time bins of <1000 minutes, 1000-3000 minutes and > 3000 minutes respectively and their corresponding averages of the maximum intensities were given. The One-Way analysis of the variances was conducted based on the null hypothesis that the all means of the three time bins are same. The resultant P-value of 0.575 supports the null hypothesis where the level of significance was kept at <0.05. Figure 01 and 02 illustrates the correlation between the total and maximum enhancement percentage against the time (in minute) after the onset of the stroke. The resultant corresponding "r" values of -0.289 and -0.2 indicate a negative and weak correlation between the studied variables.







Fig. 1: The correlation of maximum percentage enhancement and time after the onset of stroke.

#### **Discussion:**

The purpose of this research was to derive a correlation between the onset time of an ischemic stroke and the signal intensity of the stroke volume of DWI MRI sequence. But after analyzing the data there were weak correlations between the onset time and the maximum mean intensity and the total mean intensity of stroke volume. Therefore, the prediction of the onset time of the stroke using the enhancement of the stroke volume in MRI DWI sequence is not statistically acceptable.

In clinical practice, acute stroke volumes shows more intensities than the periphery of the brain DWI images with the onset time and the clinicians identify the onset time range based on the intensity level of the stroke area. It has proved that even it has been given the negative trend of the correlations it can be assumed that the stroke volume signal intensities are reducing with the time. Nevertheless, to conclude that, more data from wide time frame is required.

Winbeck et al. (2004) has concluded their study as within 6 hours after symptom onset, Transient Ischaemic Attack (TIA) and stroke might be differentiated by analysing the DWI signal intensity of the lesions. They have done DWI of the subjects within 24 hours of the onset of stroke. We realized that the admission after the stroke in Sri Lanka within 4.5 hours are very less and most of the subjects who were diagnosed as acute strokes were admitted after 4.5 hours which were not be able to get the maximum benefit of the thrombolytic treatment. The reason for the late admission for the diagnosis of stroke may be due to the socio-economic reasons, negligence and the far reach to the MRI facility.

This data were analysed assuming the all the physiological and anatomical factors except the onset time of stroke were not variable in between subjects even though all the MRI parameters in the facility kept unchanged and that might also have been affected the results as those factors also might impact on the signal intensities of the stroke volumes. To reduce this error, percentage signal intensities of DWI stroke regions were measured comparing with the reciprocal brain hemispheres.

When collecting the data of the time of onset, it was relied on the subjects' or bystanders' record on the onset time of the stroke as when the first physical sign to judge as the beginning moment of stroke. That also might have been affected the reliability of onset time data. This possible error was earlier predicted and the correlation between the onset times of the stroke was suggested to be adjustable to nearest hour as the clinical necessity is to identify whether the onset time has elapsed more than 4.5 hours at the identification time in the MRI to start the thrombolytic treatment.

Rogers et al. (2014) has proved that quantification of absolute MR relaxation times and signal intensities are potential methods for estimating stroke duration. That study sample was seven Wistar rats and they have undergone the study with the time and developed the correlation of the signal intensities of the stroke regions and the relaxation times. But in our study it was not practical to obtain DWI images of a stroke patients in certain time gaps by bringing the patient back to the facility after certain time and rescan. If a study design could be implemented to measure the signal intensity of the stroke region with the MRI relaxation time in different time points, a strong correlation between the time elapsed from the onset of the stroke and the signal intensity of the stroke region in DWI could be derived.

#### **Conclusion:**

Weak correlations were derived in between onset time of an ischemic stroke and the maximum and mean signal intensities of the stroke region. Even it has been given weak correlations it was shown that the signal intensities of the stroke volume were reducing with the onset time of the stroke. Therefore if a wide data frame and more reliable parameter than depending on the subjects' or bystanders' record on the onset time of the stroke could be used, constructing a strong correlation between the onset time and the signal intensity of the stroke volume is suggested to be derived.

#### **References:**

- Allen L.M., Hasso A.N., Handwerker J. and Farid H. (2012). Sequence specific MR imaging findings thatare useful in dating ischemic strok e. *Radiographics*.Sep-Oct;32(5).1285-97.
- Ay H., Buonanno F.S., Rordorf G., Schaefer P.W., Schwamm L.H., Wu O., Gonzalez, K. Yamada R.G., Sorensen G.A. and Koroshetz W.J. (1999) Normal diffusion-weighted MRI during stroke-like deficits. American Academy of Neuroradiology. June;52(9).
- Chung S.P., Ha Y.R., Kim S.W. and Yoo I. S. (2003) Diffusion-weighted MRI of intracerebral hemorrhage clinically undifferentiated from ischemic stroke. Am J Emerg Med. May;21(3). 236-40.
- Damion R.A., Knight M.J., McGarry B.L., Bosnell R., Jezzard P., Harston G.W., Carone D., Kennedy .J, El-Tawil S., Elliot J., Muir K.W., Clatworthy P. and Kauppinen R. A. (2019) Quantifying T 2 relaxation time changes within lesions defined by apparent diffusion coefficient in grey and white matter in
- Daniel J. M., Jennifer R. S. and Brian S. (2011) Safety of Thrombolysis in Acute Ischemic Stroke: A Review of Complications, Risk Factors, and Newer Technologies.

acute stroke patients. Phys Med Biol. 64(9).

- Hsu Y.C., Sung S.F., Ong C.T., Wu C.S. and Su Y.H. (2009) Intravenous thrombolytic therapy for acute ischemic stroke: the experience of a community hospital. *ActaNeurol Taiwan*. Mar;18(1).14-20.
- Lövblad K.O., Laubach H.J., Baird A.E., Curtin F., Schlaug G., Edelman R.R., and Warach S. (1998). Clinical experience with diffusionweighted MR in patients with acute stroke. *American Journal of Neuroradiology*. June;19 (6). 1061-1066.
- Lutsep H.L., Albers G.W., DeCrespigny A, Kamat G.N., Marks M.P. and Moseley M. E. (1997) Clinical utility of diffusion-weighted magnetic resonance imaging in the assessment of ischemic stroke. *Ann Neurol.* May;41(5). 574-80.
- Miller D.J., Simpson J.R. and Silver B. (2011). Safety of Thrombolysis in Acute Ischemic Stroke: A Review of Complications, Risk Factors, and Newer Technologies. *Neurohospitalist*. Jul;1(3).138-47
- O'Brien P., SellarR..J. and Wardlaw J.M. (2004). Fogging on T2weighted MR after acute ischaemic stroke: how often might this occur and what are the implications? Neuroradiology. Aug;46(8). 635-41
- Rogers H.J., McGarry B.L., Knight M.J., Jokivarsi K.T., Gröhn O.H. and Kauppinen R.A. (2014) Timing the ischaemic stroke by 1H-MRI: improved accuracy using absolute relaxation times over signal intensities. *Neuroreport*. Oct;25(15).1180-5.
- Srinivasan A., Goyal M., Azri F.A., Lum C. (2006). State-of-the-art imaging of acute stroke. *Radiographics*. vol. 26. No. suppl\_1.
- Tomandl B,F., Klotz E., Handschu R., Stemper B., Reinhardt F., HukW.J., Eberhardt K.E., Moghadam F.S. (2003). Comprehensive imaging of ischemic stroke with multisection CT. *Radiographics*. May-Jun;23(3). 565-92.
- Winbeck K., Bruckmaier K., Etgen T., Gräfin von Einsiedel H., Röttinger M. and Sander D. (2004)Transient Ischemic Attack and Stroke Can Be Differentiated by Analyzing Early Diffusion-Weighted Imaging Signal Intensity Changes. *Stroke*. vol.35(5). 1095–1099.
- Xing D., Papadakis N.G., Huang C.L.H., MengLee V., Carpenter T.A. and Hall L.D. (1997) Optimised diffusion-weighting for measurement of apparent diffusion coefficient (ADC) in human brain. *Magnetic Resonance Imaging*. vol. 15 (7). 771-784.
- Yung C.H., Sheng F.S., Cheung T.O., Chi.W. and Yu H.S. (2009) Intravenous Thrombolytic Therapy for Acute Ischemic Stroke: The Experience of a Community Hospital. *Acta Neurol Taiwan.* 18:14-20.



" Prof Volker Steil started his career as a medical physicist in 1983 and retired as the Head, Department of Medical Physics and Radiation Protection at the University Hospital Mannheim, Germany in 2022. Since early in his career he was associated with promoting the quality of medical physics education in Bangladesh and South Asia with the German Academic Exchange Service (DAAD). The features of DAAD projects include knowledge transfer by exchange of faculty members, teacher's fellowship program to provide a supportive professional experience for fresh recruits, up-gradation medical physics departments, joint research opportunities for M. Sc and PhD students. He coordinated two DAAD projects between Gono Bishwabidyalay Bangladesh, and the Heidelberg University, Medical Faculty Mannheim, Germany since 2014 and mentored numerous young medical physicists from the region to excel in their careers. He is actively associated with activities of SCMPCR and been a faculty for many of its training programs conducted for medical physicists, biomedical engineers and other health professionals both in offline, online and hybrid modes.."

Empowering Medical Physics Services and Capacity Building in South Asia: A Story of Cooperation and Concord

Quality education and health science for patient benefit' is the motto of South Asia Centre for Medical Physics and Cancer Research (SCMPCR). Half a decade is completed with its innovative and proven to be efficient education and training activities. The challenges for medical physicists in South Asia are strenuous and grueling; the diverse socio-economic status, availability of education and training programs, deficiency in advanced diagnostic and treatment modalities are a few attributing factors. The pioneers of medical physics from the region have envisioned that collaboration and cooperation is the key to address these issues. Initiatives were in place even before the inception of SCMPCR to deal with the heterogeneous demands of the region. SCMPCR added momentum to these activities and stood strong even in the unprecedented challenge of a pandemic.

For this issue of newsletter, we are privileged to have Prof Volker Steil (VS) to share his experiences and insights. Here is a snippet of the chat with Prof Steil by Dr. Mary Joan (NJ) regarding his pioneering efforts in establishing cooperation and collaborations for capacity building and empowerment of medical physicists in South Asia especially Bangladesh.

**MJ:** Glad to have this opportunity to hear about your experiences. Would you please share what prompted you to be choose medical physics as a career?

**VS:** My path from primary school to university was not direct and straightforward. But that is another story. As part of my biomedical engineering degree, I specialized in the use of radiation in medicine. Part of this specialization was an internship in radiotherapy/nuclear medicine at the University Hospital in Frankfurt. That interested me. It was the first step into the field of medical technology in hospitals and the opportunity to make further contacts. This also led to the topic of my master's thesis: "Possibility of expanding a radiotherapy department with an additional radiotherapy unit" at the Mannheim hospital.

**MJ:** How did your association start with DAAD projects for Bangladesh?

#### **News and Events**





**VS:** When I moved to the University Hospital in Mannheim in 1990, with the special feature that there is a second medical faculty of the University of Heidelberg in Mannheim, there was in principle the possibility of initiating DAAD cooperation projects at the academic level. I also met Prof. Dr. Zakaria in 1983 or 1984 at a joint course on radiation protection at the German Research Centre for Environmental Health (HMGU) in Munich. We kept in touch and became friends over time. Now it was only a small step to working together.

**MJ:** Are you satisfied with what you achieved with these projects and is it same as what you envisioned in the early 90's?

**VS:** As I mentioned above. I myself was not directly involved in the DAAD projects of the 1990s. It was the merit of Prof. Zakaria to lay the foundation for the academic development of medical physics in Bangladesh.

In medical physics, as is often the case in low- and middleincome countries (LMICs), the academic training capacity in universities is low because there is a parallel lack of radiotherapy treatment capacity in the health systems. As a result, the career prospects of graduates are poor - a vicious circle. The focus of our first joint DAAD programme was therefore to improve the academic infrastructure initiated by Prof. Zakaria through the exchange of students and lecturers, and to establish local cooperation with radiotherapy clinics in order to carry out internships. So, the answer is yes.

**MJ:** Can you please share the challenges and stumbling blocks you had to overcome?

**VS:** Allow me to touch on a few, but essential aspects for such a cooperation.

The most important thing is to have committed people on both sides to support and promote this cooperation to overcome such challenges and stumbling blocks. In addition, a local infrastructure is needed, such as a master's programme in medical physics or biomedical engineering and cooperating hospitals for internships.

The first stumbling block was the complex application procedure of the German Academic Exchange Service (DAAD) itself. You have to find the right "building blocks" that best fit the intended programme. Within the first DAAD programme, we had to realise that the possible financial framework for a longer stay in Germany was not sufficient, because living and working in Germany is expensive. So, it was clear that we needed local opportunities.

By expanding the focus from Bangladesh to countries in South Asia, we were also able to reach a larger group of people interested in a specific field such as medical physics. The establishment of the SCMPCR has also enabled the successful development and support of an e-learning infrastructure. This was essential, also from a financial point of view, in order to involve larger groups of participants in on-site education and training.

**MJ:** Kindly elucidate the current prospects for career development for young medical physicists of South Asia?



#### SCMPCR Newsletter, July 2023

#### **News and Events**



**VS:** Good career prospects are essential for young medical physicists. My impression is that the field of radiotherapy in particular is growing, not least because of the high incidence of cancer. This means that more and more treatment options are being developed. From my outside perspective, this offers good opportunities for a professional career in hospitals and the medical technology industry.

**MJ:** Many technological advancements became part of our daily lives in recent years. Could it have a positive impact on medical physics professional development?

**VS:** There is absolutely a positive impact of many technological advances. Let me take an example from the field of artificial intelligence (AI).

After my retirement, I am working as a consultant for the management of the University Hospital in Mannheim, for example, on digital restructuring processes. During a discussion, the doctors said: "We have to learn to prompt." At first I had no idea what they meant. But I learnt that it is an essential skill of AI, for example, to be able to search the literature in a targeted and effective way, or to be able to search all the digital information available on a patient for further therapy. Progressive digitalization, including in medicine, has advantages and disadvantages and therefore involves a process of adaptation. Will certain activities in medical physics, such as quality control or treatment planning, remain as they are?

Not least for this reason, I also refer to my answer to the previous question.

**MJ:** You have been an integral part of many workshops and elearning programs of SCMPCR in addition to the DAAD cooperation. What are your most memorable experiences?

**VS:** For me, it was very impressive to see the professional potential of the students and colleagues who came together at these events. This impression was also confirmed by the fact that companies actively supported these events financially and by

providing measurement equipment. So it was a win-win situation.

MJ: What is your message for health professionals of the region?

**VS:** Don't just define yourself in terms of specific procedures, such as quality control or treatment planning. Try to actively participate in the whole clinical process, e.g. in radiotherapy. Be open to additional, new aspects, such as planning and optimizing clinical processes. This will also lead to greater acceptance by clinical staff.

**MJ:** Thank you very much for sparing your time in sharing your thoughts and experiences which are very much important for the budding medical physicists of South Asia. Your energy, spirit, dedication and mentoring are indeed motivating. Your life story tells us the importance of being grounded and also to keep learning and make life a heartening learning experience. It gives us confidence that success is not always a dream, it becomes a reality with diligence and commitment. Looking forward to having active cooperation and collaborations with you in the future.



Dr Mary Joan is Associate Professor and Radiological Safety Officer at Christian Medical College and Hospital Ludhiana, India. She is Chair, Professional Relations Committee AFOMP, Member- Science Committee IOMP and Executive Committee AMPI-NC and Co Editor-in-Chief of SCMPCR Newsletter.

#### SCMPCR Newsletter, July 2023

#### **News and Events**



It is with profound sorrow and aching hearts that SCMPCR mourn the loss of a true visionary, Prof. Dr. Harald zur Hausen. The world has lost a scientific pioneer, a compassionate mentor, and a relentless fighter in the battle against cancer. As we reflect on his extraordinary life and immeasurable contributions, we find solace in the memories of his fruitful collaboration and unwavering dedication to the advancement of medical science.

Prof. Dr. Golam Abu Zakaria, the esteemed founder of the SCMPCR, shared a good relationship with Prof. Dr. Harald zur Hausen. Their association traces back to their shared participation in the momentous cancer conference held in Tanzania in the year 2000.

Born on March 11, 1936, in war-torn Gelsenkirchen, Germany, Prof. Dr. Harald zur Hausen's early years were marked by upheaval and hardship. Raised by parents who had fled the turmoil caused by the Russian Revolution, he witnessed the devastating consequences of World War II firsthand. The relentless bombings and upheaval shaped his character, fostering a deep connection with nature and an unwavering commitment to understanding the intricate workings of the human body.

Throughout his illustrious career, Prof. Dr. Harald zur Hausen fearlessly challenged the prevailing dogmas and pushed the boundaries of scientific knowledge. In the face of skepticism and resistance, he embarked on a daring journey to unravel the mysteries surrounding cervical cancer. While many believed that hormones and hereditary factors were the primary culprits, he dared to explore the role of the human papillomavirus (HPV). Armed with unwavering determination and an indomitable spirit, he relentlessly pursued this groundbreaking theory.

The path was strewn with obstacles, as the scientific community lacked the necessary tools to grow HPV in tissue cultures. Nevertheless, Prof. Dr. Harald zur Hausen remained undeterred, tirelessly toiling in the laboratory, determined to unravel the enigma that lay before him. Securing research funding proved to be an arduous task, with only a few visionaries standing by his side. Despite skepticism and prevailing beliefs that herpes viruses held the key, he meticulously hunted for genetic markers of HPV in cancer cells, leaving no stone unturned in his quest for the truth.

Finally, in 1984, his groundbreaking studies confirming the presence of HPV strains in cervical cancer clusters were published. This revelation was a turning point in the fight against cervical cancer, shedding light on the insidious nature of this disease and offering hope to millions around the world. Prof. Dr. Harald zur Hausen's seminal work not only paved the way for the development of the life-saving HPV vaccine but also unveiled the hidden links between HPV and various other sexually transmitted cancers affecting both men and women.

Prof. Dr. Harald zur Hausen's dedication to scientific progress extended far beyond the confines of his laboratory. He recognized the urgent need for global HPV vaccination programs to protect future generations from the scourge of cervical cancer. Alarmed by the declining vaccination rates worldwide, he vehemently advocated for wider coverage, passionately emphasizing the importance of prevention and public health. His



Prof. Zakaria and Prof. Dr. zur Hausen, Captured Together at the Farewell Symposium for Prof. Wolfgang Schlegel, May 31, 2019, Organized by DKFZ

unwavering commitment to this cause was a testament to his selflessness and genuine concern for the well-being of humanity.

We, the members of the SCMPCR, humbly offer our deepest condolences to Prof. Dr. Harald zur Hausen's beloved family, friends, and colleagues. His departure leaves an irreplaceable void in the world of medical research, but his indomitable spirit and enduring legacy will continue to inspire generations to come. The impact of Prof. Dr. Harald zur Hausen's work reaches far and wide, and his contributions to the field of oncology will forever be etched in the annals of medical history.

Prof. Dr. Harald zur Hausen left an indelible mark on cancer research and the German Cancer Research Center (DKFZ), where he served as the Chairman of the Board and Scientific Director for twenty years. Under his leadership from 1983 to 2003, the DKFZ rose to prominence as one of the world's leading international research institutions in the field of cancer research. His visionary approach and groundbreaking achievements in tumor virology transformed the landscape of cancer prevention. As Germany's largest biomedical research institute, the DKFZ employs over 3,000 individuals dedicated to identifying cancer risk factors, studying the progression of cancer, and developing innovative cancer prevention strategies. Collaborating with excellent research institutions and university hospitals throughout Germany, such as the National Center for Tumor Diseases (NCT), the German Cancer Consortium (DKTK), and the Hopp Children's Cancer Center (KiTZ) in Heidelberg, the DKFZ strives to translate promising research into clinical applications that improve the prognosis and treatment of cancer patients. With the support of the Federal Ministry of Education and Research and the state of Baden-Württemberg, the DKFZ plays a crucial role in advancing cancer research and providing vital information and resources through its Cancer Information Service (KID). As a member of the Helmholtz Association of German Research Centers, the DKFZ remains at the forefront of cancer research and continues to drive innovation in the fight against cancer.

The Medical Physics community, particularly in Bangladesh, is profoundly grateful the German Cancer Research Center (DKFZ) for their invaluable contributions. Behind this collaboration Prof. Dr. Wolfgang Schlegel, Prof. Gunther Hartmann, Dr. Frank Hensley and Medical Physics Team from DKFZ played a pivotal role. Their support provided aspiring medical physics students from Bangladesh with the opportunity to visit DKFZ between 2003 and 2006 for practical thesis work, which proved instrumental in shaping their careers.

Thanks to this collaboration, many of these talented medical physicists have become pioneers within Bangladesh's healthcare system, carrying forward Prof. Dr. Harald zur Hausen's legacy of knowledge and innovation. The impact of this collaboration on the field of Medical Physics in Bangladesh cannot be overstated. It has empowered a new generation of professionals who continue to advance the frontiers of medical science and positively impact patient care.

Prof. Dr. Harald zur Hausen's remarkable journey, from battling skepticism to receiving the Nobel Prize in Medicine in 2008, stands as an everlasting testament to the power of perseverance and the pursuit of truth. His life's work has transformed the lives of countless individuals, offering hope where there was once despair and paving the way for a brighter future. Today, as we bid farewell to this extraordinary soul, let us remember him not only for his scientific achievements but also for the profound impact he had on the lives of those he touched.

### International Medical Physics Week (IMPW) Celebration 2023 Workshop on Brachytherapy Treatment Techniques: Procedures and Planning

#### Department of Radiation Oncology, Christian Medical College and Hospital Ludhiana

To celebrate the international Medical Physics Week (IMPW) 2023, a workshop on 'Brachytherapy Treatment Techniques: Procedures and Planning' was organized by the Department of Radiation Oncology, Christian Medical College & Hospital, Ludhiana on 28<sup>th</sup> & 29<sup>th</sup> April 2023. It was organized in collaboration with the Indian Brachytherapy Society **(IBS)** and was also financially supported by National Academy of Medical Sciences (**NAMS**) and Atomic Energy Regulatory Board (**AERB**). The workshop was endorsed by AFOMP, AMPI, ESTRO, IOMP, NZAROI, SCMPCR and accredited with 8 credit hours by the Punjab Medical Council. The entire workshop proceedings were held in the Department of Medical Education Conference Hall, Christian Medical College Ludhiana.

The faculty included renowned radiation oncologists and medical physicists from various reputed hospitals of India. Dr. Bhavna Rai from PGIMER, Chandigarh was the course director, and Dr. DN Sharma from AIIMS New Delhi and Dr Rakesh Kapoor from PGI Chandigarh were the radiation oncology faculty while Dr Arun Chougule from Jaipur, Dr. Arun Oinam from PGI Chandigarh, Dr Seema Sharma from AIIMS, New Delhi, Dr. Frank Hensley from Germany were Medical Physics faculty of the workshop. The workshop was attended by 54 delegates including consultant oncologists, resident doctors, medical physicists and intern medical physicists from various hospitals across North India.

The workshop aimed at highlighting the role and importance of brachytherapy in various cancers, specially the gynecological cancers, head and neck cancers, breast cancer and sarcomas in addition to introduction to rare treatment sites where brachytherapy could be beneficial and provided practical knowledge to the young radiation oncologists and medical physicists about the various types of brachytherapy procedures practiced. The two day workshop had sessions catering to all the basic requisites that one needs to practice brachytherapy in their department and gave them the confidence to take initiatives in the field of brachytherapy.

The workshop started with the inaugural ceremony which was graced by Dr Jeyaraj Pandian, Principal Christian Medical College Ludhiana, Dr Allen Joseph, Medical Superintendent, CMC Hospital, Prof Arun Chougule, Observer NAMS, Dr Karamvir Goyal, Observer PMC and all the faculty of the workshop. Dr Pamela Jeyaraj, Prof and Head Department of Radiation

#### SCMPCR Newsletter, July 2023

Oncology and the Organizing Chairperson of the Workshop formally welcomed all the guests and delegates and threw light on the objectives of the workshop. Dr. Jeyaraj Pandian highlighted the importance of Brachytherapy and shared insights for dealing with the cancer and non-communicable disease burden of the country. He also appreciated the efforts of the Department of Radiation Oncology for organizing this workshop in a very relevant field of expertise for cancer treatmentbrachytherapy. Dr. Allen Joseph spoke on the need of keeping everyone updated with advanced treatment options and developing necessary skills. The inaugural ceremony ended with Dr. Mary Joan, Associate Professor and RSO and the Organizing Secretary of the Workshop extending a vote of thanks to the entire invited faculty, delegates and the team of support persons.

The two day workshop had various sessions which included lectures from the faculty, videos for giving the audience a nearlive experience of the OT procedures, live treatment planning and contouring sessions, lectures on the physics & planning of brachytherapy procedures and need of QA/QC, optimization methods, radiobiology of brachytherapy etc. Each teaching session held its own importance and gave the delegates an opportunity to explore each aspect of brachytherapy. Each teaching session ended with discussion and questions and the participants asked their doubts without any apprehension. The discussions continued till the breaks as well and the delegates got ample opportunity to interact with the expert faculty.

The objectives of the workshop were successfully met with the lectures and training sessions. Dr DN Sharma led a session on "Indications of Brachytherapy in the precision RT era" to highlight the role and importance of brachytherapy in the treatment of cancer. Dr. Frank Hensley led a session on "Advanced techniques in Brachytherapy - current status and future scopes" to project the versatility and the benefits of brachytherapy as a radiation therapy modality. Dr. Bhavna Rai led a session on "Imaging and contouring" to bring to light, various advancements in imaging techniques in brachytherapy. To assist delegates to build a conceptual basis for the use of brachytherapy Dr. Arun Chougule led a session on "Radiobiology of Brachytherapy", Dr Seema Sharma led a session on "Physical principles and calculation algorithms for brachytherapy planning" and Dr Rakesh Kapoor led a session on "Principles of Interstitial Brachytherapy". Dr DN Sharma led a session on "Indications of Brachytherapy in the precision RT era" and 3 sessions where video demonstration of brachytherapy procedures in various sites were taken by Dr. DN Sharma, Dr. Rakesh Kapoor and Dr. Bhavna Rai to create awareness among Radiation Oncology team about various types of applications and accessible primary sites suitable for brachytherapy procedure. To familiarize the basics of contouring and tumor delineation in brachytherapy, Dr. Bhavna Rai led a session on "Imaging and contouring", 3 sessions where video demonstration of brachytherapy procedures in various sites were taken by Dr. DN Sharma, Dr. Rakesh Kapoor and Dr. Bhavna Rai and sessions where participants were guided in the art of contouring and planning in brachytherapy by the faculty. To explain the reconstruction

#### **News and Events**



#### **News and Events**

#### SCMPCR Newsletter, July 2023



and planning techniques to the physicists, Dr Arun S Oinam, Dr Arun Chougule and Dr Seema Sharma led the sessions on "Image guidance - reconstruction and planning". Dr Arun S Oinam led a session on "Applicator commissioning and Quality Assurance in brachytherapy" to reinstate the importance of QA/ QC for equipment as well as procedures. All Faculty monitored a session on "Planning, plan evaluation and dose reporting" to understand the process of optimization and highlight the role of Radiation Oncologist and Medical Physicist. To equip the Radiation Oncologists and Medical Physicists with knowledge and skills so as to establish a brachytherapy facilities in their respective centers there were 3 sessions where video demonstration of brachytherapy procedures in various sites were taken by Dr. DN Sharma, Dr. Rakesh Kapoor and Dr. Bhavna Rai, sessions where participants were guided in the art of contouring and planning in brachytherapy and principles of planning, plan evaluation and dose reporting.

Abstracts on topics related to brachytherapy were invited and the participants were given an opportunity to present their research

work and have a discussion with the esteemed faculty of the workshop on prospects of research in brachytherapy and guidance and continued support to carry on with their areas of interests in brachytherapy research.

The workshop concluded with the valedictory session in which feedback was taken from the delegates and the invited faculty. The delegates were satisfied with the workshop and asked for more such training sessions and workshops to be held in future. The faculty was happy with the arrangements too and looked forward to teach more in future through such programs. The invited faculty was given token of appreciation by members of the organizing team and the certificates were distributed to all delegated by the faculty.

A pre workshop survey was conducted among the registered delegates prior to the workshop to get to know about the facilities available and their expectations on the workshop. An online pre and post workshop questionnaire evaluation was conducted on the first day and at the end of the workshop to assess the effectiveness of the workshop and seek the feedback from the delegates. A word finding cross word was conducted to make the learning enjoyable.

The 2-day workshop on 'Brachytherapy Treatment Techniques: Procedures and Planning' organized by the Department of Radiation Oncology, Christian Medical College & Hospital, Ludhiana was completed on a successful note concluding the international medical Physics Week celebrations 2023.



#### **News and Events**



# Advancing Cancer Care: Achievements and Milestones at INOR in Recent Years

Over the past year and in recent years, The Institute of Nuclear Medicine, Oncology and Radiotherapy (INOR) has achieved significant milestones, including the successful introduction of Intensity-Modulated Radiation Therapy (IMRT) – a first for Khyber Pakhtunkhwa (KPK) public sector cancer hospitals. ISO 9001:2015 Certification was attained through a successful audit, marking a pioneering achievement in KPK's public sector cancer hospitals.

We congratulate Mr. Muhammad Mubashar Hussain on receiving the Gold Medal. In recognition of his services and performance in the field of Medical Physics at the institute level, he was recently awarded and decorated with the Gold Medal and Distinguished Service Award on May 28, 2023. He dedicated this award to his father, Muhammad Arif (Late), whose guidance, encouragement, and support made all this possible.

Working as a Medical Physicist in a public sector organization since October 2012 at the NIMRA Cancer Hospital Jamshoro and currently serving at INOR Cancer Hospital Abbottabad since 2016 to the present date, he has taken on additional responsibilities as Quality Manager/ISO since September 2018. He is also a member of the Ethical Review Committee (ERC) and the Institutional Review Board (ERB). His responsibilities encompass Radiation Safety, assistance in conducting External Quality Audits/safety inspections by PNRA, Radiation Protection, Radiation Safety assessment, Planning and design of new radiation facilities, Preparation of Procedures and SOPs, Radiation Survey, Dosimetry, Simulation, Treatment Planning, Member of the Radiation Safety Committee, QA/QC of Radiotherapy/Nuclear Medicine/Radiology Equipment, Teaching and Training, ISO certification audit compliance, and other assignments assigned from time to time.

He has published research in prestigious journals, addressing diverse topics such as the impact of COVID-19 on radiotherapy services and the optimization of hospital services during the pandemic. Moreover, he has actively participated in national and international conferences, including the initiation of the Annual National Symposium on International Day of Medical Physics (IDMP) SOUTH ASIA CENTRE FOR MEDICAL PHYSICS AND CANCER RESEARCH

(A Project of Alo Bhubon Trust)

SUBMISSION **DEADLINE FOR NEXT ISSUE:** November 30, 2023

### The main objectives of SCMPCR

SCMPCR

To organise awareness, prevention, and screening program for cancer disease.

To provide adequate training to all personnel associated with cancer treatment.

To establish the clinical residency training program for medical physicists.

To develop the infrastructure of e-learning and library.

To establishment welfare home for poor cancer patients.

To build a self-help groups for cancer patients

To establish a team who will assist in the management and quality control (QC) procedure for the diagnostic radiology equipment in the districts levels.

SCMPCR was established on 3rd July 2018 and is comprised of a group of philanthropic personnel with representatives from different regions of South Asia to work on different projects. SCMPCR is an autonomous body under All Bhubon Trust (Alo-BT) and is accountable to its board of trustees/governors. It is a non-profit public partnership which will seek support from other sources. It shall work conjointly with various national and internationals organisations. The major activities of SCMPCR are: to produce skilled manpower, enhance health education and establish a welfare home for cancer patients.

MISSION

TO Achieve UNDP SDG-goal 3 & 4

# OUR VISION

PROVIDE OUALITY SERVICES IN CANCER TREATMENT THROUGH

TRAINING, EDUCATION

E- LEARNING IN

**RADIOTHERAPY AND** 

IMAGING DISCIPLINES.

INCLUDING

**GOALS OF SCMPCR** 

Major activities of SCMPCR are to produce skilled manpower, enhance health education and establish a welfare home for cancer patients.

#### UNDP SDG-goal 3 (Good Health & Well-being)

Awareness program for the mass people for different communicable and non-communicable diseases, especially for cancer patients.

#### **UNDP SDG-goal 4 (Quality Education)**

Arranging and conducting training programs to develop skilled manpower. It realizes the need to educate specially; women regarding the screening and prevention of cancer treatment under UNDP SDG-goal 4.

PROJECT of ALO BHUBON TRUST (Alo-BT)

FIND

...

www.scmpcr.org



### OUR MOTTO OUALITY EDUCATION AND HEALTH SCIENCE FOR PATIENT BENEFIT