SCMPCR

South Asia Centre for Medical Physics and Cancer Research

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QUALITY EDUCATION AND HEALTH SCIENCE FOR PATIENT BENEFIT

Clinical Implementation of SRS, SRT, and SBRT Workshop: Advancing Precision Radiotherapy in South Asia Held at B P Koirala Memorial Cancer Hospital, Nepal | March 13–16,2025

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In the rapidly advancing field of oncology, radiation therapy remains a cornerstone of cancer management. With increasing global emphasis on precision medicine, high-dose, hypo-fractionated stereotactic techniques like **Stereotactic Radiosurgery (SRS)**, **Stereotactic Radiotherapy (SRT)**, and **Stereotactic Body Radiotherapy (SBRT)** have become pivotal in treating small-to-moderate tumors, especially those situated in surgically challenging or anatomically sensitive regions such as the brain, spine, liver, and lung. These methods allow accurate tumor targeting with minimal exposure to surrounding healthy tissues, significantly improving patient outcomes.

At the heart of this advancement is the **South and Central Asia Medical Physics Collaboration and Research (SCMPCR)**, whose vision is to build a robust network of medical physicists, clinicians, and researchers across the region. SCMPCR's mission emphasizes **capacity building, cross-border knowledge exchange, and the promotion of best practices in medical physics and radiotherapy**. By supporting

initiatives like this workshop, SCMPCR continues to bridge resource and expertise gaps, empowering healthcare professionals to deliver high-quality cancer care in diverse clinical settings.

Recognizing the urgent need to disseminate the clinical and technical knowledge required to implement these complex techniques, SCMPCR organized a **Four-day international workshop** at B P Koirala Memorial Cancer Hospital(BPKMCH) in collaboration with BPKMCH and NAMP. The event drew over **42 participants** including medical physicists, radiation oncologists, and Radiation Therapist from **India, Nepal, and Bangladesh**, and featured distinguished faculty from **India, Germany, Switzerland, Belgium, and the Netherlands**.

Interdisciplinary Emphasis: Bridging Clinical Insight and Technical Expertise

One of the workshop's key distinguishing features was its dual focus on both medical physicists and radiation oncologists. This inclusive format acknowledged that the **successful implementation of stereotactic techniques** relies on close collaboration between the clinical and technical teams. Whereas radiation oncologists make critical decisions about treatment eligibility, fractionation schedules, and anatomical targeting, medical physicists ensure accurate dose calculations, quality assurance (QA), and compliance with international safety protocols.

Unlike traditional training sessions that cater to only one discipline, this workshop offered parallel and collaborative sessions that emphasized clinical decision-making, contouring, treatment planning, dosimetry, QA, and image-guided verification techniques—all delivered in a structured and logically progressive format.

Day 1: Clinical Concepts and Anatomical Contouring.

Understanding the clinical rationale and anatomical considerations is essential for accurate implementation of SRS, SRT, and SBRT. Day 1 established foundational knowledge crucial for every step-in stereotactic workflow, from patient selection to target delineation

The workshop commenced with an inauguration ceremony graced by leadership from **BPKMCH** and **SCMPCR**, setting the tone for a high-caliber academic event. The first day focused on establishing a strong foundational understanding of stereotactic techniques and anatomical contouring essentials.

Dr. Raju Srivastava (Belgium) delivered the opening keynote, providing a comprehensive overview of the **principles, indications, and limitations** of SRS, SRT, and SBRT. He emphasized the importance of patient selection criteria, immobilization techniques, and the need for stringent imaging protocols to ensure sub-millimeter accuracy. Following this, **Dr. S. Ghosh Laskar** (Tata Memorial Hospital, Mumbai, India) led an

in-depth session on **contouring for head and neck SRT**, focusing on high-dose conformity requirements and dose constraints for organs-at-risk (OARs). His session also featured real-world clinical cases, underlining the

complexity of anatomical delineation in stereotactic settings. **Dr. Robert Semrau** (University Hospital Düsseldorf, Germany) presented a session on the **critical impact of contouring accuracy** on dosimetric outcomes. His lecture emphasized the use of image fusion (CT-MRI, PET-CT), deformable registration, and the importance of inter observer variability reduction. He continued with a session on **image guidance and registration pitfalls**, drawing attention to the potential dosimetric consequences of inaccurate image alignment. In the evening, two online guest lectures broadened the clinical scope of the program.

Dr. Janine Simons (Netherlands Cancer Institute) presented the role of **hypo-fractionation in breast cancer**, highlighting trials like Fast-Forward and their implications for regional practice. **Prof. Dr. Luca Incrocci** (Erasmus MC, Rotterdam) delivered a talk on **ultra-hypo-fractionation in prostate cancer**, covering evidence-based schedules like the HYPO-RT-PC trial and their application in resource-limited settings.

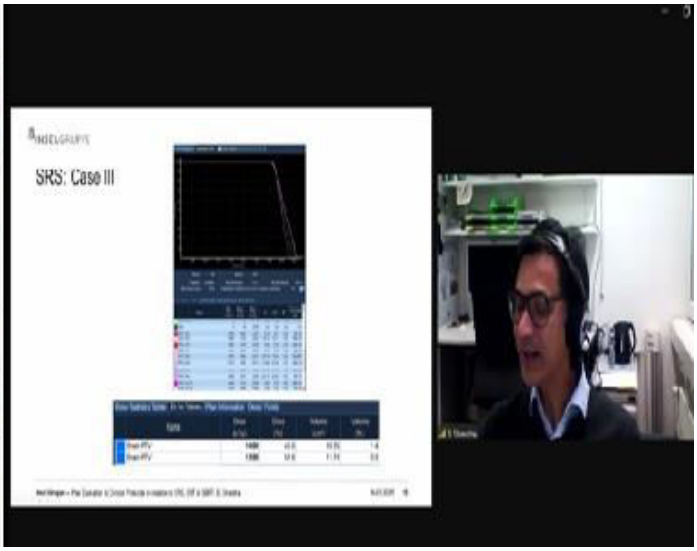
Day 2: Planning, Radiobiology, and Quality Assurance: Treatment planning and QA are cornerstones of safe stereotactic radiotherapy. Day 2 addressed the radiobiological principles behind hypo-fractionation, essential planning techniques, and the rigorous QA needed to ensure accuracy and patient safety.

Day 2 began with a powerful radiobiology session by **Dr. S. Ghosh Laskar**, who explained the **Linear-Quadratic (LQ) model**, **Biologically Effective Dose (BED)**, and **Equivalent Dose in 2 Gy fractions (EQD2)** calculations—critical tools in evaluating high-dose-per-fraction treatments. She provided practical examples comparing SRS/SBRT plans with conventional regimens, enhancing participants' ability to understand the radiobiological trade-offs.

Prof. Dr. Golam Abu Zakaria (Germany), a key figure at SCMPCR, provided an engaging lecture on **patient-specific QA methodologies**, emphasizing gamma index analysis, absolute dose verification, and tools

suited for stereotactic environments. He also discussed common challenges in QA workflows such as detector resolution, phantom design, and positioning reproducibility.

A significant highlight of the day was the session by the **Varian Medical Systems representative**, who presented an in-depth demonstration of **HyperArc**—a state-of-the-art technology designed to optimize **SRS and SRT treatment planning**. HyperArc automates and streamlines the planning of non-coplanar volumetric modulated arc therapy (VMAT) for cranial stereotactic radiosurgery.



It ensures ultra-conformal dose distributions, steep dose gradients, and minimal exposure to surrounding healthy tissues—all of which are critical for treating multiple or complex brain lesions. HyperArc reduces planning variability by automating beam arrangement and optimization parameters, allowing for consistent high-quality plans. Non-Coplanar Arc Delivery enhances dose conformity and sharpens falloff, especially beneficial in treating closely spaced or multiple intracranial targets. With integrated collision avoidance algorithms, HyperArc ensures safe delivery of complex non-coplanar arcs. HyperArc reduces planning and delivery time, allowing clinics to treat more patients with higher precision and confidence

In the afternoon, **Dr. Binay Shrestha** (Switzerland) joined online to present **clinical workflows and plan evaluation protocols**. He detailed standard operating procedures (SOPs) for various tumor sites treated with SBRT, including spinal metastases, lung nodules, and adrenal lesions.

Dr. K. Kanakavel (PTW, India) concluded the day with a hands-on demonstration of **QA tools such as RUBY phantom** for end-to-end testing and **OCTAVIUS 4D** for patient-specific dosimetric validation, explaining detector calibration, software use, and data interpretation. In the context of high-dose, high-precision radiotherapy like **SRS**, **SRT**, and **SBRT**, **quality assurance (QA)** is not just a regulatory formality—it is a clinical necessity. To maintain sub-millimeter accuracy and protect critical structures located near small targets, every component of the treatment chain must be meticulously validated. This is where advanced QA tools like **RUBY** and **OCTAVIUS** play a transformative role. Following the academic sessions on Day 2, the **official inaugural ceremony** took place. The event was attended by key dignitaries from **BPKMCH**, **Bhaktapur Medical College**, and **SCMPCR**, as well as the international faculty and workshop participants.

The ceremony began with a keynote address by **Prof. Dr. Golam Abu Zakaria**, Chairman of **SCMPCR**, who set the tone for the event with a powerful message on the **importance of scientific workshops**. Prof. Zakaria reaffirmed the belief in the **transformative potential of education and innovation** to shape a more sustainable and equitable world. The session continued with a compelling address by **Prof. Dr. Hasin Anupama Azhari**, CEO of SCMPCR, who shared the **vision and mission of SCMPCR**. Her remarks

highlighted the organization's commitment to building a stronger network of academic excellence, capacity-building, and resource-sharing in radiation oncology. She expressed optimism about the collective efforts of the region's professionals in shaping the future of precision radiotherapy through unity and mutual growth. This formal opening ceremony marked the **commencement of a meaningful journey into the realm of advanced radiotherapy techniques**, setting a tone of inspiration and shared purpose for the days that followed.

Day 3: Hands-On Sessions in Contouring, QA, and Image Fusion: Day 3 emphasized skill-building through practical exercises. Applying theoretical concepts to real patient data ensures participants can confidently perform stereotactic procedures in clinical practice. Practical learning took center stage on Day 3, reinforcing theoretical knowledge through direct application. Participants were divided into **Group A** and **Group B** for parallel sessions.

Group A engaged in **contouring exercises** using real patient datasets under the guidance of **Dr. Robert Semrau**, **Dr. S. Ghosh Laskar**, and Varian experts. Tumor volumes and OARs were delineated, followed by peer-reviewed evaluations to highlight common contouring discrepancies. Group B worked with **Mr. K. Kanakavel** and **Dr. Raju Srivastava** on **QA demonstrations**, setting up the RUBY and OCTAVIUS systems for plan verification. They explored **phantom positioning, dose delivery**, and **gamma analysis interpretation**, including tips for mitigating measurement errors.

In the post-lunch session, both groups attended **treatment plan evaluation sessions** led by **Dr. Binay Shrestha** and **Prof. Zakaria**, who emphasized the use of Conformity Index (CI), Homogeneity Index (HI), Gradient Index (GI), and DVH (Dose-Volume Histogram) analysis in plan assessment.

Later, Group A participated in **image fusion exercises**, particularly **4DCT with PET-CT**, while Group B focused on **QA data interpretation**, involving log file analysis and report generation.

Day 4: Evaluation and Certification: This day focused on consolidating knowledge through evaluation and charting a long-term vision for stereotactic radiotherapy in South Asia, emphasizing sustainability, collaboration, and academic growth.


Day 4 was dedicated to academic evaluation and strategic vision. An **examination session** was conducted by**Prof. Dr. Golam Zakaria**, **Dr. Raju Srivastava**, and **Prof. H.A. Azhari**, assessing the participants' understanding of stereotactic principles, workflows, QA, and radiobiology. The closing day featured a **certificate distribution ceremony** co-hosted by **BPKMCH** and **SCMPCR**. The workshop awarded each participant **38 Continuing Professional Development (CPD) points**, officially recognized by professional regulatory authorities. This accreditation affirms the workshop's academic rigor and its relevance to professional licensing and advancement. Participants expressed overwhelming satisfaction with the workshop's structure, balance of theory and hands-on sessions, and the depth of international faculty interaction. Many noted that this training would directly influence how SRS, SRT, and SBRT are implemented at their home institutions. The event concluded with a festive group photo, exchange of tokens of appreciation, and a strong call for continued regional collaboration in building equitable, high-quality cancer treatment infrastructure.


Participant Reflection: Bridging Knowledge and Practice in Precision Radiotherapy.

"Participating in the workshop was not merely an academic engagement—it was a transformative journey that expanded both my clinical insight and technical skill set".

As a participant, I found the workshop at Bhaktapur Medical College to be exceptionally insightful and professionally enriching. The seamless integration of theoretical lectures with hands-on sessions allowed me

to internalize complex concepts in SRS, SRT, and SBRT and apply them in practical scenarios. Each day brought a deeper appreciation for the intricacies of high-precision radiotherapy—from the radiobiological rationale and anatomical contouring to the implementation of advanced planning technologies like HyperArc and the robust quality assurance protocols using RUBY and OCTAVIUS systems. What stood out most was the opportunity to engage directly with global experts and peers from across South Asia. The discussions, case reviews, and interactive sessions not only deepened my technical knowledge but also fostered a spirit of collaboration and shared learning that I will carry forward in my clinical practice and academic journey.

Mr. Dinesh Saroj

I wholeheartedly encourage fellow medical physicists, radiation oncologists, and dosimetrists to participate in future SCMPCR workshops. These events are not only academically rigorous but also uniquely tailored to the regional challenges and opportunities in high-precision radiotherapy. Engaging with SCMPCR opens the door to a vibrant network of professionals committed to excellence, innovation, and cross-border collaboration in cancer care. Let us work together to build a stronger, more unified future for radiotherapy in South and Central Asia.