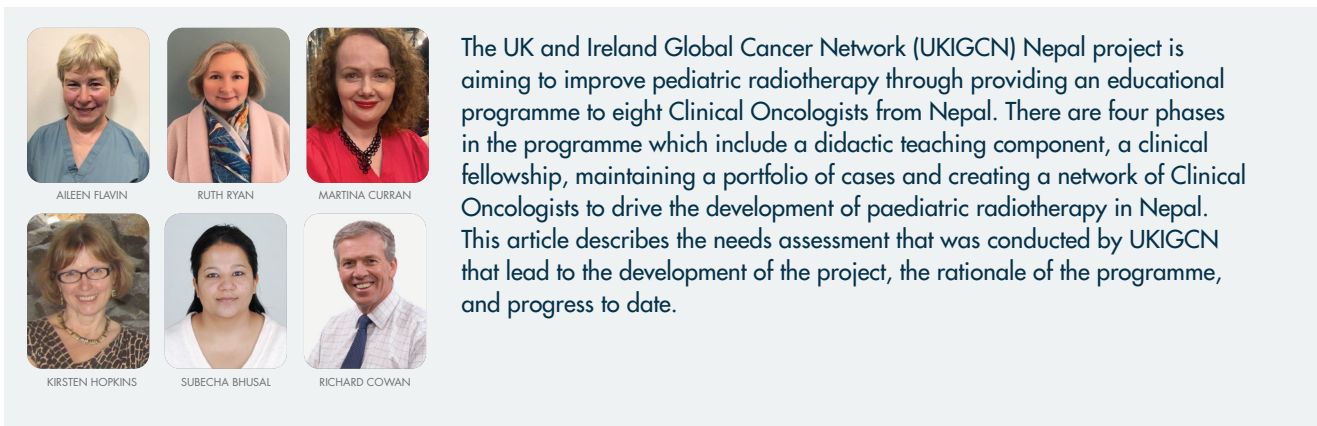


Improving the quality of paediatric radiotherapy in Nepal: A UK and Ireland Global Cancer Network project

Aileen Flavin, Consultant Radiation Oncologist, St Luke's Radiation Oncology Network, Dublin, Ireland; **Ruth Ryan**, General Manager, National Cancer Control Programme, Health Services Executive, Ireland; **Martina Curran**, Management Accountant, Corporate HSE, Ireland; **Kirsten Hopkins**, retired Clinical Oncologist; **Subecha Bhusal**, Senior Clinical Fellow in Clinical Oncology, Maidstone and Tunbridge Wells NHS Trust, UK and **Richard Cowan**, Consultant Clinical Oncologist, Christie Hospital, Manchester, United Kingdom and Clinical Professor in Oncology, University of Manchester, United Kingdom.



Nepal is a low-income country in Southeast Asia with a population of 29 million. As with other low- and middle-income countries (LMICs) the incidence of cancer is rising in all age groups as the death toll from infectious diseases falls (1). Worldwide the incidence of cancer in children appears to be increasing (2). There is no cancer registry, that covers the entire population in Nepal, but GLOBOCAN estimates for 2020 were 829 cases of paediatric and adolescent cancer (3).

The outcome of children with cancer is better than that of adults and it has improved greatly because of modern developments in treatment and improvements in supportive care (1). Currently more than 80% of children in high-income countries with cancer are cured (1). However, 80% of children with cancer reside in a LMIC and while data on outcome is scarce the survival in a LMIC such as Nepal are low (1, 4). Several factors contribute to this including delays in seeking medical attention, advanced disease at presentation, lack of access to diagnostic tests and lack of adequately trained personnel. Treatment refusal and abandonment are significant issues as is suboptimal critical care, access to surgical expertise, systemic agents, and radiotherapy (1,4). Out-of-pocket payment for treatment is a huge issue in many LMICs including Nepal and is a big factor affecting treatment completion (5). On a positive note, Nepal became a focus country for the WHO Global

Initiative for Childhood Cancer (GICC) in 2020. The aim of the initiative is to achieve at least a 60% survival rate for childhood cancers by 2030. St Jude's Hospital, a WHO collaborating centre for childhood cancer, is supporting Nepal with achieving this goal (6). A major step forward took place in March of 2024 with the announcement of free chemotherapy for children with cancer in Nepal which should address treatment abandonment/refusal due to poverty.

Radiotherapy is an essential treatment modality for most paediatric oncology patients and contributes significantly to cure or palliation (7). One study from a LMIC showed that 33% of children with cancer received radiotherapy at some stage of their cancer journey (8). The aim of radiotherapy in children, as in adults, is to maximize local control/cure/palliation while minimizing late effects. It is recognized that normal tissues in development in childhood are more radiosensitive and children are more vulnerable than adults to the long-term adverse effects of radiotherapy (9). The prevention of these long-term side effects is very important (10). This makes paediatric radiotherapy more complex than adult radiotherapy. In high-income countries children are generally treated with advanced radiotherapy using techniques such as Intensity Modulated Radiation Therapy (IMRT), Volumetric Modulated Arc Therapy (VMAT) or protons to spare normal tissues. For best results radiotherapy should be

given by an experienced and well-trained team in a well-equipped dept with appropriate specialist paediatric support (7,11).

The UK Global Cancer Network (UKGCN) was formed in 2020 with the mission of enhancing the UK's contribution to cancer care in LMICs (12). In 2022 the network joined forces with Irish colleagues and became the United Kingdom and Ireland Global Cancer Network (UKIGCN).

One of the earlier projects undertaken by the UKIGCN was a mapping exercise exploring the extent of cancer-related partnerships between colleagues in the United Kingdom, Ireland and LMICs (13). This project revealed several "hot spots" around the world where there was significant activity related to cancer. One example was Nepal. This led us to invite colleagues who had answered our survey indicating their work in Nepal to attend a meeting to share their experiences. At that meeting there was a clear enthusiasm for future collaboration. We then invited our colleagues in Nepal to recommend an area of cancer care for a joint project. They made us aware of an IAEA/WHO/IARC IMPACT review conducted in 2021 which had highlighted the need for improvements in paediatric radiotherapy. We subsequently conducted a needs assessment of paediatric radiotherapy in Nepal to see how UKIGCN could best assist Nepal in relation to improving paediatric radiotherapy.

Needs assessment

This was conducted in early 2023 and consisted of 19 questions related to the provision of paediatric radiotherapy in Nepal. The questionnaire (survey monkey) was sent to nine centres with radiotherapy facilities. Seven centres responded. Of the seven centres who responded five treated children with radiotherapy. The most significant finding was that children were being treated in these centres by many clinical oncologists none of whom had ever received any specific training in paediatric radiotherapy (Figures 1 and 2). Some of the other issues that came to light following our survey were the lack of (a) clear referral pathways for paediatric radiotherapy patients, (b) multidisciplinary meetings where paediatric cases are discussed in detail before embarking on treatment, (c) dedicated follow-up clinics for children, (d) access of paediatric radiotherapy patients to clinical trials, and (e) local clinical guidelines. Following the needs assessment, it was apparent to us that a UKIGCN project should address

Figure 1: Do residents in Clinical Oncology in Nepal receive and formal training in paediatric radiotherapy during the training programme

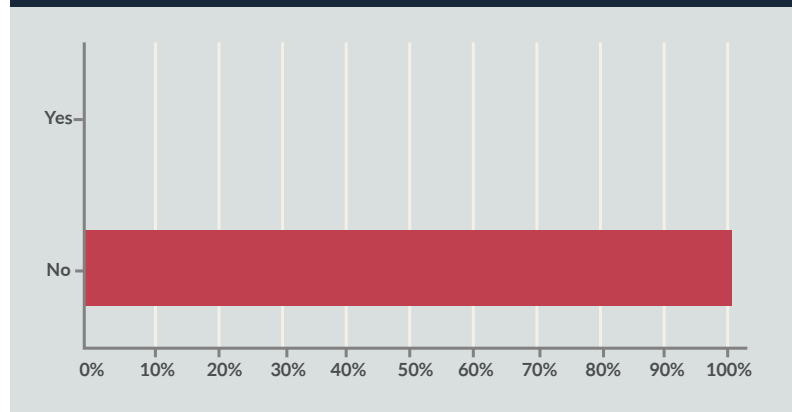
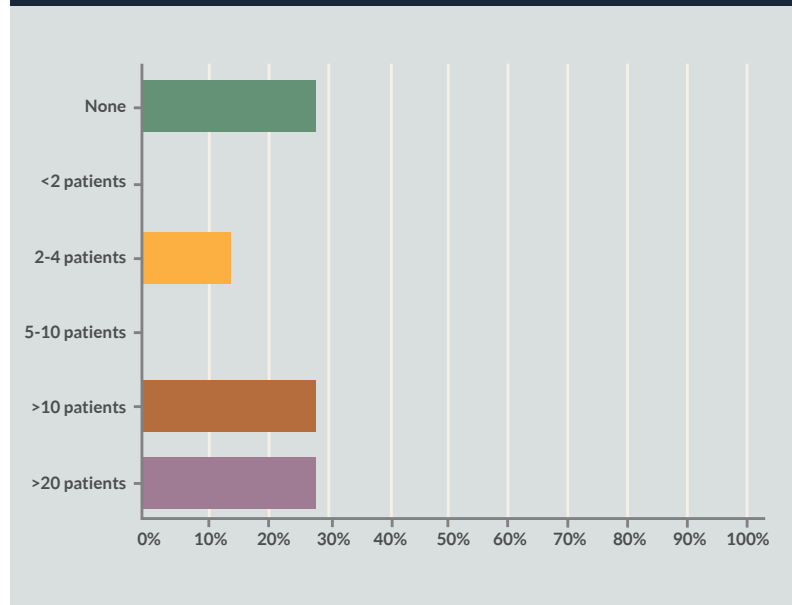


Figure 2: How many children are treated with radiotherapy at your centre per year?



education on paediatric radiotherapy and additionally address the organizational issues mentioned above.

Aims and objectives

Having established a need for training of Clinical Oncologists in Nepal in paediatric radiotherapy, we set about designing a training programme. Our primary aim being to improve the outcome of paediatric oncology patients in Nepal through providing training in paediatric radiotherapy. Our objectives are:

- ➔ to ensure that all children in Nepal will be treated by a Clinical Oncologist who has received specific training in paediatric radiotherapy;
- ➔ to develop a network of Clinical Oncologists treating children with radiotherapy in Nepal who drive the development of the paediatric radiotherapy service in Nepal.

The project

The project is expected to take three years to complete and is

divided into four specific phases (Table 1). We ran an opening evening in Kathmandu in March 2024 to launch the project and there we received feedback from local stakeholders including the World Health Organization (WHO) country office. This led to the design of the four phases of the programme (Figures 3 and 4). We were particularly pleased with the advice and support of WHO who felt our programme aligned well with the recommendations of the IAEA/WHO/IARC IMPACT review of oncology services in Nepal.

Phase 1: We have linked with Children's Cancer and Leukaemia Group of UK and Ireland (CCLG) to conduct the first phase of the programme. They run a virtual didactic CCLG/Christie School of Oncology Paediatric Radiotherapy Course which is designed to provide a basic education for healthcare professionals wishing to specialize in paediatric radiotherapy. This consists of five webinars lasting 90 minutes each conducted over a two month period. The course extensively covers paediatric radiotherapy topics as well as the related topics of surgery, systemic treatment, anaesthesia for children requiring radiotherapy, play therapy and late effects of radiotherapy in children. Between each of the five webinars, a UKIGCN-organized virtual tutorial was planned to enhance learning. Following completion of the didactic teaching there will be a UKIGCN-organized formative assessment which will be used to assess the participants learning. The outcome of this assessment will not affect the candidate's ability to complete the training programme. It will be used merely to see if any additional support would be required.

Phase 2: The next phase of the programme will be a one month fellowship in a centre in the United Kingdom or Ireland. The function of this fellowship will be to consolidate learning and allow the participants to get hands on experience of paediatric radiotherapy under supervision. UKIGCN will take responsibility for organizing the logistics of these fellowships. A training supervisor will be assigned to each participant during the fellowship and be required to provide feedback to UKIGCN.

Phase 3: This phase will start when the participants have returned to Nepal. It focuses on consolidating their learning by applying it to cases seen in Nepal. Each participant will be asked to complete a post training portfolio of 10 paediatric radiotherapy cases. Feedback will be provided by mentors in United Kingdom and Ireland. A certificate confirming completion of training in paediatric radiotherapy will be awarded on satisfactory completion of the portfolio.

Phase 4: This focuses on the development of ongoing relationships between Clinical Oncologists in Nepal who have completed the training programme and mentor Clinical/Radiation Oncologists in Ireland and the United Kingdom. A virtual business meeting facilitated by UKIGCN with an agenda/

minutes will be held every six months to ensure the long-term goals of referral pathways, multidisciplinary meetings, follow up clinics and involvement in research are addressed. It is envisaged that Clinical Oncologist Mentors from Ireland and the United Kingdom will visit partnering institutions in Nepal during this phase. A regular monthly meeting to discuss paediatric radiotherapy cases will be established between the Nepalese Clinical Oncologists and one of the host UK/Ireland hospitals (in rotation).

Table 1: Overview of project activities

Phase 1: Virtual teaching. This is the CCLG/Christie didactic training course in paediatric radiotherapy, the associated tutorials, and the formative assessment.

Phase 2: Short fellowships (one month) for those who have completed Phase 1 to get hands on experience of paediatric radiotherapy in a centre in the United Kingdom or Ireland.

Phase 3: Consolidating learning by the participants producing a portfolio of 10 cases for discussion.

Phase 4: Developing a network of Clinical Oncologists in Nepal who develop the service. Maintaining relationships with centres in the United Kingdom and Ireland.

Figure 3: Launch of UKIGCN project Kathmandu in March 2024



Figure 4: Meeting with Drs Gampo Dorji and Suman Panthi at the WHO Country Office in Nepal



Selection of participants

The participants will be Clinical Oncologists who have completed their postgraduate training. We invited applications for the training course after the launch of the project in Kathmandu. We received a total of 18 applications for eight places. Participants were selected following the completion of an application form and an interview. Selection interviews were held virtually in April 2024. Each interview was conducted by two Clinical Oncologists and an independent observer. Selection criteria for candidates were defined prior to the interview. Preference was given to candidates who were working in centres treating significant numbers of children, who were personally treating children and demonstrated an understanding of the challenges around delivery of a paediatric radiotherapy service. The interview panel sought to identify participants who were committed to completion of all phases of the project and who demonstrated commitment to collaboration with colleagues to drive paediatric radiotherapy services in Nepal forward. The eight successful candidates were asked to sign a learning contract commitment before the programme commenced.

Progress to date

The project started in May 2024 with eight participants attending the CCLG/Christie Paediatric Oncology Virtual Training Programme. This and the associated UKIGCN tutorials were completed by mid-July 2024. The participants have access to the recorded webinars for three months and the formative assessment is due to take place in October 2024. We aim to complete Phase 2 with short fellowships in the United Kingdom or Ireland in 2025 and Phase 3 in 2026. Phase 4 will be an ongoing process.

Measuring success

To measure the outcome of the programme, we will repeat our initial needs assessment to estimate the impact of the programme on the delivery of paediatric radiotherapy in Nepal. We are particularly hoping that our main objectives of (a) children only being treated by a Clinical Oncologist with specific training in paediatric radiotherapy and (b) the establishment of a network of these clinicians in Nepal to drive the service forward will be achieved. We consider evaluation of the programme during each phase to be essential and UKIGCN will conduct a formal evaluation at the end of each phase of the programme.

Discussion

It is recognized that there is a need to improve paediatric radiotherapy in LMICs (14,15). Many of the issues pertaining to paediatric radiotherapy in Nepal had been previously

described in an IAEA patterns of care review of paediatric radiotherapy in LMICs (14). This study highlighted the many differences between paediatric radiotherapy services in high-income versus LMIC. The lack of resources such as diagnostic imaging, treatment machines, staff, and supportive care in LMICs was apparent. Children had more advanced cancers at diagnosis and a far greater proportion were having palliative treatment. The Paediatric Radiation Oncology Society (PROS) LMIC working group recognize the paediatric radiotherapy issues in LMICs and aims to (a) increase access and quality of radiotherapy for children and adolescents afflicted with cancer; (b) enumerate, engage, and educate a global community of providers of childhood and adolescent radiotherapy; and (c) create evidence establishing the outcomes of setting specific treatment standards of care when first-world standards are not achievable (15).

The IAEA and PROS recognize that education is an issue in paediatric radiotherapy in LMICs (14,15) and both organizations have been made aware of this project in Nepal to avoid any duplication of efforts. Education in paediatric radiotherapy has been addressed in sub-Saharan Africa in the PedROC (Paediatric Radiation Oncology (Virtual) Course) project. This was established to increase paediatric radiation oncology capacity, which is a significant challenge sub-Saharan Africa. A comprehensive virtual curriculum in paediatric radiotherapy for a multidisciplinary group of radiotherapy professionals was created. The project demonstrated success as Radiation Oncologists and trainees reported a significantly improved self-confidence following the education particularly with contouring of target volumes in paediatric radiotherapy (16).

Our programme differs from PedROC in that we have confined our programme to eight selected trained clinical oncologists. We felt it was important to limit the number of Clinical Oncologists doing the programme on the basis that ideally paediatric radiotherapy should be performed by a small number of specialists, so they have an adequate caseload to develop expertise. This approach would be very similar to the United Kingdom and Ireland where paediatric radiotherapy only takes place in centres with a sufficient case-load to have the infrastructure and staff that can support the service (7,11). The IAEA patterns of care study also supported specialization of Radiation/Clinical Oncologists in paediatric oncology (14).

We have included a fellowship so that the participants get hands on experience. Short fellowships have been found to be of great benefit in many spheres of oncology (17). We appreciate that they add an additional significant cost but practical experience in a supervised setting as well as developing relationships with the host centre should benefit Nepal in the future. The third phase of our project, a portfolio

of cases post fellowship was recommended to us by local stakeholders in Nepal and the final phase of our project which looks to develop the service came from our initial needs assessment which demonstrated mainly organizational issues which could be resolved.

We must acknowledge that education is not the only issue that leads to a successful paediatric radiotherapy programme. The lack of resources in LMICs such as Nepal cannot be ignored. Nepal currently has only 11 megavoltage radiotherapy machines for a population of 29 million. This and late diagnosis of childhood cancer due to lack of access to healthcare and diagnostic tests need to be tackled if we are to see a substantial improvement in outcome of paediatric cancers in Nepal. However, we are hopeful that training and development of a network of Clinical Oncologists with sub-specialty expertise will facilitate advocacy in paediatric radiotherapy. This and the GICC commitment to improving outcome in children with cancer should lead to an improvement in resources.

Finally, there is a huge need for improving paediatric radiotherapy in other LMICs (14,15). We hope to learn from our programme through rigorous evaluation so that we can improve it in the future and extend it to other LMICs who can benefit from it. ■

This project has been supported by funding from Climbers against Cancer. A UK-based charity with international outreach (<https://www.climbersagainstcancer.org/>).

Aileen Flavin, MB Bch BAO, MRCP, FFRRCSI, MSc is a Consultant Radiation Oncologist currently working in the St Luke's Radiation Oncology Network in Dublin. She has been involved in oncology in Nepal since 2009 playing an educational role with colleagues from the United Kingdom and Ireland. She has been a team member on several IAEA missions in LMICs since 2009. She was the National Cancer Control Plan (NCCP) lead for radiation oncology for Ireland in 2020–2021. She is currently leading the UKIGCN Nepal project.

Ruth Ryan, BSc (Health Service Management), MBA is a General Manager in the National Cancer Control Programme (NCCP) in the Health Services Executive in Ireland. Ruth has worked in the delivery and management of local hospital services and held national roles in the National Hospitals Office and the NCCP, HSE.

Martina Curran is a Management Accountant with over 23 years' experience in Corporate HSE. Currently working in the transport sector in assurance and performance. Martina has made significant achievements in developing strategy and delivering implementation of change programmes in Irish healthcare.

Dr Kirsten Hopkins, MD, FRCP, FRCR (Clin Onc) is a retired Clinical

Oncologist. When practising, she developed a chemotherapy service in Uganda through a hospital link and UK Aid. Recognizing the overwhelming global shortage in radiotherapy access, she moved to the IAEA, where she advised on over 50 development projects and co-ordinated five research projects in LMICs. She also supported WHO initiatives including national cancer service planning, the Joint Global Cervical Cancer Control initiative and the Global Initiative in Childhood Cancer.

Dr Subecha Bhusal is a Senior Clinical Fellow In Clinical Oncology at Maidstone and Tunbridge Wells NHS Trust, UK. After completing her MD in radiation oncology in Nepal, she gained significant experience in India at the Tata Medical Center and The Royal Marsden NHS Foundation Trust. She holds an FRCR in clinical oncology and has a strong commitment to reducing global disparities in cancer care.

Professor Richard Cowan is a Consultant Clinical Oncologist at the Christie Hospital, Manchester, UK and Clinical Professor in Oncology at the University of Manchester. He was Director of the Christie School of Oncology in Manchester 2010–2022 and Chair of the UK and Ireland Global Cancer Network 2020–2024. He sits on the Steering Group of the Kenya UK Health Alliance and is Co-leader of the NIHR Research Grant assessing the implantation of early detection and genomic analysis in oesophageal cancer in Kenya as part of the Christie Hospital/Manchester Cancer Research Centre partnership with the Kenyatta University Teaching Referral and Research Hospital in Nairobi, Kenya.