

Improving the safety of chemotherapy treatment for cancer patients in Uganda

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As the burden of cancer in low- and middle-income countries assumes greater priority for global health workers, attention must be paid to ensuring safety and quality in novel practice. Following on from a longstanding collaboration between the UK and Uganda, we implemented a quality improvement project focusing on safe practice in chemotherapy delivery at a cancer centre in Mbarara, which delivered noticeable improvements for both patients and staff.

The burden of cancer is increasing across the globe. Whilst in high-income countries the resources and infrastructure exist to address this burden, in low-middle income countries the disproportionate number of patients affected by cancer is compounded by a need for far greater investment in the necessary tools to address prevention, treatment and palliation. As progress is undeniably being made in addressing cancer in underserved settings, it is imperative that measures are put in place early to ensure that the quality of novel services is optimal and the safety of patients is paramount. The intensive nature of cancer treatments – often with a relatively narrow therapeutic window – means that attention to safe practice is of particular importance. Treatment modalities used in oncology are inherently potentially hazardous – chemotherapy drugs (or cytotoxics), for example, can cause significant harm if not handled or administered correctly. With this in mind, on the back of an existing partnership between Bristol, UK and Mbarara, Uganda, we conducted an 18-month quality improvement collaboration, to focus on improving the safety of chemotherapy delivery to adult and paediatric cancer patients in Mbarara, as Uganda's countrywide cancer services expand.

Uganda's capital, Kampala, hosts the Uganda Cancer Institute, founded in 1967, and treating approximately 200 cancer patients a day. In a country of 93,000 square miles, with a population of 44.3 million, there has increasingly been a need to expand cancer services to "satellite units" in further corners of the country. Mbarara lies approximately 200 miles southwest of Kampala and is the largest town in Uganda's western region, with a population of approximately 195,000. Mbarara's Regional Referral Hospital (MRRH), a public

hospital founded by the Ministry of Health, provides medical services to the local and regional population, with a catchment of approximately 10 million people. It also serves as a teaching hospital for the Mbarara University of Science and Technology (MUST).

History of the Bristol-Mbarara partnership

In 2000, the University of Bristol and MUST established a paired institutional partnership with support from the Tropical Health & Education Trust (THET) to establish postgraduate training in internal medicine in Mbarara. This was complemented by a formal Memorandum of Understanding between University Hospitals Bristol (UHB) and MUST. The Master's in Medicine (MMed) programme proved highly successful; a number of doctors who graduated from this initial programme continue to work as lecturers at MUST delivering the current MMed curriculum.

In 2012, as non-communicable diseases assumed increasing priority following the successful implementation of HIV programmes, oncology formally became part of the curriculum for postgraduate doctors undertaking the MMed qualification in Mbarara. Oncologists from UHB began to engage regularly with the department of medicine at MUST, providing teaching in the discipline of oncology and liaising with the department to support the future vision of an oncology service at MRRH for cancer patients.

It had become clear that the existing HIV clinic at MUST was seeing an increasing number of patients suffering from Kaposi's sarcoma, an HIV-associated malignancy which, although sometimes manageable with anti-retroviral therapy alone, often requires the use of cytotoxic chemotherapy for

adequate palliation. Paediatric malignancies – particularly haematological malignancies identified after communicable diseases such as malaria had been ruled out – were also evident, and as cancer awareness in the general population increased, so the demand for treatment grew.

What started as a small service quickly expanded, and the cancer clinic at MRRH became the first Satellite Cancer Centre affiliated with UCI, treating patients with a variety of malignancies. UHB supported the development of the clinic with more than 10 inter-institution exchange visits, providing education to nurses and doctors at MUST during this time of expansion. The exchanges took the form of “expert missions” – where experienced staff travel to the recipient’s institution to provide training, advice and “fellowships”, and where recipients travel to host institutions for training and education. Examples of the types of support provided include:

- ➔ Nine expert missions by consultant oncologists for teaching and clinic development.
- ➔ Expert mission by consultant paediatric oncologist for teaching.
- ➔ Expert mission by consultant chemotherapy pharmacist for teaching.
- ➔ Fellowship for MMed trainee from Mbarara to Bristol for oncology training.
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- ➔ Procurement of funds for refurbishment of designated space in Mbarara for oncology clinic, chemotherapy storage and preparation, MDT meetings and chemotherapy delivery areas for adults and children.
- ➔ Procurement of funds for a biosafety cabinet, for preparation and re-constitution of cytotoxic agents.

Identification of need for quality improvement

With more patients attending the cancer clinic in Mbarara came increasing complexity of disease presentations and the subsequent necessary treatment regimens. Staff were delivering multidrug protocols, with complex dosing and critical time-bound delivery requirements. At the same time, they were tasked with handling, preparing, re-constituting and accurately administering these unfamiliar and potentially hazardous drugs, with no formal safety training.

Chemotherapy delivery requires logistical, clinical and administrative support, and in most centres worldwide is managed by a multidisciplinary team of highly-trained specialist professionals. Cytotoxic medications are, by their nature, inherently dangerous drugs which require safe handling, meticulous attention to detail during preparation, and thorough checks of dose calculations and prescriptions. Infusion rates, timing of administration and even the order

in which multidrug regimens are administered must also be strictly adhered to, to ensure the safety of patients and staff. In the treatment of cancer, whether curative or palliative, chemotherapy must be given with the most stringent attention to these safety measures. While both under-dosing and over-dosing can lead to serious consequences for the patient, even giving the appropriate dose incorrectly or ineffectively can lead to adverse consequences – for example, an increased risk of treatment toxicity and risks of harm related to drug spillages, extravasation or drug reactions.

The increasing demand for patients in Mbarara to have access to cancer treatment reflected the progressive shift in prominence of non-communicable diseases in LMICs in recent years. However, the evolution of underlying governance frameworks and specialist training structures required to provide these tertiary services lagged behind the upfront clinical demand, and, despite the positive progress made in Mbarara and the impact of the longstanding partnership with Bristol, challenges remained. Areas that were particularly identified as requiring focus were:

- ➔ No opportunity for specialist training of nurses.
- ➔ No formal role for a chemotherapy-trained pharmacist in cancer clinic.
- ➔ No embedded policy for observing or updating chemotherapy dose protocols.
- ➔ No formal requirement for staff to acquaint themselves with emergency procedures in the event of acute chemotherapy reactions.
- ➔ No benchmark of competency for handling, preparing or administering cytotoxic drugs.

Critical incidents, including failure to follow protocols, inaccurate calculations and dosing, inappropriate fluid regimens and incorrect drug formulations for intrathecal administration, had been observed, with the frequency unknown because of a lack of reporting protocols.

The commitment to providing a safe and effective cancer service in Mbarara was evident from the dedication of the staff working at the clinic and was supported by colleagues from UCI. Regular attendance from UCI’s medical oncologist and chemotherapy pharmacist was instrumental in supporting the growth of the service. However, local training in cytotoxic administration and the associated safety procedures was not formalised and UCI staff had commitments and heavy workloads in Kampala. With ongoing input from colleagues in Bristol, in 2016 a quality improvement project was devised, with the specific aim of improving safety measures in the clinic for the benefit of both staff and patients.

Funding was sought from the UK Government’s Department for International Development, through the THET’s Health

Partnerships Scheme, and ultimately a grant of £80,000 was awarded to support the implementation of the project.

Aims

We specifically aimed to address training in the safe handling, preparation and administration of chemotherapy, to both adult and paediatric patients, in order to work towards providing a safe and accountable chemotherapy service. This required the input of professional staff from various disciplines, including doctors, nurses, pharmacists and pharmacy technicians. A series of bilateral training fellowships and expert missions were arranged, with input from the head of the department of Medicine at MUST, the director of the Uganda Cancer Institute, the chief chemotherapy pharmacist from UCI and all local cancer clinic staff in Mbarara.

Our aim was to provide training which could positively impact the day-to-day running of the clinic, whilst providing a firm foundation of guidelines, standard operating procedures (SOPs), training manuals and other educational materials for future reference. Given the time-bound nature of the project, with finite funding, we planned to create a broad-based, sustainable training structure involving a variety of health professionals, utilizing both formal teaching and practical experience of safety procedures, in order that these staff members could propagate their expertise to future incoming staff, in a waterfall fashion.

Training methods

For practical training, we devised several workplace-based assessment tools, utilising logbooks and sign-off sheets, which allowed staff to practice their skills and ultimately achieve competency in unsupervised practice. In this way, we taught safe cannulation for delivery of cytotoxics, safe set-up of chemotherapy infusions, management of acute complications, such as extravasation and anaphylactic reactions, and safe disposal of cytotoxic waste. Large posters detailing emergency procedures and other useful clinical algorithms for common procedures were placed around the clinic. A laptop computer was provided and training materials, such as PowerPoint presentations, posters, chemotherapy protocols and sample SOPs, were stored there for all staff to access at any time.

We delivered a series of lectures to each cadre of staff, providing training in the basic science of oncology (particularly for newer staff with limited experience of treating cancer patients), and, over time, teaching increasingly specialised material suitable for healthcare providers working in this setting.

Practical demonstrations of procedures and scenarios also formed part of the programme, particularly for emphasising the importance of safe handling of cytotoxic medications

during spillage or leakage incidents. Personal Protective Equipment (PPE) kits were provided, consisting of gloves, gowns, masks and goggles, so that contact with potentially harmful medications was limited in the event of spillage incidents.

Impact and outcomes

An important part of this quality improvement project – and the historical partnership as a whole – was the maintenance of a strong professional relationship between healthcare professionals at our institutions. A key aspect of the project's structure was the inclusion of training fellowships for Ugandan staff in Bristol, through which our oncology teams forged stronger friendships and expanded professional networks. Colleagues from Uganda were able to see the context in which oncology is practised in a westernized, state-funded healthcare system, and to reflect on some of the aspects of care that could be transferred back to the clinic in Mbarara. During the fellowships, we provided practical, on the ground training in aseptic services, pharmacy, chemotherapy delivery and inpatient settings. Doctors also attended clinics and MDT meetings, and all visiting staff spent time on our inpatient ward. For each staff member coming to Bristol, we planned a series of activities through which we aimed to encourage reflection on both the differences and similarities of the journey of the cancer patient in the UK and Uganda. Participating staff reported significant benefits from their visits. Activities that were noted as being particularly beneficial were:

- ➔ Handover meetings – providing an opportunity for shift staff to discuss patient care and managements plans.
- ➔ Documentation practices – accurately recording treatment decisions, chemotherapy prescriptions and drug administration, and any adverse events.
- ➔ Routine double-checking of chemotherapy prescriptions (by pharmacists) and drug administration (by nurses).

These activities were highlighted as priorities for introduction into the clinic in Mbarara, as a way of addressing continuous improvement in safety standards.

The role of the oncology pharmacist was a further specific focus of this quality improvement intervention. One pharmacist was working in the Mbarara clinic, who had general pharmacy training but no chemotherapy-specific formal qualifications. UCI's chief chemotherapy pharmacist had been very involved in the development of the clinic and continued to engage with the team throughout our project. A major focus of the local pharmacist's training was the correct use and maintenance of the bio-safety cabinet that was previously procured for the clinic, but had not been utilised effectively due to a lack of training. We therefore worked closely with our pharmacist

and pharmacy technicians from Bristol to devise a simplified training manual, relevant to the local setting, so that any nurse or pharmacist required to prepare cytotoxic medication was able to use the cabinet and maintain safety requirements. Practical demonstrations and supervised chemotherapy preparation sessions provided useful training, and gave staff a sense of empowerment to use this unfamiliar equipment. A maintenance and cleaning log for the cabinet was drawn up to ensure its continued reliable functioning.

Once this had been established as a fundamental part of the safe workflow process, our team from Bristol concentrated on enhancing the clinic pharmacist's role. We introduced routine screening of chemotherapy prescriptions, looking for dose calculation errors and inaccuracies, and encouraged the pharmacist to take a more prominent role in the clinic. His engagement with the doctors during consultations and when making treatment decisions gave him further confidence in his role and has been a major factor in the improved running of the clinic.

At the end of our 18-month period of planned activities, significant improvements had been made in the day-to-day running of the clinic from a safety perspective. The doctors and pharmacist enjoyed a good working relationship where dose calculations and prescriptions were queried and double-checked without fear of criticism or judgment. An audit of prescription charts showed an encouraging increase in the rate of documented chemotherapy prescriptions which were correctly administered to patients, when compared with the baseline data at the start of the project.

Nursing staff showed demonstrably improved confidence in handling and administering chemotherapy, which motivated them to continue to learn and encourage their colleagues to adhere to safety guidelines. Our institutions remain in close contact and further fellowships and expert missions continue.

Conclusions

Our collaborative experience has highlighted some of the

challenges faced at the grassroots level when addressing the needs of cancer services in LMICs and provided insight into some of the day-to-day activities that can be incorporated into standard practice in these settings to provide safe and effective cancer care to patients. We achieved a noticeable improvement in safety practices within the 18 months that the project was running and with sustainable investment in teaching materials and a close ongoing professional relationship, we envisage further progress and maintenance of high standards in the cancer clinic in Mbarara.

We believe there is a need for other health partnerships and collaborators to report and publish similar experiences of quality improvement efforts, to highlight the needs of individual cancer centres and to provide contextual evidence of their benefits. With greater emphasis placed on the importance of quality improvement and strict adherence to safe practice in cancer centres globally, we can take steps in the right direction across the globe towards effective cancer care for those who need it most. ■

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