Building sustainable Interventional Radiology training and research infrastructure in East Africa.

Nabawanuka et al give us a glimpse into the power of collaboration both global and regional in the development of Interventional Radiology in East Africa.



Dr. Nabawanuka doing a bilateral percutaneous nephrostomy

Background

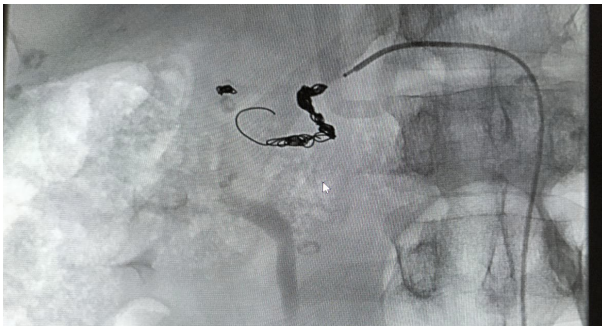
Interventional radiology (IR) is a subspecialty of radiology that uses minimally invasive, image-guided procedures to diagnose and treat various medical conditions. IR has transformed modern medicine by reducing the need for major surgery and improving outcomes for a broad range of conditions, including vascular disease, infection, cancer, and trauma [(1)]. While there have been several published studies worldwide demonstrating the benefit of IR in the implementation of care, there continues to be a lack of awareness of IR has a specialty and its role in patient care regardless of setting location or resources [(2)].

And yet, it is hard to imagine any hospital system in the US, East Asia, or Europe functioning without basic IR procedural services. The advantages provided by IR include lower complication rates, decreased need for general anesthesia, shorter hospitalization, decreased post-procedural pain, and in many cases, ability to treat on an outpatient basis [(2)]. Many procedures, which were previously managed by open surgery, are now almost exclusively treated via minimally invasive, image-guided techniques by IR [(2)].

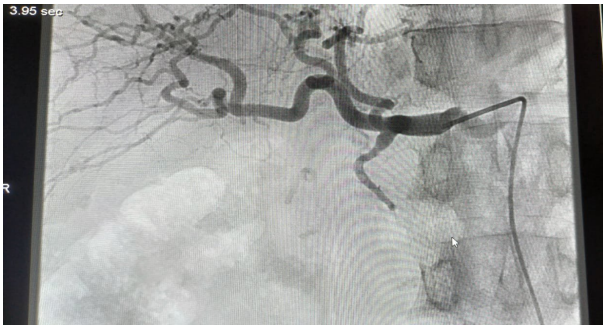
Unfortunately, over half of the global population does not have access to even the most basic Interventional Radiology procedures which are required for improving outcomes for a broad range of indications[(3)]. This disparity is most exaggerated in Sub-Saharan Africa (SSA), where recent publications suggest there is lack of trained Interventional Radiologists in most countries and the majority of the population of 1.2 billion lack access to care [(4)]. To address this need, SSA's first documented training program was established by the Road2IR Foundation, in 2018 at Muhimbili National Hospital in Tanzania. The training model is based on high-frequency teaching trips of international IR faculty, nurses, and technologists, providing hands-on procedural training in-country to Tanzanian IR trainees and staff [(5)]. This program has resulted in 10 fellows graduating with a certificate of Interventional Radiology between September 2021 and August of 2022 with additional fellows, though unpublished as of yet having graduated in the class of 2023 and 2024. Additionally, Tanzania's largest public tertiary referral and academic teaching center, now offers the full range of minimally invasive IR procedures to Tanzanian patients with a total of 1595 procedures reported as performed as of July of 2024 [(4)].

Based on Tanzania's model, a partner training program has been created at Makerere University College of

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Coeliac Artery angiogram showing the Gastroduodenal Artery prior to embolisation



Fluoroscopic image showing coils in the embolised Gastroduodenal Artery

Health Sciences (MakCHS) in Uganda, with visiting IR faculty, nurses and technologists from North America, Europe and Africa. Uganda's first sub specialty radiology fellowship training curriculum was approved by Uganda Medical and Dental Practitioners Council and the pioneer class of three trainees is set to graduate in August 2025. Hands-on training at Mulago National Referral Hospital (MNRH) is provided by international visiting faculty, nurses, and technologists combined with didactic online lectures and other teaching activities. While the majority of visiting teams in Tanzania came from the US, there is now an increased emphasis on regional exchange of knowledge in Uganda, with a higher proportion of teams coming from Tanzania and other African nations. While still lacking robust data in IR specifically, the implementation of regional exchange of teaching facilitates increased inter-continental collaboration which potentially decreases costs, optimizes the use of local resources, and decreases brain drain.

Progress made

The first three Ugandan IR trainees and several of their prospective IR nurses and technologists traveled to Tanzania for one-month observer ships starting in early 2023. In August 2023, training trips with IR faculty, nurses and technologists commenced at MNRH in Kampala. A total of 23 international teaching teams have completed trips to Uganda since program establishment.

During this time, several critical steps have been taken to ensure sustainability and safety while implementing the new program. There have been steps taken to ensure appropriate radiation protection of patients and personnel. Additionally, protocols for commonly performed procedures have been established and a quality assessment program has been implemented. The clinical service is run by the IR trainees, the local radiography and nursing staff with visiting faculty acting as mentors. The local trainees provide longitudinal care in order to assure a sustained service. Ultimately, the first and only public clinical IR service in the country at MNRH has been established. This center is the largest tertiary referral center and training facility for Makerere College of Health Sciences.

A total of 1,389 consultations had been made as of December 2024, resulting in 1,072 IR procedures. The procedures included biopsies (n = 694), thoracocenteses and paracenteses (n=99) abscess drainages (n=56), fine needle aspirations (n=71), sclerotherapy (n = 9), nephrostomies (n =71), biliary drains (n=51) and vascular studies (n=21). Modalities used were Ultrasound (n = 841), fluoroscopy (n = 123), and CT (n = 108). Overall, 372 (34.7%) of these procedures were performed independently, while 700(65.3 %) were performed under direct supervision of visiting teaching faculty.

In order to facilitate continue learning and peer-review to ensure internationally published outcome standards are being met; a peer-review and quality assessment program was implemented in parallel. A comprehensive patient registry with patient demographics, procedure details, adverse events, and clinical outcomes have been continuously documented in a hospital compliant fashion. Additionally, all complications both minor and major as categorized by Society of Interventional Radiology grading criteria are reviewed with visiting faculty.

This ensures a system that has the ability to track and monitor procedural and clinical outcomes for the sake of long-term sustainability and safety of the specialty in Uganda. This has also facilitated regular iterative and adaptive modifications to the structure of the program so that patient needs in the specific setting of Uganda are met.

Collaboration

The development of this program is a collaborative effort of the Road2IR Foundation, the Ugandan Ministry of Health, MNRH, MakCHS, and several partner institutions in the US, including Emory, Harvard, and Yale Universities.

The training institutions in Uganda and Tanzania have a long history of collaboration with strong support by radiology and hospital leadership on both sides.

We are further supported by the Association of Radiologists of Uganda (ARU) and the Society of African Interventional Radiology and Endovascular Therapy (SAFIRE) as well as the European Institute for Biomedical Imaging Research (EIBIR).

What we have versus what we can get

While there have been 1072 procedures performed at the time of manuscript preparation, there are still several on-going challenges that will need to be addressed. For example, a 62-year-old male was referred to MNRH from one of the private facilities in the city following



Mulago IR team doing the first Gastroduodenal Artery (GDA) embolization in the country at the Uganda Heart Institute facility

three weeks hospitalization with progressive vomiting of blood and passing black stools. A computed tomography scan done had showed a blood clot in the duodenum and a diagnosis of upper gastrointestinal hemorrhage had been made. The patient was scheduled for surgery but was not stable enough for the procedure, and Interventional Radiology was consulted for bleeding control. Interventional radiology was able to perform catheter directed therapy via a small needle access into the right common femoral artery and block the bleeding gastro duodenal artery with coils. The patient stabilized and was discharged home 2 days after the procedure.

While the above procedure illustrates the ability of IR to treat patients in acute settings, there are several challenges which are still being evaluated. Currently, complex procedures can only be done at the Uganda Heart Institute which results in limited equipment availability and long patient wait times even in bleeding or unstable patients. The above patient required a week long wait before he was able to be treated. In more acute cases such as postpartum hemorrhage (PPH) or massive pulmonary embolism, this type of waiting time would not be feasible although IR could rapidly treat those patients without surgery. While access to imaging equipment is still a limitation, there are several ongoing discussions regarding improving access to imaging infrastructure to improve patient care. Additionally, there are on-going challenges with access to consumable equipment due to cost, lack of direct engagement, and lack of locally produced equipment. These needs are in an on-going state of discussion with direct engagement with some manufacturers to facilitate lower cost and more easily available consumable equipment.

Impact

Through international collaboration, the institution has successfully leveraged experiences from Tanzania and replicated this training model in Uganda. The infrastructure for organizing safe, efficient, and cost-effective travel to East Africa via Road2IR is already in place and there is a large and ever-growing network of IR physicians, nurses, and technologists from which to recruit.

The training program in Uganda will serve as a catalyst for the development of additional IR programs in Africa, thereby creating a domino effect with growing infrastructure, scientific environment, specialty societies, academic exchange, local production of IR equipment, and associated economic opportunities.

Most importantly, clinical outcomes have been improved by interventional radiology for the people of Uganda.

Conclusion

Global health efforts enhance transfer of interventional radiology knowledge and skills to trainees in resource limited settings in an evidence based and sustainable manner.

References

1. Baum RA, Baum S. Interventional radiology: a half century of innovation. Radiology. 2014;273: S75–91.
2. Ali Dablan, Hamit Ozgul, Yigit Can Kartal, Ali Fuat Tekin. Comparative analysis of interventional radiology awareness: insights from Turkey, the USA, and Europe using Google Trends data. Clinical Imaging PMID: 40349578. DOI: 10.1016/j.clinimag.2025.110491
3. Charalel RA, McGinty G, Brant-Zawadzki M, Goodwin SC, Khilnani NM, Matsumoto AH, et al. Interventional Radiology Delivers High-Value Health Care and Is an Imaging 3.0 Vanguard. Journal of the American College of Radiology. 2015. pp. 501–506. doi:10.1016/j.jacr.2014.10.024
4. Alswang, Jared M. et al. Creating a Sustainable Foundation for IR Services and Training in Sub-Saharan Africa: 5-Year Update on the Road2IR Initiative. Journal of Vascular and Interventional Radiology, Volume 35, Issue 7, 1049 - 1056
5. Laage Gaupp FM, Solomon N, Rukundo I, Naif AA, Mbuguje EM, Gonchigar A, et al. Tanzania IR Initiative: Training the First Generation of Interventional Radiologists. J Vasc Interv Radiol. 2019;30: 2036–2040.