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[10.1093/crival/vaw009](https://doi.org/10.1093/crival/vaw009)



Pathology in Southwest Uganda: Teaching, Mentoring, and Capacity Building

Between August 2014 and July 2015, Dr. Meier taught as a visiting professor at Mbarara University of Science and Technology (MUST) in Uganda, where he mentored pathology resident-equivalents and worked on capacity building in the pathology department. ASCP facilitated support for his time there.

Mbarara University of Science and Technology (MUST)
MUST, which began 26 years ago as the second medical faculty in Uganda, hosts the Massachusetts General Hospital (MGH) Global Health Collaborative, through which Seed Global Health volunteers come to train and work

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Dr. Meier and Professor Damaris Laffita review a case with MUST pathology MMeds, resident equivalents.

with Ugandan medical and nursing personnel. As a temporary employee of the pathology department of MGH, I came to Mbarara to contribute to Seed's effort for the academic year 2014-2015.

My colleagues at MUST included teachers and practitioners from Cuba, Great Britain, Germany, Canada, Australia, New Zealand, and organizations such as Seed and the Peace Corps Response, the latter part of the Global Health Service Partnership. Damaris Laffita, professor of pathology at MUST and an excellent, patient, and kind

colleague, is the only full-time onsite pathologist at the university. She combines a knowledge base and technical vocabulary familiar to North American pathologists with experience in making defensible diagnoses in resource-constrained settings, an advantage for practice in Africa.

Teaching at MUST

Each semester I taught 20 large-group lectures, all with associated practical sessions. Seventy second-year medical students, as well as another 40 nursing and allied

health students, attended lectures on general pathology, and similar numbers of third-year students attended lectures on systemic pathology topics. During the spring 2015 semester, Professor Damaris and I also conducted daylong seminars and tutorials on pathologic topics relevant to residents in surgical specialties (general surgery, obstetrics/gynecology, and ophthalmology) as well as for master's-degree candidates in medical technology.

While teaching pathology to medical and other allied health students in Mbarara was a great pleasure, it required a major investment of time and effort—from composing PowerPoint presentations to preparing and correcting examination questions. We projected PowerPoint slides onto walls and purchased a battery-run projector, so lectures or practical hours could continue when electrical power failed. My wife, working as a volunteer, prepared PowerPoint presentations and assisted with grading; her help allowed me more time to spend with the resident equivalents (called “MMeds” in Uganda).

Mentoring at MUST

I mentored three pathology MMeds. The MGH Global Health Collaborative supported their pathology specialty training with Paiko scholarships. In conjunction with Professor Damaris, I supervised cutting-in of specimens, looked together with the MMeds at all surgical cases, heard weekly tutorials, and provided direction for their research projects. Working with the MMeds was the heart of my Seed Global Health assignment at MUST. The MMeds' intelligence, industry, and good humor made this core activity a source of great satisfaction.

The opportunity to help young colleagues flourish professionally, and to cultivate their talent and industry over 10 months, was a special gift to this old practitioner. MGH Pathology's donation of a four-headed microscope, which arrived with me, (see photograph on previous page) was the main support for the core activity of looking at clinical cases together. The cases conducted a course of education for us all, even when teachable moments taught us to deal with the mental state of being completely perplexed by the patterns on the slides. Over our time together, we worked out diagnostic approaches to, for example, lymph nodes (very challenging), skin biopsies (widely diverse), cases of intestinal obstruction (more often benign than malignant),



In the MUST histology laboratory a technician performs hematoxylin and eosin staining by hand.

and cases of intestinal perforation (often due to typhoid fever), as well as splenomegaly (not always malarial).

During my stay, two other activities presented further opportunities to facilitate MMeds' professional growth. First, the second year and third year MUST MMeds made six-week visits to the Aga Khan Hospital (AKH) in Nairobi, Kenya, an endeavor also financially supported by Paiko scholarships. At AKH, the MMeds observed and learned in a large teaching pathology department at a medical center committed to ISO performance standards, engaged with an African mix of cases. Dr. Drucilla Roberts of MGH Pathology, who also supervised my activities, organized the learning content of this year's visits, and Dr. Shahin Sayed, section chief at AKH and a previous academic visitor in Boston, supervised the MMeds in Nairobi.

Second, the MMeds' research projects offered another mentoring opportunity. Their studies, on pathologic appearances of placentas of growth-restricted babies, prognostic pathological features in mastectomy specimens, and similar features in eyes resected for retinoblastoma, all touched on clinically relevant issues in Mbarara. MMeds at MUST perform research in a setting that requires patience, persistence, flexibility, and inspired ingenuity, along with the usual demands for orderly thought, clear exposition, attention to practical detail, and management of administrative oversight.

Capacity Building at MUST

In pathology, professional development and technical capacity building intertwine tightly because the quality of histological slides is critical to the quality of pathological diagnoses. The detail of technique—what needs to be done, how to do it, how to evaluate whether what was done works—is important; however, the amount of detail necessary sometimes distracts from the equally necessary task of encouraging colleagues to make changes. Polite, patient, and personal long-term commitment to improving clinical care and to professional training has to come first—followed by lists of major barriers to overcome. Otherwise, interlocutors hear “everything is wrong and nothing is right,” and lists, which are necessary steps toward improvement, become barriers to amelioration.

Capacity building defines structural challenges so they can be overcome, then overcomes them. At places like MUST, making structural changes calls on self-control and moderate action from everyone involved. Successful changes in equipment and procedures integrate with

simultaneous cultivation of colleagues’ talents; their knowledge and skills are the essential human resources.

Five major barriers to capacity in pathology presented themselves for this sort of action at MUST: (1) Challenges in initial specimen handling (preproduction features that affect specimen quality); (2) challenges early in slide production that lead to technically inadequate histological sections that take too long to produce; (3) Challenges in later production steps that increase variability in slide quality and mislabeling; (4) Difficulties with patient and specimen data acquisition and management that interfere with timely, clinically relevant reporting; and (5) Unreliable availability of reagents and consumables for slide production.

We used a “lean” approach to define preproduction and production barriers, then discover remedies for them. Unavailability of adequate fixative, appropriate specimen containers, and labels, absence of procedures to deliver specimens to pathology, difficulty obtaining missing clinical information, and batching specimens were all salient

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defects in the preproduction steps of specimen collection, transport, and accession. With a personal understanding of the challenges, Dean Samuel Maling of the MUST medical faculty organized a workshop for suppliers of surgical pathology specimens. At the workshop, I presented requirements for adequate formalin, acceptable containers, accurate labels, and appropriate requisitions. We distributed a redesigned requisition form, solicited providers' mobile telephone numbers for a contact list, and simultaneously presented the pathology department with its own mobile telephone, whose number was printed on the new requisition.

Unscheduled cutting-in of specimens had produced inadequate, handwritten records of specimen appearance, measurements, and sampling schemes. The 15-year-old tissue processor took 23 hours to fix and paraffinize tissues, harming them in the process. Difficulty in obtaining reagents and variable electrical power added more delay. With MGH support, we had color-coded specimen storage shelves built locally; these shelves separated specimens that had arrived for gross description and sectioning (red) from those in process (yellow) and those ready for discard (green). At the urging of Dr. Roberts, MGH Pathology financed installation of an inverter-battery electrical system, a very important change. The system now provides steady power for MUST Pathology to protect devices from sudden surges and failure of stream, and to end "no power today" processing delays. The MGH Department also paid for a new embedding device, which permits use of a modern microtome, which MGH had already donated.

From the point in process improvement that we have now reached, we not only look to improve later steps of slide production but also aim to improve pathology report generation, transmission, and storage/retrieval. A combination of smartphones, tablets, and scanners can acquire patient and specimen information, construct gross descriptions and diagnostic reports, then transmit, store, and retrieve reports. Building a smartphone-centric pathology information system because it fits African *technical* circumstances brings up an important axiom of relevant *human* capacity building. Two differences in technical platforms between resource-replete and resource-constrained settings make an argument for training African pathology practitioners in their own practice situations and for devising novel solutions to diagnostic challenges onsite in Africa. First,

training practitioners from environments with constrained resources in resource-replete settings ill prepares them for effective practice when they return home. In addition, technological change's steep slope in resource-replete settings makes training there less and less relevant to the future in resource-constrained circumstances.

The Horizon of Cancer Pathology in Mbarara

While my wife and I were at MUST, a major cancer care initiative underway in southwestern Uganda increased interest in cancer pathology there. Differences and similarities between neoplasms seen by pathologists in Mbarara and tumors presenting in Europe or North America are important to shaping appropriate cancer care in a Southwest Ugandan setting.

In one striking difference, at Mbarara, the most frequently encountered malignant tumors in men (Kaposi sarcoma), women (cervical cancer), and children (Burkitt lymphoma) all fall into the virally induced category. In southwest Uganda, virally induced neoplasms also present both with and without HIV amplification. Tumors with both HIV+ and HIV− epidemiology include not only human herpesvirus 8 (HHV8)-induced Kaposi sarcoma, Epstein-Barr virus (EBV)-induced Burkitt, and diffuse large B-cell lymphomas, but also human papillomavirus (HPV)-associated cervical carcinoma and EBV-induced nasopharyngeal carcinoma. In contrast, lung cancer—the most common (and primarily carcinogen-induced) major carcinoma in North America and Europe—is rare in Mbarara, most likely a happy consequence of the low frequency of cigarette smoking in Uganda. Among gastrointestinal (GI) tract cancers in Mbarara, squamous carcinoma of the mid-esophagus presents relatively frequently, and its carcinogenesis is vigorously debated; in contrast, adenocarcinomas of the lower esophagus appear to be rare. Further, among GI-tract cancers in Mbarara, pathologists are relatively often called upon to characterize adenocarcinoma of the stomach, but rarely presented with cases of colorectal carcinoma.

Other Africa-specific variations among neoplastic proliferations also come across a pathologist's desk in Mbarara. Ocular surface squamous neoplasia (OSSN) is much more frequent in Sub-Saharan Africa than elsewhere, with, again, cases presenting in both endemic (HIV−) and

epidemic (HIV+) settings. Extended exposure to direct rays of tropical sunlight in rural environments, where people work outside through long hours of intense daylight, seems to be the primary risk factor for OSSN.

Other differences have to do with the demographic structure of Europe and North America vs. that of African populations. A general pathologist in Mbarara encounters many more tumors of childhood and adolescence, retinoblastoma, and bone and soft tissue sarcomas, and fewer tumors of old age, adenocarcinoma of the prostate, and endometrial carcinoma, than he or she would in North America.

Gynecological tumors also present in different patterns. Gestational trophoblast disease is more common than in Europe or North America, but less common than in south and southeast Asia. Teratomas are also more common, but whether this is a matter of demographics alone or a compound of multiple factors remains a matter of speculation. Other ovarian neoplasms are also more frequent; they include a wide spectrum of epithelial, stromal, and sex cord tumors to challenge a non-specialist pathologist.

In company with these contrasts in cancer pathology, two tumors appear to have similar epidemiology in the developed world and in Mbarara: breast cancer (the second most common cancer in Ugandan women) and thyroid neoplasms. Differential diagnoses of these two entities enlivened Professor Damaris's FNA clinics.

A final, rather frequent diagnostic challenge in general pathology practice in both Mbarara and more developed settings is separating malignant and benign lymphoid proliferations, then classifying them. In Mbarara, lymphomas are usually classified without immunohistochemical panels or molecular diagnostics.

Oncology Outreach at MUST

The MGH/MUST Collaborative hopes to develop a cancer program that will manage the gap between resource-replete and resource-constrained oncological diagnostic and therapeutic platforms.

In 2014-15, on the diagnostic side of this task, we tried, among other tactics, to narrow the resource-constrained

to resource-replete diagnostic gap in selected cases by exchanging emails between MUST and MGH Pathology containing clinical and specimen information and iPhone-acquired gross and microscopic images. Narrowing the gap proved most effective in diagnosis of lymphoproliferative disorders and diagnoses of soft tissue and osseous sarcomas.

In 2016-17 we hope to take advantage of the ASCP-led initiative to acquire digital images of histological sections and send these images by satellite from Africa to North America. In southwestern Uganda, the MGH/MUST Oncology Outreach's initial objectives are to characterize disease stage adequately and monitor effectiveness of palliative treatment. Subsequent objectives will support local efforts toward earlier detection, particularly to try again to instigate *sustainable* cervical cancer screening in Ugandan settings. Other initiatives may entail immediately linking diagnostic FNA to breast self-examination or to village health workers' ultrasound breast examination.

Africa's Fascination

Many pathologists' particular fascination with places such as Mbarara stems from this realization: *Most pathology is one part of the world, and most pathologists are in another; a pathologist in Africa helps redress the balance.*

Practice in Mbarara developed a preference for small-scale, personal, and communal action, in contrast to large-scale, systematic, and social initiatives. Personal relations inform teaching; they especially inform mentoring and also successful capacity building.

People in North America who are considering working in small African medical settings and African friends who host expatriates in such settings, may ponder this wise sentence (not mine), which arose from time spent with Ugandan colleagues and friends: "*We in the North are often the ones who receive the net benefit by living and working with purpose in a welcoming community.*"

This is the context in which we are bringing pathologists to the pathology in Africa.

Dr. Meier is an Associate in Pathology and Diagnostics for Seed Global Health.

Morphologic spectrum from therapy-related myelodysplastic syndrome to acute myeloid leukemia with erythroid differentiation. Image by Magdalena Czader, MD, PhD, and Attilio Orazi, MD, FRCPath from the September 2009 issue of *AJCP*, with permission to use from ASCPedia.