

Improving health equity through sustained academic partnership: development of a maternal-fetal medicine fellowship training program in Western Kenya



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Low- and middle-income countries are underresourced in subspecialist care. This study describes a unique maternal-fetal medicine clinical fellowship training program at Moi University School of Medicine and Moi Teaching and Referral Hospital in Eldoret, Western Kenya. The first of its kind in Eastern Africa, it has met with success in the retention of highly qualified practitioners providing complex pregnancy care to a population that has been heretofore underserved.

Key words: global health, perinatal outcomes, maternal morbidity and mortality

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Introduction

Huge disparities in outcomes among pregnant women continue to exist worldwide. In the African region in 2020, the maternal mortality rate was 69% of global maternal mortality, accounting for 531 deaths per 100,000 live births.¹ Many organizations have implemented strategies to address this gap. Regionalization of perinatal care is a successful strategy that allows complex pregnancies to be managed in tertiary-level centers with subspecialists in maternal-fetal medicine (MFM).^{2,3}

MFM subspecialty training traditionally requires prospective trainees from low- or middle-income countries (LMICs) to travel to high-income countries (HICs) for access to clinical and didactic teaching resources that provide current and often “state-of-the-art” diagnostic and intervention services. Although training within this traditional model offers opportunities for the transfer of knowledge and skills from HIC to LMIC settings, barriers exist to achieving the full benefit of this educational approach in terms of both access to training and implementation of newly acquired skills. Examples of such barriers include the financial cost of tuition and significant cost of living expenses, which will exclude many from training opportunities in

HIC. Once completed, the subspecialist returning to an LMIC setting may find that their newly acquired skills are not directly transferable to the local setting because of a lack of infrastructure, which has remained unchanged in their absence. They may wish to remain and work in the HIC for training, further widening the gap in subspecialized care globally. Sustainable training models without the need for relocation provide an alternative to overcome these educational barriers.

We report on a unique model of MFM fellowship training in which the program is based in the LMIC local setting, which, in this case, is in Eldoret, Kenya (with a University of Toronto donor-funded rotation in an HIC). Training in place via an academic partnership model simultaneously builds the crucial program infrastructure required to improve perinatal outcomes and provides critical skills development applicable to the local patient population, translating early improvement of care to underserved patients who are most at risk of adverse outcomes.

The people: the Academic Model Providing Access To Healthcare model

This MFM training program evolved within a long-standing academic partnership infrastructure: Academic Model

Providing Access To Healthcare (AMPATH). The AMPATH consortium is a network of academic health centers in the United States, Canada, and Europe that fosters long-term academic partnerships with host country public health facilities and universities serving populations in low-income settings.⁴ “Leading with care” defines the central tenet of the partnership, which is based on addressing patient needs via an academic model encompassing clinical care, research, education, and partnerships with community care and political entities that oversee health policy. The partnership is centered on equity, and the model empowers host country leadership in terms of setting priorities and directions.

The process: the Moi University/University of Toronto partnership in reproductive health

In 2007, the University of Toronto became a partner in the AMPATH Consortium, in collaboration with Moi University (MU) and the Moi Teaching and Referral Hospital (MTRH) (both in Eldoret, Kenya) in the reproductive health program. The University of Toronto faculty and supervised trainees (medical students, residents, and fellows) are hosted by MU for on-the-ground teaching and clinical care and research participation. Moreover, the MU faculty and trainees are hosted at the University of Toronto. Following this collaborative training program for postgraduate obstetrics and gynecologic residents, subspecialty training began in 2012, first in gynecologic oncology and then in MFM in 2019.

The Moi University/University of Toronto maternal-fetal medicine training program

Before starting clinical training in January 2019, a 2-year curriculum for MFM was created within the vision, mission, and core values of the MTRH Directorate of Reproductive Health and the MU School of Medicine and Department of Reproductive Health. Prerequisites to enrollment included holding Doctor of Medicine and Master of Medicine (obstetrics and gynecology residency)

degrees at MU or an equivalent university recognized by MU and being registrable for general and specialist practice by the Medical Practitioners and Dentists Board of Kenya. The specific expected outcomes were to demonstrate medical/clinical expertise in MFM for the patient and community at large; show leadership and collaboration in health systems management concerning MFM; demonstrate scholarship through participation in teaching, research, innovation, and lifelong learning; extend professionalism in the practice of MFM; demonstrate health advocacy in the prevention and management of high-risk pregnancies; and show effective communication in both MFM and the larger healthcare systems. In line with traditional HIC MFM training programs, the clinical expertise learning objectives centered around advanced fetal diagnosis and care of pregnant individuals with medical disorders.⁵ We aligned these expected outcomes and objectives with metrics of competence via established subspecialty training and standardized examination requirements of the Royal College of Physicians and Surgeons of Canada (RCPSC), providing an international benchmark for MFM training.^{6,7} As with other AMPATH initiatives, a goal of the MFM training program was to transition over 6 years from a University of Toronto–lead program to a self-sustaining MU-run fellowship with ongoing partnerships with HIC settings (University of Toronto and other North American academic consortium partners). Initially, it involved significant “on-the-ground” teaching (attending inpatient rounds and outpatient clinics, ultrasound teaching, and lectures) by mentors from HIC via university donor–sponsored and self-funded teaching trips, with licensing provided by the Kenya Medical Practitioners and Dentist Council. This in-person teaching was supplemented by virtual teaching rounds, as described below (by HIC faculty), and fellow self-study sessions (self-monitored), guided by the core textbook of Creasy and Resnik entitled “*Maternal-Fetal Medicine: Principles and Practice*”⁸ and the international

guidelines on the management of pregnancies complicated by medical and fetal disorders. A concentrated course in clinical epidemiology was jointly delivered by the University of Toronto and MU. Finally, a combined practicum and didactic course in Community-Based Education and Service in reproductive health was delivered by MU to include the crucial component of connecting tertiary MFM with primary antenatal care in rural referral areas.

The first 3 fellows (2019 and 2020) were MU and hospital staff consultants with more than 5 years of clinical obstetrical experience, allowing them to exercise their clinical expertise and licensed consultant status while increasing their subspecialty skills in fetal diagnosis and medical disorders or pregnancy. In addition, their senior status at MU and in the MTRH department facilitated the simultaneous development of crucial relationships with experts in neonatology, subspecialty medicine, radiology, pediatric/adult surgery, and nursing/midwifery, as necessary, to form interdisciplinary care teams for pregnant patients with complex fetal and/or maternal disorders. Although challenging as many of these specialties were not familiar with the skill set and added value of MFM, on-site training with known senior obstetrical consultants allowed for more efficient networking and infrastructure changes as the training program proceeded.

A donor-funded ultrasound machine that provided high-quality obstetrical imaging was a crucial acquisition. A standardized curriculum for ultrasound foundational teaching was donated by the Burwin Institute.⁹ Fellows completed online assignments and an online examination for each module, of which they received a certificate of competence in obstetrical ultrasound consistent with the requirements of the American Registry for Diagnostic Medical Sonography.

Between 2019 and 2023, 1 to 2 fellows were recruited each year via a competitive process with standardized interviews in the MTRH/MU department. With each successive recruitment, local

graduate faculty (the first 3 remaining at or affiliated with MTRH/MU) adopted more program administration, teaching, and evaluation functions.

In March 2020, all travel was halted because of the COVID-19 pandemic. Despite this significant setback, the program rapidly pivoted to an online curriculum composed of weekly virtual teaching alongside the University of Toronto MFM fellows (where in-person rounds were also prohibited). These included weekly sessions at Mount Sinai Hospital and Toronto-based fetal imaging case reviews, didactic fetal medicine rounds, didactic maternal medicine rounds, and review of current active MTRH case reviews using cloud-based software for fetal ultrasound imaging review.

Standardized examinations were set following the RCPSC examination standards for Canadian MFM fellows. Of note, 2 written examinations are invigilated and marked by internal and external (invited HIC) examiners after the first and second years. This approach is complemented by a clinical examination component of observed demonstration of competence and standardized marking of real-time ultrasound encounters and observed encounters with patients with complex maternal medical disorders. The internal and external examiners mark independently and meet and compile a mark for each component of the examination, with an overall minimum pass mark of 70%. During the COVID-19 pandemic (between March 2020 and October 2022), this procedure was performed entirely virtually, with written examinations marked by the examiners remotely and the clinical component composed of virtual case presentations of ultrasound competence (still images obtained by the fellow) and fetal and medical disorders.

Finally, each candidate was required to complete a research project and submit it for presentation at a Kenyan or international meeting.

After successful completion of all components of the program, fellows are awarded a certificate of clinical fellowship in MFM at MU. This certificate

allows graduate fellows to be recognized by national medical boards as subspecialists and able to legally practice.

The impact

Notable advancements in several domains of clinical care, education, and research have been achieved in the short history of the program, exemplifying the “leading with care” model of AMPATH.¹⁰ Challenged by administrative limitations in recording diagnostic codes and maternal and neonatal outcomes, we cannot yet provide a robust analysis of clinical effects. However, we present process changes that would be expected to and anecdotally have positively affected clinical outcomes. For example, the use of detailed fetal Doppler assessments on which management decisions are now made permits patients with evolving preeclampsia to gain critically later gestational ages. Patients with advanced rheumatic valvular heart disease are now delivered in the cardiac care unit with hemodynamic monitoring, regional anesthetic, and planned operative-assisted vaginal births. Patients with fetal anomalies and complex fetal conditions are counseled by MFM and pediatrics, offered options and shared decision-making, and involved in the plan for individualized management, ranging from palliation, interruption of pregnancy, or local availability of fetal therapeutic procedures, such as amnioreduction and, most recently, intrauterine fetal transfusion, the first performed in the region.¹¹

In addition, the MFM program has affected clinical teaching in the reproductive health program for residents, undergraduate medical students, and nursing students at MTRH. Inpatient and outpatient services have expanded to include an increasing array of allied specialty involvement for the management of complex pregnancies, including cardiology, endocrinology, pediatrics, and internal medicine. Finally, the program has positively affected further development in clinical subspecialty fellowships in these services, adapted from the template for those in the reproductive health program.

As of 2023, 5 trainees have completed the program. Recruitment is ongoing for the sixth year with 10 applicants from East Africa for 2 positions. Moreover, 4 graduates have remained at or returned to MU, providing MFM services and education on-site and further growing the profile of the academic and clinical programs. Of note, 1 graduate is providing services in Nairobi (Kenyatta Hospital). Program graduates support each other virtually during challenging cases. MFM graduates have linked with private hospitals, including the Aga Khan Hospital in Nairobi, where there is also a consulting MFM service. Graduated fellows are forming a Kenyan MFM society and attending and presenting at international meetings.¹² With each successive year, the curriculum and evaluation functions fall increasingly to MU faculty. By 2027 (6 years after completion of the first fellows), the program will be fully administered by MU.

Conclusion

Our study demonstrates a unique model of education for MFM that blends training that adheres to standards in a high-income country with the contextualized needs and priorities of an LMIC setting in full partnership. The training results in rapid, demonstrable improvement in outcomes while simultaneously building a multidisciplinary team, health administration support, and community referral network to improve maternal and perinatal outcomes sustainably and incrementally. This program is new in East Africa. ■

CRediT authorship contribution statement

David Nding'ori: Conceptualization, Data curation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Rachel F. Spitzer:** Conceptualization, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Julia Songok:** Writing – review & editing. **Marie Buitendyk:** Conceptualization, Writing – review & editing. **Pal-lavi Mishra:** Conceptualization, Writing – review & editing. **Wycliffe Kosgei:** Conceptualization, Writing – review & editing. **Bett Kipchumba:**

Conceptualization, Writing – review & editing. **Mutindi Kakuti:** Conceptualization, Writing – review & editing. **Philip Tonui:** Conceptualization, Project administration, Writing – review & editing. **Karen Fung-Kee-Fung:** Writing – original draft, Writing – review & editing. **Heidi Leftwich:** Writing – original draft, Writing – review & editing. **Adrian Gardner:** Writing – original draft, Writing – review & editing. **Paul Nyongesa:** Conceptualization, Writing – review & editing. **Nanette Okun:** Conceptualization, Data curation, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. ■

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