

The East African Training Initiative

A Model Training Program in Pulmonary and Critical Care Medicine for Low-Income Countries

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Abstract

Despite an extensive burden of lung disease in East Africa, there are remarkably few pulmonary physicians in the region and no pulmonary subspecialty training programs. We developed a unique training program for pulmonary medicine in Ethiopia. The East African Training Initiative (EATI) is a 2-year fellowship program at Tikur Anbessa (Black Lion) Specialized Teaching Hospital, the largest public hospital in Ethiopia and the teaching hospital for the Addis Ababa University School of Medicine. The first year is devoted to clinical care and procedural skills. Lectures, conferences, daily inpatient and outpatient rounds, and procedure supervision by visiting faculty provide the clinical knowledge foundation. In the second year, training in clinical research is added to ongoing clinical training. Before graduation, fellows must pass rigorous written and

oral examinations and achieve high marks on faculty evaluations. Funding derives from several sources. Ethiopian trainees are paid by the Ethiopian Ministry of Health and the Addis Ababa University School of Medicine. The World Lung Foundation and the Swiss Lung Foundation supply travel and housing costs for visiting faculty, who receive no other stipend. The first two trainees graduated in January 2015, and a second class of three fellows completed training in January 2016. All five presented research abstracts at the annual meetings of the International Union Against Tuberculosis and Lung Disease in 2014 and 2015. The EATI has successfully provided pulmonary medicine training in Ethiopia and has capacity for local leadership. We believe that EATI could be a model for other resource-limited countries.

Keywords: training; education; pulmonary; Africa

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Health care challenges in low- and middle-income are enormous. Life expectancy in these nations is much less than in high-income countries. This gap reflects social, economic, infrastructure, demographic, and medical challenges. The prevalence of infectious diseases and the prevalence of chronic and noncommunicable illnesses are substantial. Respiratory disorders are prominent in both categories. Acute respiratory infections are the leading cause of death among children under the age of

5 years in most resource-constrained countries, and tuberculosis remains among the leading causes of death in the world (1). Chronic obstructive pulmonary disease (COPD) and lung cancer currently rank among the top 10 leading causes of death in the world (2, 3), and global morbidity due to asthma is enormous (4).

The importance of lung disease in the world, especially in low- and middle-income countries, demands a cadre of physicians trained not only in the diagnosis and

treatment of such disorders but also in public health aspects of respiratory illness. At present, no such cadre of physicians exists, and, in fact, it is very difficult to identify precisely the number of specialists and subspecialists in regions such as sub-Saharan Africa.

Data from the World Bank indicate that the lowest-income countries in the world have, in general, one-tenth the number of physicians as high-income nations on a *per capita* basis (5). It is safe

to assume that whereas in high-income countries the physician labor supply includes generalists, specialists, and subspecialists, in low-income countries the physician labor supply consists largely of generalists, many of whom have little or no post-graduate training after medical school (6).

Although notable and successful attempts have been made to provide intensive, focused short-term training experience covering specific topics in subspecialty care in certain resource-limited settings (7), very few attempts have been aimed at developing full-fledged subspecialty training programs in such regions. In 2011, the leadership of the Addis Ababa University (AAU) School of Medicine and the Department of Medicine at Tikur Anbessa Specialized Hospital (Black Lion) in Addis Ababa, Ethiopia, invited us to aid in the development of a fellowship training program in pulmonary and critical care medicine. In this PERSPECTIVE, we describe the development of the program thus far with the hope that others may benefit from our experience, both in replicating successes that we have had and in avoiding our stumbles and missteps as well.

The guiding principle we have had in our program is to create meaningful physician capacity to address the care and future educational needs in Ethiopia by training fellows to the highest standards, but in the settings in which they will work after their training is complete. Working collaboratively, we have established a unique training program for pulmonary and critical care medicine in Ethiopia. The graduates of the East African Training Initiative (EATI) will ultimately lead Ethiopia's efforts in clinical care, education, and research in respiratory diseases and critical care illnesses.

Setting

Ethiopia is now the second most populous country in Africa, with a population of 94.1 million people, 80% of whom are living in rural areas. Located in the Horn of Africa, the country is extremely poor, with a per capita gross domestic product (GDP) that ranks among the lowest in the world despite a robust agricultural economy with cash crops of coffee, oilseeds, cotton, tobacco, sugarcane, tea, and spices. Most of the population is engaged in subsistence farming. Ethiopia sits

on a high plateau with a central mountainous range divided by the Great Rift Valley.

Economic growth is robust, however, with gross domestic product growing at a rate of roughly 10% per year for the past several years (8).

The average life expectancy at birth for the total population is 60.75 years (58.43 yr for men and 63.15 yr for women).

Communicable infectious diseases, especially in childhood, and malnutrition remain the biggest causes of morbidity and mortality. Noncommunicable diseases such as injuries, cardiovascular disease, diabetes, cancer, and COPD are all rapidly increasing in number and are now major causes of death, disability, and illness (9, 10).

Ethiopia is a high-burden country for tuberculosis, with an annual incidence of over 200 cases per 100,000 population (11). Levels of indoor air pollution are high, as 80% of the country relies on biomass fuel for cooking and heating (12). Use of tobacco cigarettes is low; it is estimated that only 5–6% of the population are smokers (13). Reliable statistics on the incidence of COPD, asthma, and lung cancer are not available, although anecdotal reports suggest these diseases are not rare, and COPD is thought to account for as many as 3% of all deaths in the country (10).

Health care remains underfunded, with only 4.7% of the gross domestic product going to the health sector. Most of the country's health care is delivered by generalists at health posts, health centers, and general hospitals. In general, physicians are in short supply overall and specialists are rare (1:62,783 population). Ethiopia's ratio of total physicians to population is less than 0.1:1,000 persons. For comparison, the corresponding ratios are 0.2 in Kenya, 0.4 in Uganda, 0.8 in South Africa, 0.7 in India, 1.9 in China, 2.5 in the United States, and 4.0 in Switzerland. Subspecialty care is even more uncommon; in fact, when our program in Addis Ababa began, there was one senior pulmonologist in the entire country, working in private practice.

There are several specialized hospitals in Ethiopia, including Black Lion, which is located in the capital of Addis Ababa. This facility is the largest public hospital in the country and has a 600-bed capacity. It is the main teaching hospital for both preclinical and clinical training of the AAU School of Medicine. The hospital also provides services not available in other public or private institutions located in the rest of

Ethiopia. The country has recently started a robust internal medicine training program. Upon successful completion of the training, physicians register as specialists with the Ethiopian Food, Medicine, and Healthcare Administration and Control Authority under the Ethiopian Ministry of Health. There is no formal accreditation body for medicine in Ethiopia. Currently, there is only one other subspecialty training program in internal medicine at Black Lion, which is in gastroenterology and follows a different educational model.

Genesis of the East African Training Initiative

In March 2011, the then–chief executive director of the AAU School of Medicine identified a need to train specialists in various internal medicine disciplines, including pulmonary medicine. However, limited local training resources and funding were available. After discussions with the leadership of World Lung Foundation (WLF), a nongovernmental organization dedicated to improving lung health in low- and middle-income nations, a decision was made to explore further the situation in Addis Ababa. An in-depth needs assessment visit to Addis Ababa occurred in January 2012. During that visit, WLF leadership met with the leadership of the medical school, the hospital, the department of medicine, and the minister of health of Ethiopia. Following this visit, a memorandum of understanding between the WLF and AAU was signed in April 2012, and both sides committed to beginning the fellowship training in January 2013.

The EATI was established as a partnership and true collaboration between the WLF and AAU School of Medicine. AAU assumed responsibility for recruitment and payment of fellows, and WLF assumed responsibility for development of the fellowship curriculum and supplying external faculty on-site. This shared responsibility for the training was initially, and remains, an important foundation for the program. Also, from the inception of the program, a commitment was made to have external faculty on-site in Addis Ababa for the duration of the program. This is the key feature of our program and one that distinguishes it from other attempts at training physicians in

low-resource settings through distance learning or short-term, in-country courses (14–16). We felt that a continual presence was necessary to achieve a high level of competence as well as to model and instill a culture of professionalism in trainees (17–19).

External faculty responsibilities were similar to those of faculty in U.S. training programs: supervision of rounds in the inpatient and outpatient services, supervision of procedures, didactic lectures, and evaluation of trainees. In the year prior to the actual beginning of training, a formal curriculum was jointly developed and external faculty for the program were recruited from leading American and European academic pulmonary divisions. Cosponsorship by the WLF and the Swiss Lung Foundation was then established to fully meet the needs and responsibilities of the external faculty.

Training Program Design

The EATI is a 2-year pulmonary and critical care fellowship training program for Ethiopian physicians following completion of internal medicine training. The first year is devoted to clinical care and procedural skills (spirometry, bronchoscopy, thoracentesis, pleural biopsies, intubation, and central line and chest tube placement). The clinical knowledge foundation is provided in an extensive, yearlong lecture series (*see online supplement*); a wide range of conferences (weekly fellows' clinical case presentations and didactic presentations, and monthly research presentations, journal club, pathology review, and cardiothoracic case presentations), daily inpatient rounds in the medical intensive care unit and on the medical wards; a weekly outpatient pulmonary clinic; and daily procedural supervision.

In Year 2, training in research methods and mentored research projects are added to ongoing clinical training. All fellows participate in the American Thoracic Society's Methods in Epidemiology, Clinical, and Operational Research program. The expectation is that each trainee will present and publish their research as part of the program requirements.

At the end of the second year, the fellows travel to Columbia University and Brown University for a 4-week observership

to learn new medical technologies and a different health care system. It is hoped that this information may be useful as these physicians take on leadership roles in Ethiopia. Before graduating, each fellow must pass rigorous written and oral examinations and achieve high marks on faculty evaluations of knowledge and skill sets. Further, there is an annual site evaluation by a fully trained pulmonologist from another country in Africa to assist in program modifications and certification of the fellows.

Ethiopian trainees are paid by the Ethiopian Ministry of Health and the AAU School of Medicine. The WLF and the Swiss Lung Foundation supply travel and housing for visiting faculty, who receive no stipend for their time. Visiting U.S. and European faculty provide continuous in-country mentorship and have specific on-site teaching responsibilities (*see online supplement*). An Ethiopian physician who completed his pulmonary training in India now leads the pulmonary and critical care medicine unit.

Program Achievements and Current Status

The first two trainees matriculated in January 2013 and have successfully completed their training. They each presented the results of their individual research projects at the International Union Against Tuberculosis and Lung Disease annual meeting in October 2014. The two poster presentations were entitled "Utility of Fiberoptic Bronchoscopy at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia," and "Profile and Risk Factors of Patients with Obstructive Airway Diseases at Tikur Anbessa Specialized Hospital Chest Clinic, Addis Ababa, Ethiopia" (20–21). Both trainees passed the interim and final 4-hour written examinations as well as oral bedside examinations with distinction, and they achieved high marks on external faculty knowledge and procedural skills evaluations. An outside examiner with no connection to the program, Dr. Jeremiah Chakaya, chief research officer of the Center for Respiratory Diseases Research at the Kenya Medical Research Institute, participated in this evaluation.

One of the trainees remains at Black Lion in the pulmonary and critical care division and the other returned to another

local medical school in Addis Ababa (St. Paul's Hospital Millennium Medical College) to start a second site for the training.

The second class of three fellows began first-year training in January 2014, and they completed training in January 2016. In 2015, they, too, presented the results of their individual research projects at the International Union Against Tuberculosis and Lung Disease annual meeting. The three oral presentations were entitled "Respiratory Failure in the Medical Intensive Care Unit at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia"; "Spectrum and Outcome of Patients Admitted with Respiratory Disease to the Medical Ward at Tikur Anbessa Specialized Hospital Chest Clinic, Addis Ababa, Ethiopia"; and "COPD Among Patients with Obstructive Airway Disease in Ethiopia" (22–24).

In addition to fellowship training, disease management protocols, checklists, standard order sets, and guidelines have all been designed to improve clinical care in both pulmonary and critical care medicine. Further, quality improvement activities have been initiated.

Hospital infrastructure has also begun to improve through joint efforts. A portable arterial blood gas machine is now available in the six-bed intensive care unit, providing rapid and reliable data with which to manage critically ill patients. Recently, two new Olympus bronchoscopes with video capability (Olympus America, Center Valley, PA) were purchased by the Ethiopian Ministry of Health and will allow the development of an independent intervention suite.

Finally, participants in the program have led the establishment and organization of the Ethiopian Thoracic Society. The Ethiopian Thoracic Society organized two successful continuing medical education programs for general practitioners, one in January 2015 and one in conjunction with World Asthma Day in May 2015.

Discussion

Despite significant in-country needs, it is well known that there is a massive migration of health care professionals from Africa to middle- and high-income countries. The reasons are many and complex, but lack of in-country clinician education and

inadequate functioning of health care facilities play major roles in fueling this emigration. Until now, to receive advanced training, Ethiopians were forced to go abroad. The EATI training program was designed in part to help address these pressing concerns.

It is also known that noncommunicable diseases impose a substantial burden of disease in low-income countries. Further, noncommunicable diseases such as COPD, hypertension, and diabetes may reach epidemic proportions in the next 10–15 years, especially in Africa. Well-trained pulmonary physicians are clearly needed to guide clinical and public health programs and to alter the impact of these diseases. The EATI is designed to meet this need.

The EATI has several features that make it unique among physician training programs. First, there is constant, early on-site training by the U.S. and European faculty. This allows for rapid transfer of medical knowledge and intense procedural instruction. In addition, there is shared country financial responsibility for the program. The Ethiopian minister of health and the dean of AAU have both committed financial resources to employ the trainees and provide equipment and materials to improve and maintain sustainability for infrastructure development at Black Lion. Further, during Year 3, transfer of training responsibility and capacity building to the current pulmonary and critical care trainees and the Ethiopian health care system has begun.

We are acutely aware of the limited impact that 8–10 pulmonologists can have in a country of 94 million people. However, we believe that there are several immediate ways that a small number of subspecialists can contribute to lessening the burden of lung disease in Ethiopia. First, each trainee will be responsible for educating medical students and generalists throughout the country about the clinical aspects and public health context of lung disease in Ethiopia. Also, each trainee will be expected to continue research activities designed to describe and determine risk factors for the most common conditions seen in the country, such as asthma, COPD, pulmonary hypertension, and lung cancer, and to widely disseminate their findings. Third, many of the trainees will return to their host institutions and start their own pulmonary training programs, thereby multiplying the effect of our program.

The training program has been constrained at times by a lack of resources; pulmonary function testing equipment, arterial blood gas analyzers, mechanical ventilators, chest tubes, and central catheters are in short supply. Further, maintenance and upkeep of available equipment is difficult without local vendors and properly trained medical engineers. Common medications that are readily available in high-income countries are often in short supply in Addis Ababa, leading to significant morbidity and mortality. Internet connectivity necessary for Internet-based educational materials, is unreliable at best and an ongoing source of frustration for the trainees.

Joint leadership decisions have helped lessen these infrastructure limitations for the training program, slowly over time. We have chosen to provide equipment that we feel is absolutely necessary for education and training. (It is difficult to learn about ventilator management without access to blood gas interpretation, for example.) We have not thought it sustainable or wise to be suppliers to the hospital of large amounts of equipment needed for patient care. To address these needs, we have engaged the leadership of the hospital and AAU School of Medicine, as well as of officials in the Ministry of Health to encourage purchase of necessary items, understanding that resource constraints are significant.

We share a constant concern that our trainees will leave Ethiopia to work elsewhere for higher pay. We also recognize that, even if our trainees stay in country, they may leave academia for the more lucrative aspects of private practice. No one can be blamed for seeking a better standard of living for themselves and their families. To improve retention, we have worked with the Ethiopian leadership at the medical school and in the hospital to provide career development opportunities to strengthen the path to professionally and personally satisfying academic careers in Ethiopia.

It was apparent at the conception of the training program that external faculty would need to be in place continuously for the first years of the program. We did not think that Internet-based or distance learning supplemented by occasional faculty lectures would allow us to meet the highest training standards we sought. Accomplishing this goal, however, took not only a substantial

recruiting effort but also great commitment of the voluntary faculty.

We have been successful in having faculty on-site in Addis Ababa 80% of the time. Medical educators who came from leading hospitals and medical schools in the United States and Switzerland were provided only with round-trip economy class travel, modest accommodations in Addis Ababa, and a small *per diem* living allowance, but no salary support. A minimum 2-week time commitment was required. Thus, it continues to take a special group of physicians willing to sacrifice money and vacation time to make the journey to Ethiopia to ensure the success of the program. We and the trainees of the program are enormously grateful for their efforts and know that the personal rewards have been great. We are currently in the process of transitioning some of the teaching responsibilities to the growing Ethiopian faculty, which will lessen the need for external educators over time.

A total of 8–10 Ethiopian trainees are expected to complete the program over the 5 years of the EATI. Eventually, physicians from other areas of East Africa will be invited to train in Addis Ababa to increase pulmonary and critical care capacity in the region. Also, to better serve the needs of those with respiratory and life-threatening illnesses, training of specialty nurses, respiratory therapists, and medical equipment technicians is envisioned, in addition to the development of programs to improve respiratory health in the population at large.

Conclusions

The EATI has successfully provided pulmonary and critical care subspecialty training in Ethiopia. There are several unique features of the training program, including constant early on-site training by external faculty, shared country financial responsibility for the training, a focus on sustainability for infrastructure development, and transfer of training responsibility and capacity building to the current pulmonary trainees and the Ethiopian health care system. We believe that the EATI could serve as a model training program for other resource-constrained countries. ■

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