COVID-19 and the Need for Global Critical Care Training

Why Ventilators Alone Are Not the Answer

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ABSTRACT

The current coronavirus disease (COVID-19) pandemic has unearthed many weaknesses in healthcare systems worldwide. In doing so, it has caused high-income countries to deal with the uncomfortable situation of resource allocation that has long been a daily occurrence in low- and middle-income countries. The shortage of equipment continues to be a major problem in low- and middle-income countries, but there is an even greater shortage of human resources in the form of trained individuals capable of caring for critically ill patients. With physicians being in short supply in many areas throughout Africa, the question becomes where do these human resources come from? In Kenya, clinical officers are the frontline workers and backbone of care in many healthcare settings and outnumber physicians four to one. AIC Kijabe Hospital, located in rural Kenya, recognized this need and identified this cohort of clinicians as a means of ramping up local emergency and critical care. In doing so, the Emergency and Critical Care Clinical Officer training program was created in 2015. Since its inception, the Emergency and Critical Care Clinical Officer program has been training nonphysician clinicians to care for critically ill patients with physician support. In this perspective piece, we outline our attempt at capitalizing on this pool of human resources to advance the care of critically ill patients, describe lessons learned along the way, and try to highlight the utility of their unique skill set in the setting of a pandemic.

Keywords: critical care; global health; Kenya; COVID-19; mechanical ventilation
The coronavirus disease (COVID-19) pandemic has unearthed many weaknesses in healthcare systems worldwide. It has also brought to light uncomfortable, previously unaccustomed situations for high-income countries (HICs). In particular, it has forced HICs to make tough decisions regarding scarcity and resource allocation, decisions that are all too common in low- and middle-income countries (LMICs). In seeing HICs wrestle through this, it has caused some interested in global health to suggest that if there was only more equipment, in particular ventilators, then those in LMICs would have a better chance of survival (1, 2). This is a tremendous shortcoming of the global health community because it ignores the fact that human resources are the backbone of care, not ventilators. This can create a risk that priorities will be shifted to the donation of equipment but then sit unused because of a lack of trained clinicians, while more long-lasting and cost-effective interventions such as clinical training and education remain relatively neglected.

Specifically, here in Kenya, a country of more than 50 million people, there is a scarce number of intensive care unit (ICU) beds, even fewer ventilators, and fewer than a dozen formally trained critical care physicians in the country (3). The whole of these individuals and the majority of the ICU beds are located in the urban capital, Nairobi, leaving the rest of the country without. Therefore, it is easy to see in this example that more ventilators will not come close to solving the healthcare system burden imposed by the COVID-19 pandemic. It is also known that although up to 20% of patients with COVID-19 may need hospitalization, only 5% of the total cases require intensive care (4). This means that the majority of the cases could benefit from other lower-resource interventions such as appropriate fluids, oxygen, and supportive management. Rajbhandari and colleagues have warned that neglecting the rural, district hospitals by continuing to undertrain, understaff, and underfund them will be to the detriment of our local healthcare systems (5). We too feel that ignoring capacity building and training for the sake of equipment procurement will have lasting effects that long outlive any pandemic.

In recognizing the need for capacity building through the training of providers, AIC Kijabe Hospital started its Emergency and Critical Care Clinical Officer (ECCCO) training program in 2015 (6, 7). Clinical officers, analogous to advanced practice providers such as physician assistants or nurse practitioners in the United States, are the frontline providers in many sub-Saharan African nations (8). Therefore, owing to their position as the essential worker in many Kenyan settings, these individuals were chosen as the primary learners for this specialized training. They outnumber physicians four to one and have been recognized by the Kenyan government as a potential solution to mitigate the unequal distribution of clinicians within the country (9). Fully approved by the Kenyan Ministry of Education, the ECCCO program has taken a large step toward Schell and colleagues’ clarion call for the global need for training in emergency medicine and critical care (10).

In these programs, registered clinical officers, who have already completed 3 years of clinical officer education and 1 year of internship, receive 18 additional months of focused training in emergency medicine and critical care.

During ECCCO training, the learners undergo rigorous didactic and bedside training in various areas of subject matter.
ranging from mass casualty triage to mechanical ventilator management of acute respiratory distress syndrome. The curriculum was created by a team of national and international physicians working at AIC Kijabe Hospital. Their fields of expertise consisted of emergency medicine, internal medicine, family medicine, pediatrics, and pulmonary and critical care medicine. The areas of instruction were determined based upon common local pathologies and admission diagnoses. During their training, they become well versed in resuscitation, airway management, and point-of-care ultrasound, making them well suited for caring for patients requiring life-saving maneuvers (Table 1). Also, given that their training takes place in a resource-limited setting, making tough decisions on resource allocation is naturally folded into their education (11).

Since its inception, this program has graduated four classes totaling 24 highly trained clinicians that are dispersed throughout Kenya in 11 different facilities. Only two graduates are working in Nairobi, whereas the rest are in rural areas. Ten of the graduates posted to government facilities are the only clinician on-site with higher-level emergency and critical care training. Their skill set and experience has made them the ideal worker to step into the large clinician gap and care for the critically ill. The current pandemic has highlighted their utility further as several of them have been on the frontlines caring for suspected and confirmed COVID-19 cases. The experiences of three of our graduates were recently highlighted in the national newspaper (12).

Additionally, although the ECCCO program was started by physicians for nonphysician clinicians, the program is now taught and coordinated by nonphysician graduates, allowing for ownership and direction to be guided by key stakeholders, the clinical officers themselves. It is a team effort that is performed in coordination with the local consultant physicians (i.e., attendings) at AIC Kijabe Hospital. Going a step further, a former graduate who has fully taken up the mantle of investment and capacity building recently pioneered a similar program in Nairobi at the Kenya Medical Training College (13).

Lessons learned along the way have been many. We need to pour more time into teaching our learners to be teachers (14). We have addressed this by engaging them early and tasking them to teach some of the core topics to their peers (Table 1) with observation and feedback given by core faculty members including physician consultants and ECCCO graduates. Furthermore, mass casualty and surge capacity planning are additional areas to grow their training so that they can better serve their respective communities. Many of these clinicians and indeed most healthcare workers in Kenya are trained in busy referral centers that are stretched to the limits in terms of human and other resources. Although this leads to inbuilt resilience and innovative homegrown solutions in times of overwhelming patient demands, there is still room for contextualized training with emphasis on clinical skills and judgment where support services like labs and imaging are not readily accessible (15).

As previously mentioned, because of resource constraints and limited training opportunities for doctors at the postgraduate level in emergency medicine and critical care, many of the graduates find that they are the only clinician on-site with hands-on ICU experience. This may seem overexaggerated until one understands the
curriculum requirements for physician interns. At present, it is not a requirement for the fulfillment of medical officer (e.g., intern physician) internship to complete an ICU rotation (16). Therefore, it is possible that a medical officer intern will finish a yearlong internship without having set foot inside of an ICU or having touched a mechanical ventilator. Therefore, another lesson learned has been finding creative means to support our graduate diaspora. This has functionally been performed by creative means of telemedicine involving WhatsApp group chats and frequent phone consultations.

Likewise, the areas identified for growth have been numerous. Most notable has been the genesis of a pediatric training complement. We began the pediatric equivalent (Paediatric Emergency and Critical Care Clinical Officer) in early 2020. Like its predecessor, it has been accredited by the Kenya Ministry of Education and is the first of its kind in improving emergency and critical care of pediatric patients. Other areas of growth for us as an institution will be tracking outcomes of both programs. Owing to the lack of any preprogram data, and shortage of electronic medical records, it will be nearly impossible to compare outcomes before and after the arrival of the graduates, but gathering this information moving forward will be of benefit. It is our intention to devise pragmatic ways to ascertain these data while trying not to place undue burden on our busy clinicians. Another area for growth will be

| Table 1. Emergency and Critical Care Clinical Officer curriculum at a glance |
|---------------------------------------------------------------|
| Basic life support cardiac ultrasound (bedside echocardiography) |
| Advanced cardiac life support                                  |
| Pediatric advanced life support                                |
| Point-of-care ultrasound                                       |
| Primary and secondary surveys in trauma patients               |
| Extended focused assessment of sonography in trauma            |
| Assessment of inferior vena cava volume by ultrasound          |
| Intraosseous needle introduction and emergency fluid management |
| Blood gas sampling and analysis                                 |
| Rapid-sequence induction and intubation of adults and children |
| Conscious sedation                                             |
| Mechanical ventilation setup and continuous management         |
| Noninvasive ventilation setup and continuous management        |
| Stabilization of open and closed fractures                      |
| Needle decompression for tension pneumothorax                  |
| Basics of electrocardiogram interpretation                    |
| Use of intravenous vasopressors and antihypertensives          |
for us to better understand the experiences of the graduates themselves. Understanding how they have been received by their institutions and their level of confidence in handling emergency situations will allow us as educators to better improve their educational experience. To this end, the creation of a survey is underway.

Furthermore, providing opportunities for continuous education will help keep them abreast of the current literature that is applicable to our setting and foster a life-long learner mentality. One such example took place in November of 2019 during the first Kenya National ECCCO Conference. This was organized by former graduates and recorded more than 100 attendees. It was an opportunity for them to share experiences from their respective centers. Of interest, one graduate shared about the outcomes of 49 patients admitted to the ICU at their hospital, whereas another shared experiences as a pioneering faculty member for a new clinical officer training program in emergency medicine at a national medical training center in Nairobi (13).

The global COVID-19 pandemic has forced countries to learn rapidly from one another, a reminder of the importance of mutual international partnerships and the true interconnectedness of the world. LMICs can benefit from some of the resources, research experiences, and expertise of HICs (17). But HICs can benefit from the experience and expertise of LMICs with regard to creative human resource solutions, allocation of scarce resources, optimizing clinical care, and relevant research under limited conditions. We are by no means suggesting that our program eliminates the need for emergency and critical care physicians in resource-limited settings. However, we do suggest that capitalizing on the available human resources and pouring into them is a tremendous means to exact high-quality care until a time arises that we can provide further training for physicians.

Pandemics will come and go, but the need for critical care in resource-limited settings will only continue to expand. This makes the impetus for well-trained, clinically sound workers of various backgrounds and training all the more important. It is our perspective that the starting point for capacity building and exacting global critical care should begin with investing in the people on the ground and then the equipment thereafter, not the other way around.

Author disclosures are available with the text of this article at www.atsjournals.org.

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