

Navigating the COVID-19 Pandemic

Lessons From Global Surgery

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Surgeons practicing in high-income countries (HIC) like the United States, which spends an estimated 765 billion dollars per year on unnecessary healthcare costs, are generally not accustomed to resource limitations.¹ However, the coronavirus disease 2019 (COVID-19) pandemic has strained the usually robust healthcare system in HIC. Lack of adequate testing, small reserves of ventilators and global supply chain disruptions, among other causes, have led to shortages affecting care for critically ill patients – most notably human resources, ventilators, and personal protective equipment (PPE).² This has transformed hospitals in HIC to a “resource variable environment” with uncertainty of the supplies, intensive care unit (ICU) beds, and staff available at any given time.

Although this challenging environment is novel for many providers in HIC, these constraints are commonplace for providers in low- and middle-income countries (LMIC). Only 12% of the world’s specialist surgical and anesthesia workforce practice in the world’s poorest regions in Africa and Southeast Asia, where a third of the world’s population lives and the majority of the world’s surgical burden lies.^{3,4} LMIC also face a severe shortage of ICU capacity, for example, Uganda has only 0.1 ICU beds per 100,000 population, compared with 20 beds per 100,000 in the United States.^{5,6} Approximately 1 in every 4 hospitals in LMIC do not have access to oxygen, rendering them unable to provide timely, basic care for many patients.³ At most hospitals in LMIC, PPE shortages are the norm and essential care is provided by family members at the bedside.^{3,7} To overcome these and other daily challenges, LMIC providers must often improvise, adapt, and innovate.

Many hospitals in HIC rely on just-in-time inventory management, which can be an effective method to cut down on costs, as it calls for minimal reserves of healthcare supplies. However, the widespread use of such strategies, which are reliant on consistent and tightly controlled supply chains, have made HIC vulnerable to PPE and supply shortages should demand sharply increase, as has been seen with the COVID-19 pandemic. In some HIC hospitals, healthcare workers facing PPE shortages have already had to adopt common practices from LMIC, such as using bin liners instead of gowns and wearing reusable cloth masks. HIC providers have also

implemented evidence based adaptations, such as creating reusable elastomeric respirators, the development of open source ventilators, and reprocessing N95 masks using the hydrogen peroxide vapor sterilization technique.^{8–11}

In many LMIC, healthcare supply chains are vulnerable at baseline, and providers are regularly faced with shortages of supplies and PPE. Items that are considered disposable in HIC, such as endotracheal (ET) tubes and electrocautery tips and pads, are often reused after high level disinfection. Equipment shortages in LMIC have led to the expanded use of regional anesthesia with intravenous (IV) sedation, and most surgeries are performed open rather than via laparoscopy. Operating room supplies are opened only as-needed and evaluated after each case; only the most essential available instruments for every case are opened, and key instruments are prioritized for sterilization throughout the day. Similar strategies towards the pragmatic use of operating room resources could be considered in HIC and may even decrease perioperative costs.¹² Public private partnerships and innovative local production strategies have emerged in LMIC in response to widespread oxygen shortages.^{13,14} Such strategies may be considered in HIC should there be an oxygen shortage during the COVID-19 pandemic. Additionally, surgical gowns, head covers, and surgical drapes in LMIC are cloth, requiring washing and reuse, whereas such supplies are disposable in the majority of hospitals in HIC, particularly in the US. The use of disposable surgical textiles is largely driven by reimbursements to hospitals based on volume of purchases, and there is a lack of evidence to suggest that the use of disposables have an overall cost or safety benefit.¹⁵ Transitioning to increased use of reusable products where possible would make HIC hospitals less vulnerable to supply chain disruptions and would additionally have a substantial sustainability benefit.

Amid the COVID-19 pandemic, the number of patients requiring mechanical ventilation in the US could range between 1.4 and 31 patients per available ventilator, which would necessitate thoughtful resource allocation should HIC face a ventilator shortage.¹⁶ Even outside the setting of pandemics, LMIC face a constant shortage of ventilators and ICU care, even in national referral hospitals.¹⁷ As a result, many young patients die from reversible etiologies, such as surgical disease, postsurgical complications, infectious diseases, trauma, and peripartum maternal or neonatal complications.¹⁸ Providers in these settings routinely make difficult ethical and practical decisions about the allocation of ICU care, often informed by the local context and cultural factors. This extends through the entirety of the perioperative journey, from who can be offered surgery, to operative approaches and postoperative care. Scoring systems appropriate for the LMIC context have been developed, and take into account some of these factors.^{19,20} Other mitigation strategies include the development of high-dependency units, which have increased capacity for monitoring and oxygen delivery, and training programs for the limited numbers of ward nurses emphasizing early recognition and intervention for critically ill patients.²¹ Should ventilator shortages become apparent, a planning exercise for this

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type of scenario in HIC may be worthwhile given the current reality of ventilator shortages to potential need.

A large volume of critically-ill patients combined with potentially high rates of healthcare worker infections and exposures has led to staffing shortages in both HIC and LMIC during COVID-19. LMIC already face severe staffing shortages due to a variety of factors, including low numbers of graduates, poor salaries and working conditions, and high attrition rates.²² Addressing such shortages has required a number of innovations, some of which could potentially be adapted for use in HIC. A program to engage family members in multiple aspects of patient care has been used successfully by Narayana Health in India. Family members were trained to perform tasks such as monitoring fluid balance, taking and recording vital signs, and assisting with incentive spirometry, which not only cut costs and addressed staffing shortages, but reduced postoperative complication rates.²³ Due to social distancing guidelines and visitor restrictions in hospitals this may be most effectively utilized for post-hospitalization care and rehabilitation programs as support staff and rehab centers are also part of the overwhelmed healthcare community.

In LMIC, both physician and nonphysician general practitioners are commonly called upon to perform essential surgery.²⁴ Such task sharing, where healthcare workers are reorganized and required to work in alternative roles to meet changes in workforce demands, is a common solution to staffing shortages in LMIC. During the COVID-19 pandemic, this practice been a necessary adaptation in HIC as the imminent need for many specialties declined, whereas intensivists and generalists have been in high demand. In our own HIC institutions we have seen the re-allocation of surgical critical care physicians and surgeons into roles assisting in the medical intensive care units and medical floors helping care for both COVID and non-COVID medical patients. This crisis has brought attention to the need to address the shortage of more broadly trained personnel and generalist physicians, which is largely attributed to the high costs of medical school and procedure-based reimbursement strategies, resulting in higher salaries for specialist physicians.²⁵ Going forward, the expansion of policies to incentivize young doctors to enter general practice, such as tuition reimbursement and a transition to value-based payment strategies in both HIC and LMIC may be necessary.

The widespread, immediate implications of the acute shortages during the COVID-19 pandemic have highlighted the need for systems strengthening in both HIC and LMIC and have forced us to re-examine our approach to healthcare delivery. Telemedicine is being optimized globally more than ever before to prevent surges through forward triage, minimize healthcare worker exposures and address workforce shortages.²⁶ The widespread implementation of telehealth interventions can be leveraged long after the pandemic ends to overcome challenges of distance and patient access in both HIC and LMIC. This will need to be done thoughtfully to ensure that alternatives are developed when necessary for vulnerable populations that may have challenges in technology use. Disruption in the global supply chain for healthcare supplies has underscored the importance of building redundancies into the system, and has led to the opening up of new local supply chains by linking local stakeholders.²⁷ Shortages of PPE and other essential equipment have also highlighted the need for a transparent, centrally controlled strategic reserve of medical supplies. Hospitals have had to rapidly scale up ICU capacity, which has underlined the value of redundant capacities and flexibility within the healthcare system. These lessons have highlighted the need for long-term investment to build flexible, resilient health systems and are sure to help providers in both HIC and LMIC care for more patients safely and effectively both during this pandemic and long after it ends.

Learning how LMIC providers manage resource limitations through global surgery collaborations can give surgeons working in HIC valuable perspective that has become increasingly relevant during the COVID-19 pandemic. The rapid expansion of social media has facilitated such collaborations, and is a valuable tool for networking, mentorship, and information sharing. Additionally, the rapid sharing of research findings via social media is enhancing our ability as a global health community to respond to this pandemic in a strong evidence based manner. However, it is essential that social media be used responsibly, and that precautions are taken to prevent the spread of misinformation.

For surgeons working in HIC, there is much to learn from counterparts in LMIC. Healthcare systems in many LMIC, particularly in Africa, have more experience responding to infectious disease pandemics, especially in contact tracing and community mobilization. The extensive network of community health workers in LMIC is an essential component of grass roots public health infrastructure that HIC may be able to emulate.²⁸ Triage systems, finite resources, and limited personnel in LMIC require constant thoughtfulness regarding testing, treatment, and disposition. More importantly, working in a resource-variable environment requires fostering a set of soft skills that LMIC practitioners utilize on a daily basis. These include adaptability, resourcefulness, frugality of supplies, humility, and leadership among others. These lessons highlight the importance of fostering bilateral partnerships and increasing relevance of global health competencies to surgical training. Examples such as task sharing illustrate that HIC can adapt and can respond to these challenges with resilience.²⁹ This requires vigilant monitoring of the situation and constant improvisation in the face of unpredictable challenges. These and other nontechnical skills are always essential to ensure safe and high quality surgical care but become especially pertinent during this trying time.

The most vulnerable populations, often linked to the underlying social determinants of health such as poverty, food security, literacy, sex, and racial and ethnic factors, are most at risk of adverse outcomes during these health and social shocks. There is already data demonstrating that racial and ethnic minorities in the US and UK are at increased risk of death from COVID-19.³⁰ Difficulty in accessing care for emergent conditions exists at baseline for these populations, and extensive backlogs for essential operations are commonplace, especially in LMIC. This is likely only to get worse during the current crisis and underscores the importance of our professional commitment to health equity – regardless of geography. New estimates of the “collateral damage” caused by the pandemic are very concerning and also illustrate the urgent need to mitigate this impact through local and global coordinated action.³¹ The overall lack of collective and individual health equity around the globe dramatically weakens our global health security and without addressing this disparity, the even the best attempts by HIC to ensure safeguard domestic health will always be undermined.³² The grave reality is in both LMIC and now in HIC, population needs vastly outpace our resources, and it is the patients who are affected unless we too improvise, adapt, and innovate. Global surgery collaborations with reciprocity between partners, with trainees and faculty working together, enhance our capacity to share our collective expertise and navigate this pandemic resiliently.

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