



# Exploring the Impact of COVID-19 on Progress Towards Achieving Global Surgery Goals

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## Abstract

**Introduction** In the 5 months since it began, the COVID-19 pandemic has placed extraordinary demands on health systems around the world including surgery. Competing health objectives and resource redeployment threaten to retard the scale-up of surgical services in low- and middle-income countries where access to safe, affordable and timely care is low. The key aspiration of the Lancet Commission on global surgery was promotion of resilience in surgical systems. The current pandemic provides an opportunity to stress-test those systems and identify fault-lines that may not be easily apparent outside of times of crisis.

**Methods** We endeavoured to explore vulnerable points in surgical systems learning from the experience of past outbreaks, using examples from the current pandemic, and make recommendations for future health emergencies. The 6-component framework for surgical systems planning was used to categorise the effects of COVID-19 on surgical systems, with a particular focus on low- and middle-income countries. Key vulnerabilities were identified and recommendations were made for the current pandemic and for the future.

**Results** Multiple stress points were identified throughout all of the 6 components of surgical systems. The impact is expected to be highest in the workforce, service delivery and infrastructure domains. Innovative new technologies should be employed to allow consistent, high-quality surgical care to continue even in times of crisis.

**Conclusions** If robust progress towards global surgery goals for 2030 is to continue, the stress points identified should be reinforced. An ongoing process of reappraisal and fortification will keep surgical systems in low- and middle-income countries responsive to “old threats and new challenges”. Multiple opportunities exist to help realise the dream of surgical systems resilient to external shocks.

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## Introduction

Coronavirus Disease 2019 (COVID-19) is a novel viral disease that has spread to nearly all countries of the world [1], reached pandemic status [2] and caused a substantial human and socioeconomic toll. This calamity has been called a once-in-a-century pandemic [3], and the human cost has been compared to that during times of war [4]. This is the defining crisis of this generation, and it will leave an indelible mark on our lives.

The extraordinary demands being placed on global health systems are unprecedented, and while surgical services are only indirectly affected, they have not been spared. Surgical diseases account for one-third of the global burden of disease [5]. There is a significant population, however, that lacks access to safe and affordable surgical care, and people in low- and medium-income countries (LMICs) are disproportionately affected [6]. Global surgery efforts focus on scaling-up surgical services to this underserved population in a bid to save lives and avoid the estimated USD12.3 trillion blow to their economic growth prospects if the status quo persists [7].

In a double-punch to surgical service provision: postponement of nonessential clinical work has almost halted surgical activity, while stay-at-home orders instituted by local governments have imposed mobility restrictions on prospective patients. This “double-lockdown” has led to major disruptions in the provision of surgical care and is expected to have devastating consequences particularly in LMICs where the surgical burden is considerable [8]. Diversion of health-care resources also threatens to impede or even reverse progress towards achieving the goals set by the Lancet Commission on Global Surgery (LCoGS). The ramifications for global surgery may stretch beyond the duration of the pandemic and have far reaching consequences for the future.

A key goal of the LCoGS was the creation of “strong, resilient surgical systems that can provide consistent, high-quality care” [6]. Health system resilience is defined as “the capacity of health actors, institutions, and populations to prepare for and effectively respond to crises; maintain core functions when a crisis hits; and reorganise if conditions require it” [9]. The resilience of our surgical systems will be rigorously tested during this time, and the current pandemic has provided an opportune moment to observe a stress-tested surgical system and identify vulnerable points. We are more than one-third of the way to the deadline for the goals set by the LCoGS for 2030; if progress towards those goals is to continue unabated, these fault lines should be attended to.

This article explores the potential impact of the current pandemic on surgical care in LMICs, taking key lessons

from the past, identifying vulnerabilities and giving recommendations for the future.

We used the 6-component framework developed by the LCoGS for surgical systems planning and evaluation [6]. These 6 components are shown in Table 1. Recommendations for bolstering vulnerabilities in each component appear in Table 2.

## Infrastructure

Travel restrictions on patients will affect the effective proximity of the population to first-level facilities because patients cannot travel when they fall ill. This will prolong the “first and second delays” using the parlance of the three-delays framework from the LCoGS: (delay in seeking care and reaching care) [6]. Surgical infrastructure will also be repurposed for non-surgical uses. Because of infection control concerns, the costs of surgery may increase to cater for increased screening, surgical personal protective equipment (PPE) and process flow rearrangements. Lock-downs will also affect the mobility of potential blood donors and will have a significant impact on the blood pool that is so crucial to surgical care. Exemptions to stay-at-home orders and COVID-19 testing for blood donors may be considered where appropriate. The WHO has recommended a variety of measures to protect the blood pool including providing transport for donors and recall of healthy repeat donors while reducing whole blood donation intervals [10]. Pre-pandemic stockpiling of blood products is another strategy to protect against expected acute shocks (Table 2). In Italy, the national blood service initially instituted a 28-day rule which deferred donation by any person at risk. This was subsequently reduced to 14 days but may have exacerbated blood shortages [11] estimated at 10% decline in weekly donations. This decline was reversed a week later after a public blood donation campaign [11].

## Workforce

Health-care workers (HCWs) are a vital part of surgical systems resilience. Past pandemics, particularly in LMICs, have exposed the deficit of trust between HCWs and their employers [12]. Fear of the disease among HCWs [12] and shortage of personal protective equipment [13] undoubtedly affect the willingness of the surgical workforce to carry out their clinical duties. This has been demonstrated during SARS-CoV-1 [14], MERS-CoV [15], Ebola [12], and the current pandemic [13], and this appears to be playing itself out as a spate of industrial actions in many countries during the current COVID-19 pandemic [16–18].

**Table 1** The 5-component framework for global surgery and indicators used to evaluate each component [6]

Component	Indicators
Infrastructure	Proportion of the population with 2-h access to a first-level facility WHO Hospital Assessment Tool (a structured appraisal of equipment electricity, water and sundries) Proportion of hospitals fulfilling the safe surgery criteria Blood bank donation rate and distribution
Workforce	Density and distribution of specialist SAO providers Number of SAO graduates and retirees Proportion of surgical workforce training programmes accredited The presence of task sharing or nursing accredited programmes and number of providers The presence of attraction and retention strategies Density and distribution of nurses, and ancillary staff including operational managers, biomedical engineers, and radiology, pathology, and laboratory technicians
Service delivery	Proportion of surgical facilities offering the Bellwether procedures Number of surgical procedures done per year Peri-operative morbidity and mortality Availability of system-wide communication
Financing	Surgical expenditure as a proportion of gross domestic product Surgical expenditure as a proportion of total national health-care budget Out-of-pocket expenditures on surgery Catastrophic and impoverishing expenditures on surgery
Information management	The presence of data systems that promote monitoring and accountability related to surgical and anaesthesia care Proportion of hospital facilities with high-speed internet connections
Governance	Governmental and non-governmental actors that influence SOA health delivery structures The manner in which these key actors relate and engage with another to influence health delivery Formulation of policies, regulations, and national budgets

Prioritisation of HCW welfare and training is vital to maintaining morale and cohesiveness particularly in LMICs where health-care worker motivation is already low [19]. HCW welfare has a direct bearing on surgical service provision, in one hospital in Sierra Leone during the Ebola outbreak, surgical volumes plummeted to 3% of baseline accompanied by the death of 25% of the surgical workforce [20]. Many countries are unlikely to reach the SOA workforce goals set by the LCoGS by 2030, without deliberate intervention; however, ongoing losses from the ‘brain-drain’ as well as the impact of COVID-19 will worsen the situation [21]. Models that rely on appealing to a sense of duty have consistently failed to improve HCW motivation [22]. A systematic review by Valdez et al. of methods for increasing HCW morale during emergencies is particularly instructive in this situation, and recommendations are incorporated into Table 2 [22]. While testing capacity remains limited in LMICs, priority should be given to all HCWs to reduce in-hospital transmission and to widen the pool of available HCWs. The universal truth that ‘there is no health without a workforce’ is as true during a pandemic as it is at any other time [23].

### Service delivery

Evidence from previous outbreaks of contagious viral diseases paints a grim picture of the potential impact on surgical service provision. A study from Sierra Leone during the 2014 Ebola outbreak showed a precipitous drop in surgical volume by 41% from pre-outbreak levels [24, 25]. This is similar to the experience in Toronto, during the SARS outbreak where stringent restrictions on nonessential surgical care are thought to have exacerbated the decline with only modest increases in outbreak-related surge capacity [26]. Strict surgical rationing policies have been discouraged in the African setting because of the prospect of exacerbating the already substantial surgical burden [8, 27]. In the US, 91% of operations are estimated to be elective [prin wjs], in Europe electives make up 75% [pearse], while in Africa only 43% of surgical procedures are considered elective [biccard]. Therefore, the expected surge capacity freed up by cancelling elective surgery is theoretically lower in Africa than in many high-income countries. There is a delicate balance to be struck between social distancing and the detrimental effects on surgical services. The current surgical rationing thresholds are

**Table 2** Recommendations for strengthening vulnerabilities exposed by the COVID-19 pandemic stress-test

Domain	Recommendation	Rationale
Infrastructure	First-time screening telemedicine consultations	Reduced access to first-level facilities
	Pre-pandemic stockpiling of blood products	Surgical speciality hospitals fulfilling safe surgery criteria repurposed for pandemic-related services
	Exemptions to lockdown restrictions and COVID-19 testing for blood donors	Risk of depleted available blood donation pool due to lockdown orders
	Public blood donation campaign, mobilisation via technology, drone-based deliveries	
	Provide transport for donors [10]	
	Reducing blood donation intervals [10]	
Workforce	Provide sufficient PPE to ensure safety of surgical workforce	Risk of reduced specialist SAO providers with narrower distribution due to illness and burn-out
	Hazard pay and life assurance cover for dependants	
	Use non-monetary remuneration for health-care workers who are chronically underpaid	Reduction in SAO graduates due to stalled training programs
	‘Intangible alternative rewards’, e.g. recognition-of-service awards and promotions [22]	Reduced retention of HCWs
	Provide mental health services to SAOs and HCWs via tele-remote services	Reduced density of nurses and ancillary staff
	Prioritise HCWs for testing	
Service delivery	No blanket elective cancellations	Reduction in annual surgical volumes
	Risk-based approach to elective cancellations	Increased peri-operative mortality with concurrent COVID infection
	Use size of waiting list and demand elasticity to determine surgical volume	Risk of incremental mortality and increased DALYs lost due to cancellation may outweigh risk of specific elective procedures in LMICs
	Use stepwise approach for cancellations that depends on number of cases in the country and expected backlog	Need to ensure continuity of surgical care and training of surgical workforce
	Pre-operative testing for all patients to identify those at increased risk of poor post-operative outcome	
Financing	Implement ring-fencing/prepayment mechanisms for funds specific to surgical conditions, e.g. “road accident fund” that cannot be redirected	Risk of redirection of domestic budget away from surgical care
	Manufacture low-cost PPE locally	Risk of foreign ICOs withdrawing funding
	Use additive manufacturing techniques	Risk of reduced independence and development of local surgical infrastructure globally
	Reduce cost of surgical care and PPE using robust supply chain management principles [42]	Risk of catastrophic health expenditure from surgical disease
	Separation of emergency and routine surgical supply chain to minimise disruptions to non-pandemic care [48]	
Information management	Zero-rating telemedicine apps by carriers	Cost of broadband makes telemedicine prohibitively expensive
	Deployment of government sponsored network technology	Telemedicine is still a nascent technology with low uptake
	Use of non-traditional information technology for training, patient information and collaboration	Pandemic offers an opportunity to accelerate adoption
Governance	Resume work on NSOAP planning, reschedule planning meetings using video conferencing technology	Risk of stalled NSOAP planning

based on an estimation of surgical urgency; however, an approach that considers demand elasticity for surgical procedures and size of waiting lists rather than just an urgency classification may help mitigate against large post-pandemic backlogs [28]. Recently published data from the COVIDSurg collaborative show that an estimated 28 million surgical operations will be cancelled, and disturbingly LMICs will bear the brunt of these cancellations [29]. They

expect the backlog to take almost a year to clear if surgeons work at 120% capacity [29]; however, LMICs already have baseline fragilities in service provision that may not allow for working at supernormal capacity for some time after resumption of services. The recovery will not be as immediate as is suggested. All surgical patients should be tested pre-operatively for the protection of HCWs and patients alike particularly in the light of new data showing

an unacceptably high peri-operative mortality in COVID infected patients [30, 31]. These data suggest that premature resumption of elective surgical activity without available testing may represent an unnecessary risk. In addition, surgery is a PPE resource-intensive activity and resumption of elective services will put strain on PPE stocks for pandemic-related work.

### Information management

Telecommunications infrastructure can play an important role in maintenance of surgical services during a pandemic. Telehealth has been called “a medical necessity” during outbreaks [32], and its integration into surgical practice is being accelerated by the current pandemic [32]. Telehealth allows care to continue while allowing compliance with social distancing and lockdown rules. When used effectively, it should markedly improve system resilience. In LMICs where distances to health-care facilities and travel are costly, telehealth provides significant opportunities. While the internet penetration in LMICs is rapidly growing, there are some places where penetration and speeds are so low that internet-based telehealth remains difficult to deploy effectively [33]. The cost of broadband data is also prohibitively high. Temporary zero-rating of telemedicine apps during the pandemic is a novel idea that may accelerate adoption by removing the financial barrier for patients and in the context of an emergency, fears about net-neutrality may be momentarily superseded in favour of the significant public health benefits. There is precedent for this practice in recent years for social media applications in LMICs but thus far not with telemedicine apps and the pandemic offer an opportunity to jump-start adoption. Mobile carriers would undoubtedly be the eventual beneficiaries of increased telemedicine use post-pandemic providing the business incentive.

Social media systems also provide a potential avenue for rapid dissemination of information for guidelines, information, and encouraging dialogue, particularly for surgeons around the globe [34]. Furthermore, USSD-based and WhatsApp-based technologies may also be able to provide information and group-based network answers to expand available information [35, 36]

### Financing

Many African countries have yet to meet the obligations of the Abuja declaration, let alone the investment required to scale-up surgical access by 2030 that has been estimated at 4–8% of total annual health expenditures among LMICs [37]. A modelling study from 2015 showed that only half

of LMICs would achieve goals for surgical scale-up at current rates of spending without additional funding [37]. It is estimated that external funding from international charitable organisations constitutes as much as 55% of surgical care delivered in LMICs [38]. There is generally a preference in funding for elective surgical diseases and a disproportionate allocation to specific conditions such as cleft lip and ophthalmology which together accounted for 75% of global surgery expenditure in LMICs from 2007 to 2013 [39]. This may leave global surgery services in LMICs vulnerable to funding cuts due to external shocks (such as a global pandemic) and potentially lead to further asymmetries in funding to certain conditions at the expense of others. Expenditure in global surgery is dominated by ‘surgical delivery’ and ‘operations management’ line items while spending on local capacity building, such as infrastructure or surgical training ranks lowest [40]. This is counterintuitive to creating a resilient system and that paradigm requires reappraisal.

The pandemic and associated national lockdowns will reduce income and increase poverty, particularly among the informally employed in LMICs [41]. This will leave them vulnerable to out-of-pocket expenditures and catastrophic health expenditures in the event of a surgical illness. Social safety nets should be extended to prevention of impoverishment as a result of seeking surgical care. Furthermore, applying sound supply chain management principles to procurement for global surgery products and services as well as PPE can minimise structural inefficiencies and reduce the cost of care, further increasing access [42]. This is particularly important during a pandemic when supply chains are interrupted. The USAID Global Health Supply Chain Program is already assisting many African nations with streamlining supply chain management using data analytics and warehouse management systems among many other strategies [43]. This program should be expanded to more LMICs urgently. Nations can also reduce their reliance on global supply chains for personal protective equipment by manufacturing low-cost alternatives locally. Many such initiatives are already being trialled across many LMICs [44]. Additive manufacturing techniques such as 3D printing allow for rapid prototyping and manufacturing [45]

### Governance

The National Surgical, Obstetric and Anaesthesia Plan (NSOAP) is a policy framework for countries to methodically deal with conditions requiring surgery [46]. As of January 2020, 6 countries had developed and launched NSOAPS, while 10 were in the process of formulating one and a further 23 had expressed an interest in doing so [46].

They are central to defining the role of surgery within the broader national health strategy, but the competing health priorities introduced by the pandemic have endangered the ongoing progress of NSOAP development, funding, and implementation. A forum for national surgical planning scheduled for early 2020 incorporating Latin American countries [46] has had to be postponed as well as a “high-level workshop on NSOAP” in Nepal organised by UNITAR, the Global Surgery Foundation and the Nepalese government [47].

## Recommendations

See Table 2.

## Conclusion

Surgical systems, as they are currently constituted, (particularly in LMICs) have multiple stress points within them that make them vulnerable during crises such as pandemics. One of the key ambitions of the global surgery movement is creation of resilient surgical systems. As we scale-up surgical and anaesthetic care and make steady progress towards our goals for 2030, it is necessary to evaluate the durability of our existing systems and test their resilience to external shocks. This will allow us to fortify fault lines in order to minimise the disruption to surgical scale-up in the future. More research is needed to characterise the magnitude of the impact the COVID-19 pandemic will have on surgical service provision. Looking ahead, innovative, tailor-made strategies are required to bolster surgical systems in LMICs against future shocks.

## Compliance with ethical standards

**Conflicts of interest** None.

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