



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

# Global surgery is an essential component of global health



Tamlyn Mac Quene<sup>1</sup>, Lynn Bust<sup>1</sup>, Johnelize Louw, Michael Mwandri, Kathryn M. Chu<sup>\*</sup>

Centre for Global Surgery, Department of Global Health, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa

## ARTICLE INFO

### Article history:

Received 9 September 2021

Accepted 26 October 2021

Available online 23 December 2021

### Keywords:

Global health

Global surgery

Health equity

Health systems strengthening

Low- and middle-income countries

## ABSTRACT

Global surgery as an essential component of global health. Global surgery is the study and practice of improving access to timely, quality, and affordable surgical care. It emphasizes horizontal health systems strengthening through addressing a range of health challenges in surgical care that improve health outcomes, particularly in vulnerable populations. Global surgery specifically contributes to achievement of the Sustainable Development Goals 2030 (SDGs) by addressing the elimination of poverty (SDG 1), ensuring good health and well-being (SDG 3), promoting decent work and economic growth (SDG 8), and reducing inequalities (SDGs 5 and 10). Global surgery issues transcend national boundaries and intersect with other global health issues such as migration and the COVID-19 pandemic. These issues are nested in a highly politicised environment, therefore power and politics should be considered when identifying problems and solutions. Despite evidence of its importance, the global surgery network has not generated substantial attention and resources compared to other global health networks. Global surgery can further increase its effectiveness through linking with health systems strengthening agendas, and identifying unified solutions to improve access to quality surgical care in low- and middle-income countries. Global surgery is indispensable in the achievement of health and well-being for all.

© 2021 Royal College of Surgeons of Edinburgh (Scottish charity number SC005317) and Royal College of Surgeons in Ireland. Published by Elsevier Ltd. All rights reserved.

## Global health

Global health is an area of research and practice that seeks to improve health and achieve health equity for all worldwide.<sup>1</sup> Global health expands the definition and understanding of health and disease from an isolated biomedical process to one of social, economic, political and environmental concern.<sup>2</sup> As such, multiple disciplines (advocacy, finance, governance, informatics, and social and behavioural sciences) beyond the traditional health sector are important.<sup>1</sup> The Sustainable Development Goals 2030 (SDGs) adopted by all United Nations Member states in 2015, represented a universal call to end

poverty, ensure prosperity, and promote well-being for all.<sup>3</sup> The 17 goals targeted a wide range of human conditions including health, development, gender, and equity, and provided global strategies that moved towards using a horizontal, intersectoral systems approach to achieving these goals. At the foreground of the SDGs is the need for strengthening health systems to reduce global mortality and morbidity, and achieve health equity.<sup>3</sup> Global health also emphasizes health systems strengthening in order to achieve universal health coverage (UHC)<sup>a</sup> of essential health services, also a specific SDG.<sup>2,3</sup>

Global health embraces both prevention and treatment from the individual to the population level.<sup>1</sup> Global health is

<sup>\*</sup> Corresponding author. Centre for Global Surgery, Department of Global Health, Faculty of Medicine and Health Sciences, Stellenbosch University, Francie van Zijl Drive, Tygerberg, Cape Town, 7507, South Africa.

E-mail address: [kchu@sun.ac.za](mailto:kchu@sun.ac.za) (K.M. Chu).

<sup>1</sup> Co-first authors.

<sup>a</sup> UHC means “all people have access to the health services they need, when and where they need them, without financial hardship. It includes the full range of essential health services, from health promotion to prevention, treatment, rehabilitation, and palliative care”.<sup>4</sup> <https://doi.org/10.1016/j.surge.2021.10.001>

1479-666X/© 2021 Royal College of Surgeons of Edinburgh (Scottish charity number SC005317) and Royal College of Surgeons in Ireland. Published by Elsevier Ltd. All rights reserved.

transnational, transcending national boundaries to focus on the extent of issues, and is not limited by geographical location.<sup>2</sup> Issues in global health research and practice are nested in a highly politicised environment. As such, power and politics should be considered when identifying problems and solutions in global health.<sup>5</sup>

Issues of global health importance are often complex in nature with multiple determinants. Therefore, solutions require a collaborative effort between institutions and actors that can contribute diverse resources, knowledge, and experience.<sup>2</sup> Global health actors are defined as individuals or organisations that operate transnationally with a primary intent to improve health.<sup>6</sup> Up to 203 different global health actors have been identified, including global civil society organisations and non-governmental organisations, public-private partnerships, professional associations, intergovernmental organisations, national governments, and others.<sup>6</sup> Global health networks are webs of actors linked by a shared concern to address a condition that (potentially) affects a sizeable proportion of the world's population.<sup>7</sup>

---

### Global surgery as an essential component of global health

Global surgery is an essential component of global health. Global surgery can be defined as the study and practice of improving access to timely, quality, and affordable surgical care for all.<sup>8</sup> It encompasses all fields related to surgical care including surgical sub-specialties, obstetrics and gynaecology, anaesthesia, perioperative care, emergency medicine, rehabilitation, palliative care, nursing and the allied health fields, among others.<sup>9</sup> A third of the global burden of disease can be cured through surgical care.<sup>8</sup> Deaths due to surgically treatable conditions outweigh those from HIV, tuberculosis (TB), and malaria combined.<sup>10,11</sup> The field of global surgery emphasizes horizontal health systems strengthening by addressing a range of surgical conditions through a health equity lens, particularly in low- and middle-income countries (LMICs). As such, global surgery has a crucial role in the achievement of SDGs and UHC.

Global surgery specifically contributes to the elimination of poverty (SDG 1), ensuring good health and well-being (SDG 3), promoting decent work and economic growth (SDG 8), and reducing inequalities (SDGs 5 and 10) (Fig. 1).<sup>13</sup> Improving the quality of and access to surgical care positively impacts the health and well-being of populations by returning people to good health with as little morbidity and mortality as possible. In addition, timely access to high-quality surgical care enables economic productivity through lengthening the quality of life and reducing illness and disability. These improvements reduce health inequities especially in low-resource settings and amongst vulnerable populations where barriers to care are the most pronounced.<sup>14</sup>

Despite the clear benefits of access to safe and timely surgical care, the poorest third of the world's population only receives 3.5% of approximately 234 million major surgical operations performed globally.<sup>15</sup> These low operative volumes, compounded by the shortage of healthcare workers and

surgical workforce in LMICs, are associated with high case-fatality rates from common treatable surgical conditions.<sup>8</sup> The Lancet Commission on Global Surgery (LCoGS) states a minimum of 5000 surgical procedures per 100 000 persons, and a specialist surgical workforce density of 20 per 100 000 persons are needed to improve access to surgical care in each country.<sup>8</sup> Most LMICs fall short of these two indicators. In addition, the quality of surgical care can only improve if there is an adequate surgical workforce which in turn affects the surgical volume to address the burden of surgical disease.<sup>8,16</sup> Thus, the delivery of and access to quality surgical care are highly dependent on interconnected domains or networks within the surgical health system. Healthcare service users also experience barriers to accessing surgical care that are linked to socio-economic challenges, particularly those experienced by marginalized groups.<sup>17</sup> Therefore, to improve surgical care services in LMICs, it is necessary to go beyond siloed research to understand the totality of these barriers and their interconnectivity.

The basic package of surgical care that should be accessible to all people is defined as emergency and essential surgical care (EESC). EESC address substantial health burdens, are feasible to implement, and are cost-effective.<sup>18</sup> In 2015, the World Health Assembly adopted a resolution (68.15) to improve EESC and decentralise (first-level) surgical services.<sup>19</sup> The third edition of the Disease Control Priorities outlined 28 EESC operations for first-level hospitals to perform.<sup>20</sup> Surgical capacity for EESC in first-level hospitals in most LMICs is not well-studied and further research into barriers to scaling up and strengthening are needed.

Decentralised surgical services at first-level hospitals are considered an essential component of UHC. To strengthen EESC, surgical care capacity at first-level hospitals must be improved.<sup>19</sup> Several key efforts are needed. Firstly, a context-specific surgical package for first-level hospitals should be defined,<sup>21</sup> and infrastructure and workforce availability considered. For example, most first-level hospitals do not have critical care units or a large complement of surgical nurses. Thus, complex procedures requiring a high level of post-operative monitoring would not be appropriate for first-level surgical care. In some LMICs, such as South Africa, surgeons and anaesthesiologists do not typically work at first-level hospitals. Instead, family physicians, medical officers, or other generalist medical cadres provide surgical care. Provision of surgical care by these non-specialist providers requires ongoing training and mentorship. A hub and spoke system that would link a second or third level hospital with a set of first-level hospitals would promote mentoring and expedite referrals.<sup>22</sup> In summary, strengthening surgical capacity at first-level hospitals would increase access to timely surgical care for a larger proportion of the population.

UHC is central to efforts aimed at strengthening surgical systems to improve the quality and distribution of surgical care and services especially in low-resource settings.<sup>23</sup> The World Health Organization (WHO) underlies three core elements to UHC, namely population, service, and financial coverage.<sup>24</sup> These elements which are crucial to ensuring equity of access and financial risk protection, can be applied to surgical care reform. Best practices of addressing universal access to surgical care encompass successful interventions at the population,



**Fig. 1 – The Sustainable Development Goals 2030 specific to global surgery (source: United Nations<sup>12</sup>).**

services, and financial levels to improve access to surgical care. For example, at the population level, enrolment of families and vulnerable populations in fully subsidised health insurance plans which include essential surgical care or social assistance programmes have worked for some countries.<sup>25</sup> At the service level (which includes workforce), successful interventions focused on improving first-level hospital surgical services through the introduction of packages of care, surgical outreach programmes to rural hospitals, promoting workforce retention, and expanding the workforce through skills development.<sup>23,26,27</sup> At the financial level, substantial investments in surgical services in addition to risk pooling of funds from multiple financial resources (taxes, other government revenues) have been successful methods used for robust financial coverage.<sup>23</sup> An all-encompassing surgical package which delineates services and finances combined with political support would allow for the adoption of surgical care into UHC progress.

Since 2015, efforts have been made to integrate surgical care or systems into national health plans through National Surgical Obstetrics and Anaesthesia Plans (NSOAPs) or blueprints for surgical care on a national level.<sup>28</sup> The NSOAPs incorporate the WHO Health Systems Strengthening framework of six essential, co-dependent, and interacting “building blocks” which include service delivery, health workforce, information, essential medicines, financing and leadership/governance.<sup>29</sup> The NSOAPs may be used to evaluate, create, implement, and finance specific sub-health systems (i.e. surgical systems) within a national health system.<sup>30</sup> Hence, the NSOAPs provide multi-stakeholder involvement to improve surgical systems and a platform for a health systems approach to improve surgery, obstetrics, and anaesthesia care and policies within the wider health agenda.

The WHO has mandated all countries to report on their NSOAP progress every two years.<sup>31</sup> Several LMICs have developed NSOAPs, including Nigeria, Ethiopia, Tanzania and Zambia<sup>32</sup>; however, implementation has been stalled by a lack of financial support. Other factors limiting the implementation of NSOAPs may be a lack of research capacity, skills, and local governance to coordinate the collective support of surgical health systems research in LMICs.<sup>33</sup> As more countries move towards the development of their NSOAPs, focus should be placed on understanding what makes for a successful strategy to attract funding, leadership, and collection of high-quality data to inform and improve outcomes for surgical and obstetric care.

The academic field of global surgery has grown over the years and comprises of clinical, educational, and research collaborations that seek to understand inequitable access to surgical care, and reasons for gaps in surgical care provision including workforce shortages and other barriers.<sup>34</sup> Several academic global surgery centres have been established worldwide and are setting research agendas to drive evidence-based solutions into policy.<sup>35,36</sup> Although the burden of preventable surgical conditions are predominately in LMICs, most academic global surgery centres are located in high-income countries (HICs) such as in the United States and the United Kingdom. However, more recently, a number of global surgery centres have been created in Latin America, Asia, and Africa which will drive the creation of national frameworks for surgical health systems strengthening and implementation into national health plans.<sup>37</sup> Coordinated sustainable partnerships between these LMIC and HIC entities will increase the visibility of the global surgery agenda on international platforms.

**Text box 1****The impact of medical migration on surgical resources**

Health systems are interconnected. Underdeveloped surgical systems in one country or region can affect those in another. For example, certain African countries have poor cancer care, and patients will migrate from one country to another to seek care. This strains the health resources of the host country. The southern African country of Zimbabwe has a health system under near collapse due to recent economic and political instability.<sup>44</sup> Treatment for many cervical, breast, and oesophageal cancers requires surgical care, but are difficult to access.<sup>45,46</sup> Patients seeking surgical care from Zimbabwe (and other neighbouring countries) typically migrate to South Africa which is a hub for those who are desperately seeking lifesaving services.<sup>47</sup> This places strain on already overburdened surgical services.

**Text box 2****The role of robust surgical systems on the COVID-19 pandemic response**

The ongoing COVID-19 pandemic is considered an infectious disease global health problem. The strength of a surgical system can affect the COVID-19 pandemic response. COVID-19 results in severe disease for a minority of infected patients who will die without critical care services including mechanical ventilation.<sup>48</sup> Health systems that have robust surgical services have intensive care units, critical care nurses, and anaesthesiologists. Surgical providers can also be deployed for vascular access and intubation for COVID-19 patients.<sup>49</sup> Under-resourced-countries such as those in LMICs, have weak surgical services and have difficulty providing critical care for COVID-19 patients.<sup>50</sup> Therefore, strong surgical systems should be considered an integral part of the response to the COVID-19 pandemic, and will benefit the health system overall.

**Practical examples of the importance of global surgery to global health**

Two practical examples of how global surgery is an essential component of global health are the impact of medical migration on surgical resources (Text box 1) and the role of robust surgical systems on the COVID-19 pandemic response (Text box 2).

**Global surgery as a global health priority**

Global surgery is one of many global health networks that compete for attention and resources.<sup>7</sup> Compared to other global health networks, such as maternal mortality or tobacco control, global surgery is considered a relatively weak global health priority.<sup>7</sup> Despite its high burden of disease, global surgery has not generated substantial attention and resources.<sup>8,38</sup> Shawar et al.<sup>38</sup> evaluated global political prioritisation of surgery, and identified potential factors which influence its lack of relative success as a global health issue. A framework developed by Shiffman and Smith<sup>39</sup> was utilised to identify the global political priority of networks and considers four factors: *actor power*, *ideas*, *political contexts*, and *issue characteristics*.

Networks of *actors* that are unified are more likely to attract political support as politicians are more likely to listen to those in agreement as authoritative knowledge sources. In addition, a clear leader and guiding institutions for a cause can make it easier for external stakeholders to identify the network and provide direction.<sup>39</sup> The global surgery network is fragmented with a lack of cohesion amongst the various

actors and a vacuum of unifying leadership or guiding institutions.<sup>38</sup> The WHO, often a leader in global health issues, has few resources dedicated to surgical health and thus far has played an important but minor role.<sup>38</sup> Other organizations such as the Global Surgery Foundation,<sup>40</sup> Operation Smile,<sup>41</sup> Lifebox,<sup>42</sup> and Harvard Medical School's Program for Global Surgery and Social Change (PGSSC)<sup>43</sup> have united many of the actors during webinars, online conferences, and editorials, but global surgery network governance needs strengthening.

The messages or *ideas* of a global health network are central to its success. An idea may appeal to different audiences depending on how it is framed. Ideas that resonate internally within communities unifies them through providing a common understanding of the definition, causes, and solutions to the problem. Ideas that resonate externally can help move individuals and organisations to action, particularly those who control resources such as political leaders.<sup>39</sup> Currently, global surgery organisations have differing messages which makes the network less effective. Some focus on specific conditions such as cleft lip/palate (Operation Smile),<sup>41</sup> while others focus on specific populations such as children (Global Initiative for Children's Surgery).<sup>44</sup> In addition, there is no clear consensus on how to address the severe limitation of surgical services in LMICs.<sup>38</sup> There has been a lack of clear outward demands, which hampers the capacity of global surgery actors to convince policymakers to provide resources.<sup>38</sup>

The global surgery community has fallen short of using specific *political contexts*, or *policy windows* - political moments when global conditions align favourably for an issue, providing opportunities to influence decision makers.<sup>39</sup> For example, surgery was not included in the 2015 Millennium Development Goals which was an important missed opportunity to link global surgery with global health goals. Funders

**Table 1 – Core indicators for monitoring of universal access to safe, affordable surgical and anaesthesia care when needed (Source: Meara et al.<sup>8</sup>).**

Indicator	Definition
Access to timely essential surgery	Proportion of the population that can access, within 2 hours, a facility that can do caesarean delivery, laparotomy, and treatment of open fracture (the Bellwether Procedures)
Specialist surgical workforce density	Number of specialist surgical, anaesthetic, and obstetric physicians, per 100 000 population
Surgical volume	Procedures done in an operating theatre, per 100 000 population per year
Perioperative mortality	In-hospital mortality of patients who have undergone a procedure in an operating theatre
Protection against impoverishing expenditure	Proportion of households protected against impoverishment from direct out-of-pocket payments for surgical and anaesthesia care
Protection against catastrophic expenditure	Proportion of households protected against catastrophic expenditure from direct out-of-pocket payments for surgical and anaesthesia care

often favour vertical initiatives rather than the horizontal health systems strengthening that global surgery supports, thereby limiting financial support for both global surgery research and service delivery.<sup>38</sup> However, recently some progress has been made. In 2021, the United States Agency for International Development (USAID) explicitly committed to funding surgical health systems strengthening in LMICs.<sup>45</sup> In addition, a prominent surgeon, Dr. Atul Gawande, has recently been appointed as USAID Assistant Administrator for Global Health.<sup>46</sup> These are major milestones in terms of the recognition of global surgery as a global health priority.

If a global health network accurately measures its issue characteristics, it is more likely to gain political support since policymakers can confirm severity and monitor progress.<sup>39</sup> Global surgery has a paucity of data on the burden of surgical disease as well as the indicators to measure progress in strengthening surgical systems. The global burden of disease was estimated from expert opinion using only a few national datasets.<sup>47</sup> The LCoGS defined six indicators (Table 1) to measure the robustness of a national surgical system.<sup>8</sup> However, data has only been collected in a few countries and unsustainably by HIC academic institutions rather than national ministries of health.<sup>48</sup> This may improve as recently all global surgery indicators have been included in the WHO 100 core health indicators,<sup>49</sup> and four out of six are in the World Development Indicators dataset.<sup>48</sup>

Problems with simple, inexpensive, evidence-based solutions are easier to promote to policymakers.<sup>39</sup> There is a long-held bias that surgery is an unaffordable, luxury item despite reports indicating the cost-effectiveness of basic surgical care delivered at first-level hospitals.<sup>8,38</sup> However, surgical care requires multiple inputs such as human and physical resources which are inadequate in many LMICs. There is no simple solution to strengthening surgical systems, which makes policymakers less likely to prioritise it.

Global health networks that have a unified consortium, a well-defined message, political attention, and measurable indicators are stronger than those that do not. By comparing global surgery to a successful global health network such as the control and eradication of TB, Shiffman<sup>7</sup> provides insight into how global surgery could potentially become a more important global health priority. TB is a longstanding public health problem, with the formation of institutions to address

the disease in the 1800s, and coalitions that have continued to grow. In 2001, the Stop TB Partnership was established which continues to serve as the global guiding institution for TB.<sup>50</sup> There is a broad coalition of researchers, advocates, and political leaders from both HICs and LMICs involved in the TB network. In addition, the TB network has a relatively cohesive problem definition and positioning, as TB is perceived as a social threat, with an established core strategy to address the disease. Annually, the TB network receives billions of dollars in donor funding.<sup>7</sup>

In order for global surgery to become a stronger political priority, the global surgery network should expand its coalition of actors, to include broader researchers, and advocates, particularly those outside of the health sector including civil society.<sup>7</sup> Global surgery should link with UHC and health systems strengthening agendas, which are receiving increasing attention, in order to advance the networks' prioritisation.<sup>38</sup> A unified solution to address key access and quality issues in LMICs should be identified. This would help to form a cohesive message to present to the public and external stakeholders.<sup>38</sup> To become a global health priority, global surgery needs more political prioritisation and better coordination at international and national levels (Table 2).<sup>38</sup>

At the international level, a stronger uniting body is needed to provide guidance and recommendations to the global surgery network. Improving access to and quality of surgical care in low-resource settings should be prioritised to achieve UHC in global surgery. To address this globally, an understanding of who has the least access to safe surgical care and the barriers to achieving equitable access are needed. This requires collection and interpretation of standardised data globally that is comparable across time and settings. A revised set of five indicators (geospatial access, workforce, surgical volume, perioperative mortality, and catastrophic expenditure) to measure the strength of a national surgical ecosystem has been recommended, and should be implemented universally as soon as possible.<sup>51</sup> These indicators would be used to benchmark and inform progress towards safe, timely, and affordable surgical care. The international global surgery community can then utilise these indicators to lobby harder for government and donor support, and raise funds and resources for global surgery. At the national level, governments first need urgent buy-in of the importance of increasing access

**Table 2 – Best practices to improve universal access to surgical care.**

Recommendations	Explanation
1. International lobbying	Need a stronger unifying body and global leadership for global surgery. Expand international funding for global surgery research and advocacy.
2. National and local buy-in	Increased funding and prioritization of global surgery is required at the country level.
3. National surgical, obstetric and anaesthesia planning	Development and implementation of national plans to address the health burden of surgical conditions. Incorporate surgical plans into national health system strengthening agendas.
4. Decentralisation of surgical services	Increase surgical capacity and services at first-level hospitals to improve access to care.
5. Increase specialist and non-specialist surgical workforce	Provide opportunities for upskilling, training, mentorship and task-sharing as well as surgical workforce retention.
6. Standardise surgical data collection	Implement data collection systems to monitor and evaluate surgical care outcomes, progress and needs.
7. Implement quality improvement mechanisms for surgical systems	Utilising data provided from consistent monitoring and evaluation to implement mechanisms to improve the quality of surgical norms and standards.
8. Community engagement and involvement	Community participation to understand priorities and barriers to accessing surgical care.

to surgical care. Governments and other global surgery actors must prioritise the development and implementation of NSOAPs.<sup>32</sup> Development of a NSOAP involves eight steps: ministry support and ownership; situation analysis and baseline assessments; stakeholder engagement and priority setting; drafting and validation; monitoring and evaluation; costing; governance; and implementation.<sup>52</sup> Barriers to successful implementation of NSOAPs should be identified and understood. Identifying the gaps across the surgical system is critical to developing a successful plan to ensure national scale-up of surgical system strengthening activities. Improving access to surgical care as a key component of a national health system is critical to achieving UHC.

## Conclusion

Surgery saves lives. Surgical care can treat up to one third of the global burden of the disease and improving access to surgical care is critical, especially in LMICs. Surgical health systems strengthening including improvements in infrastructure, equipment, and a specialist surgical workforce will benefit the greater health system. Global surgery strives to achieve high quality and timely access to surgery for all, and can contribute to the attainment of UHC and the SDGs. Several important steps are needed to increase its effectiveness as a global health network including a unified consortium, a well-defined message, political attention, and measurable indicators. Global surgery is an essential component of global health and indispensable in achievement of health and well-being for all.

## Declaration of competing interest

All authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

None.

## REFERENCES

1. Koplan JP, Bond TC, Merson MH, Reddy KS, Rodriguez MH, Sewankambo NK, et al. Towards a common definition of global health. *Lancet* 2009;373:1993–5.
2. Beaglehole R, Bonita R. What is global health? *Glob Health Action* 2010;3. <https://doi.org/10.3402/gha.v3i0.5142>.
3. United Nations. Transforming our world: the 2030 agenda for sustainable development. New York: United Nations; 2030.
4. World Health Organisation. *Universal health coverage* [Internet] [cited 2021 19 Aug]. Available from: [https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-\(uhc\)](https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-(uhc)); 2021.
5. Bozorgmehr K. Rethinking the 'global' in global health: a dialectic approach. *Glob Health* 2010;6:1–19.
6. Hoffman SJ, Cole CB. Defining the global health system and systematically mapping its network of actors. *Glob Health* 2018;14:1–19.
7. Shiffman J. Four challenges that global health networks face. *Int J Health Pol Manag* 2017;6:183.
8. Meara JG, Leather AJ, Hagander L, Alkire BC, Alonso N, Ameh EA, et al. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *Surgery* 2015;158:3–6.
9. Dare AJ, Grimes CE, Gillies R, Greenberg SL, Hagander L, Meara JG, et al. Global surgery: defining an emerging global health field. *Lancet* 2014;384:2245–7.
10. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012;380:2095–128.
11. Shrimpe MG, Bickler SW, Alkire BC, Mock C. Global burden of surgical disease: an estimation from the provider perspective. *Lancet Glob Health* 2015;3(Suppl 2):S8–9.

12. United Nations. *The 17 goals* [Internet] [cited 2021 25 Aug]. Available from: <https://sdgs.un.org/goals>; 2021.
13. Roa L, Jumbam DT, Makasa E, Meara JG. Global surgery and the sustainable development goals. *Br J Surg* 2019;106:e44–52.
14. Grimes CE, Bowman KG, Dodgion CM, Lavy CB. Systematic review of barriers to surgical care in low-income and middle-income countries. *World J Surg* 2011;35:941–50.
15. Weiser TG, Regenbogen SE, Thompson KD, Haynes AB, Lipsitz SR, Berry WR, et al. An estimation of the global volume of surgery: a modelling strategy based on available data. *Lancet* 2008;372:139–44.
16. The World Bank. *Specialist surgical workforce (per 100,000 population)* [Internet] [cited 2021 25 Aug]. Available from: <https://data.worldbank.org/indicator/SH.MED.SAOP.P5>; 2021.
17. van Rensburg HC. South Africa's protracted struggle for equal distribution and equitable access—still not there. *Hum Resour Health* 2014;12:1–16.
18. Price R, Makasa E, Hollands M. World Health Assembly Resolution WHA68.15: “strengthening emergency and essential surgical care and anesthesia as a component of universal health coverage”—addressing the public health gaps arising from lack of safe, affordable and accessible surgical and anesthetic services. *World J Surg* 2015;39:2115–25.
19. WHA68.15. *WHO reform. Sixty-eighth world health assembly, Geneva, 18-26 May 2015; resolutions and decisions, annexes*. Geneva: World Health Organisation; 2015.
20. Mock CN, Donkor P, Gawande A, Jamison DT, Kruk ME, Debas HT. *Essential surgery: key messages from disease control priorities*. 3rd ed. *Lancet* 2015;385:2209–19.
21. Chu KM, Duvenage R. A call to action: translating procedural baskets into improved surgical capacity at the district hospital. *World J Surg* 2021;45:378–9.
22. Chu K, Maine R, Duvenage R. We asked the experts: the role of rural hospitals in achieving equitable surgical access in low-resourced settings. *World J Surg* 2021;45:3016–8.
23. Reddy CL, Vervoort D, Meara JG, Atun R. Surgery and universal health coverage: designing an essential package for surgical care expansion and scale-up. *J Glob Health* 2020;10:020341.
24. World Health Organisation. *Health systems financing: the path to universal coverage*. Geneva: WHO; 2010.
25. Maeda A, Araujo E, Cashin C, Harris J, Ikegami N, Reich M. *Universal health coverage for inclusive and sustainable development: a synthesis of 11 country case studies*. Washington, D.C.: The World Bank; 2014.
26. Reddy CL, Makasa EM, Biccadd B, Smith M, Steyn E, Fieggen G, et al. Surgery as a component of universal healthcare: where is South Africa? *S Afr Med J* 2019;109:624–5.
27. McCord C, Kruk ME, Mock CN, Cherian M, von Schreeb J, Russell S, et al. Organization of essential services and the role of first-level hospitals. In: Debas HT, Donkor P, Gawande A, Jamison DT, Kruk ME, Mock CN, editors. *Essential surgery: disease control priorities*. 3rd ed., vol. 1. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2015.
28. Truché P, Shoman H, Reddy CL, Jumbam DT, Ashby J, Mazhiqi A, et al. Globalization of national surgical, obstetric and anesthesia plans: the critical link between health policy and action in global surgery. *Glob Health* 2020;16:1.
29. World Health Organization. *Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies* [Internet] [cited 2021 July 20]. Available from: [https://www.who.int/healthinfo/systems/WHO\\_MBHSS\\_2010\\_full\\_web.pdf](https://www.who.int/healthinfo/systems/WHO_MBHSS_2010_full_web.pdf); 2010.
30. Sonderman KA, Citron I, Meara JG. National surgical, obstetric, and anesthesia planning in the context of global surgery: the way forward. *JAMA Surg* 2018;153:959–60.
31. World Health Organisation. *Progress in the implementation of the 2030 agenda for sustainable development*. Geneva: World Health Organisation; 2017.
32. Peters AW, Roa L, Rwamasirabo E, Ameh E, Ulisubisya MM, Samad L, et al. National surgical, obstetric, and anesthesia plans supporting the vision of universal health coverage. *Glob Health Sci Pract* 2020;8:1–9.
33. Makasa EM. Universal access to surgical care and sustainable development in sub-Saharan Africa: a case for surgical systems research: comment on “global surgery—Informing national strategies for scaling up surgery in sub-Saharan Africa”. *Int J Health Pol Manag* 2019;8:58.
34. Park J, Cheoun M-L, Choi S, Heo J, Kim W-H. The landscape of academic global surgery: a rapid review. *J Public Health Emerg* 2021;5:1–16.
35. Chu KM, Naidu P, Hendriks HJ, Nash J, Coetzee FJ, Esteves M, et al. Surgical care at rural district hospitals in low- and middle-income countries: an essential component of universal health coverage. *Rural Rem Health* 2020;20:5920.
36. Rayne S, Burger S, Van Straten S, Biccadd B, Phaahla MJ, Smith M. Setting the research and implementation agenda for equitable access to surgical care in South Africa. *BMJ Glob Health* 2017;2:e000170.
37. Hardcastle T, Chu K. Global surgery: a South African action plan. *S Afr J Surg* 2020;58:176–7.
38. Shawar YR, Shiffman J, Spiegel DA. Generation of political priority for global surgery: a qualitative policy analysis. *Lancet Glob Health* 2015;3:e487–95.
39. Shiffman J, Smith S. Generation of political priority for global health initiatives: a framework and case study of maternal mortality. *Lancet* 2007;370:1370–9.
40. *Global surgery foundation* [Internet] [cited 2021 9 Sept]. Available from: <https://www.globalsurgeryfoundation.org/>; 2021.
41. *Operation smile* [Internet] [cited 2021 30 Aug]. Available from: <https://www.operationssmile.org/>; 2021.
42. *Lifebox* [Internet] [cited 2021 9 Sept]. Available from: <https://www.lifebox.org/>; 2021.
43. Harvard Medical School. *Program in global surgery and social change* [Internet] [cited 2021 9 Sept]. Available from: <https://www.pgssc.org/>; 2021.
44. *Global initiative for children's surgery* [Internet] [cited 2021 30 Aug]. Available from: <https://www.globalchildrensurgery.org/>; 2021.
45. *Explanatory statement for department of state, foreign operations, and related programs appropriations Bill*. 2021. p. 2021.
46. Harvard School of Public Health. *Atul Gawande nominated for senior USAID post* [Internet] [cited 2021 30 Aug]. Available from: <https://www.hsph.harvard.edu/news/hsph-in-the-news/atul-gawande-nominated-for-senior-usaid-post/>; 2021.
47. Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, Evans DB, et al. *Disease control priorities in developing countries*. 2nd ed. The International Bank for Reconstruction and Development/The World Bank; 2006.
48. Juran S, Gruendl M, Marks IH, Broer PN, Guzman JM, Davies J, et al. The need to collect, aggregate, and analyze global anesthesia and surgery data. *Can J Anaesth* 2019;66:218–29.
49. World Health Organisation. *Global reference list of 100 core health indicators (plus health-related SDGs)* [Internet] [cited 2021 30 Aug]. Available from: <http://www.who.int/healthinfo/indicators/2018/en/>; 2018.
50. Quissell K, Walt G. The challenge of sustaining effectiveness over time: the case of the global network to stop tuberculosis. *Health Pol Plann* 2016;31:i17–32.
51. Davies JI, Gelb AW, Gore-Booth J, Martin J, Mellin-Olsen J, Åkerman C, et al. Global surgery, obstetric, and anaesthesia indicator definitions and reporting: an Utstein consensus report. *PLoS Med* 2021;18:e1003749.
52. Sonderman KA, Citron I, Mukhopadhyay S, Albutt K, Taylor K, Jumbam D, et al. Framework for developing a national surgical, obstetric and anaesthesia plan. *BJS Open* 2019;3:722–32.