




BMJ Open Assessing the inclusion of children's surgical care in National Surgical, Obstetric and Anaesthesia Plans: a policy content analysis

Sabrina Wimmer ^{1,2}, Paul Truche,^{3,4} Elena Guadagno,¹ Emmanuel Ameh ⁵, Lubna Samad,⁶ Emmanuel Mwenda Malabo Makasa,⁷ Sarah Greenberg,⁸ John G Meara,^{3,9} Tonnies H van Dijk,¹⁰ Dan Poenaru ¹

To cite: Wimmer S, Truche P, Guadagno E, *et al.* Assessing the inclusion of children's surgical care in National Surgical, Obstetric and Anaesthesia Plans: a policy content analysis. *BMJ Open* 2023;**13**:e051248. doi:10.1136/bmjopen-2021-051248

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-051248>).

Received 15 March 2021
Accepted 14 May 2022



© Author(s) (or their employer(s)) 2023. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Dr Sabrina Wimmer;
s.wimmer@doctors.org.uk

ABSTRACT

Objective While National Surgical, Obstetric and Anaesthesia Plans (NSOAPs) have emerged as a strategy to strengthen and scale up surgical healthcare systems in low/middle-income countries (LMICs), the degree to which children's surgery is addressed is not well-known. This study aims to assess the inclusion of children's surgical care among existing NSOAPs, identify practice examples and provide recommendations to guide inclusion of children's surgical care in future policies.

Design We performed two qualitative content analyses to assess the inclusion of children's surgical care among NSOAPs. We applied a conventional (inductive) content analysis approach to identify themes and patterns, and developed a framework based on the Global Initiative for Children's Surgery's Optimal Resources for Children's Surgery document. We then used this framework to conduct a directed (deductive) content analysis of the NSOAPs of Ethiopia, Nigeria, Rwanda, Senegal, Tanzania and Zambia.

Results Our framework for the inclusion of children's surgical care in NSOAPs included seven domains. We evaluated six NSOAPs with all addressing at least two of the domains. All six NSOAPs addressed 'human resources and training' and 'infrastructure', four addressed 'service delivery', three addressed 'governance and financing', two included 'research, evaluation and quality improvement', and one NSOAP addressed 'equipment and supplies' and 'advocacy and awareness'.

Conclusions Additional focus must be placed on the development of surgical healthcare systems for children in LMICs. This requires a focus on children's surgical care separate from adult surgical care in the scaling up of surgical healthcare systems, including children-focused needs assessments and the inclusion of children's surgery providers in the process. This study proposes a framework for evaluating NSOAPs, highlights practice examples and suggests recommendations for the development of future policies.

INTRODUCTION

Five billion people globally—including 1.7 billion children—lack access to safe, affordable, and timely surgical and anaesthesia care,

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ To our knowledge, this is the first study to analyse the inclusion of children's surgical care in National Surgical, Obstetric and Anaesthesia Plans (NSOAPs).
- ⇒ We developed a policy analysis framework based on the Global Initiative for Children's Surgery's Optimal Resources for Children's Surgery.
- ⇒ This study outlines practice examples of countries and provides recommendations to scale up surgical care for children.
- ⇒ Limitations include the application of a standardised analytical framework to NSOAPs that is specific to the country's needs and existing healthcare structure, and likely under-reporting on strategies and existing infrastructure for children's surgical care.

with a disproportionate need in low/middle-income countries (LMICs).^{1,2} Children under 15 years represent one-quarter of the world's population, and close to 90% of children globally live in LMICs.² To address children's surgical needs, children's surgery should play an important role in the scale-up of surgical healthcare systems as an estimated 85% of children will require some form of surgery by the time they are 15 years.^{2,3} Furthermore, as childhood deaths from infectious diseases and malnutrition decreased in the last decades,^{4,5} congenital anomalies are now the fifth leading cause of death in children under the age of 5 years, constituting 9% of the global surgical burden of disease.⁶ Additionally, surgery is the only treatment option for many childhood diseases, including congenital anomalies, cancer, injuries and other emergencies in regions with low resources.⁷

Expanding surgical care has long been neglected, as it was considered a complex and expensive intervention with limited public health benefits compared with treating and preventing communicable

diseases.⁸ In 2015, the Lancet Commission on Global Surgery (LCoGS)¹ and Disease Control Priorities Third Edition⁹ highlighted the critical need to improve global surgical care. This was followed by the World Health Assembly resolution 68.15,¹⁰ which prioritised the strengthening of surgical healthcare systems as a component of universal health coverage. Recognising the unique needs of children, the Global Initiative for Children's Surgery (GICS) was established in 2016 to combine the experience and capabilities of children's surgery providers in LMICs with the resources and expertise of high-income country partners.⁴ To provide guidelines for essential surgical care for children in LMICs, working groups under LMIC leadership were convened with representation from all aspects of children's surgical care including surgery and surgical subspecialties, anaesthesia and allied health professionals from 44 different countries. Four independent working groups were formed to provide guidelines and recommendations along the domains of (1) 'research, data and quality improvement', (2) 'financing, policy and advocacy', (3) 'training, human resources and education', and (4) 'infrastructure and standards'. This unique, multidisciplinary strategy resulted in the publication of the Optimal Resources for Children's Surgery (OReCS) document, which outlines guidelines for different levels of care and the resources required.^{5,7} OReCS provides a framework against which gaps in existing children's surgical care can be identified, and efforts made to integrate this essential component of surgical services into existing and ongoing national strategies.⁷

In response to the unmet burden of surgical need, a growing number of countries have been developing National Surgical, Obstetric and Anaesthesia Plans (NSOAPs). These plans are Ministry of Health-led national health policies aimed to ensure that surgical, obstetric and anaesthesia services are available for an increasing number of people through supporting the planning of health workforce and infrastructure capacity.⁷ As of June 2020, seven countries have developed national-level policies, including Ethiopia, Nigeria, Madagascar, Rwanda, Senegal, Tanzania and Zambia. Over 20 additional countries have made initial commitments to start the NSOAP planning process or are in various stages of development.¹¹ The process of NSOAP planning is adaptable to the local setting and resources of each country and designed to address the unique interplay of population-specific surgical needs within the existing healthcare structure. The NSOAPs are intended to be fully integrated into the national health planning strategy. Although designed to improve access to surgical care for patients of all ages, including language specific for children's surgery, they may represent an opportunity to address the unique challenges when providing children's surgical care.

In this study, we assess the inclusion of children's surgical care among existing NSOAPs and develop a framework based on the GICS OReCS to guide inclusion of children's surgery in future policies.

METHODOLOGY

Applying a health policy analysis framework to global children's surgery

To assess the degree of inclusion of children's surgical care within existing NSOAPs, we applied a health policy analysis approach, including two separate qualitative content analyses. We first developed a framework for the analysis, and consequently performed an individual policy analysis of each published NSOAP.

We analysed the GICS OReCS document and the six publicly available NSOAPs at the time of writing through a systematic classification process that supports the identification of themes and patterns and the consequent coding and evaluating of these.¹² A similar method has been used to perform a qualitative policy content analysis on subnational insect pollinator legislation in the USA.¹³ We collected the NSOAPs of Ethiopia, Nigeria, Rwanda, Tanzania and Zambia from publicly accessible websites (eg, from national ministries). Through the GICS network, we additionally received access to the NSOAP of Senegal; we later identified the NSOAP policy on a publicly accessible website. The NSOAPs of Madagascar and Pakistan were not publicly available (as of June 2020), and were therefore not included. Of note, the NSOAP of Pakistan was in the final approval stage at time of writing. The Program in Global Surgery and Social Change (PGSSC) compiles NSOAP policies and related documents on their website.¹⁴

Based on Collins' eight-step framework for health policy analysis,¹⁵ we performed the first three steps of the framework in this research. A similar methodological approach has been used in a study analysing asset management policies in Australia.¹⁶ Step 1 of the framework defines the context for the policy analysis. In response to the increased focus on the surgical burden of disease, a growing number of countries have developed local ministry-led NSOAPs with support from global partners focusing on the country-specific context (step 1). In step 2, the study collaborators defined the problem following discussions that took place at a previously held GICS meeting: 'Considering that children make up a significant proportion of the total population in LMICs, to what degree is children's surgery addressed in these NSOAPs?'. In step 3, we looked for evidence to answer this question by analysing the GICS OReCS document and six NSOAPs.⁵ This analysis was then used to make recommendations to guide the inclusion of children's surgery in future policies. We did not perform the further steps of the Collins' framework, as the NSOAPs are currently in their implementation phases and none have collected benchmarking data so far. The Collins' framework will allow for the further steps to be completed at a later stage to evaluate the implementation and effectiveness of the policies.

Patient and public involvement

Since this study was designed as a policy content analysis of publicly available documents, we did not involve

patients or the public in the design and conduct of the study. The NSOAP development process, however, was led by national ministries and involved elected officials and government representatives as well as various local stakeholder groups, depending on the country setting. It was beyond the scope of our study to analyse country-specific policy processes and the extent various stakeholders were involved in the respective NSOAP process.

Developing a framework based on GICS OReCS

To develop the framework based on the OReCS document, we followed the conventional content analysis approach, without predetermined themes or concepts.¹² We used a general inductive approach^{17 18} with the purpose of deriving themes and patterns from observation in order to capture the frequent, dominant or significant themes described in the OReCS document. For this, one author (SW) closely read the full text of the OReCS document and identified 10 main themes and multiple subthemes. Next, to test the identified themes, this author selected two NSOAPs (Ethiopia and Nigeria) based on the criteria that these were the first NSOAPs alphabetically, written in English language, and had different purposes. The Ethiopian policy was written to address general surgical care, while the Nigerian policy included a section on children's surgical care specifically. By comparing the identified themes based on the OReCS document and the two NSOAPs, and following multiple rounds of reviews by the other authors, we developed a framework that includes six themes. Those themes were named 'domains', and the multiple subthemes for the domains were called 'key components' (see graph 1 for the definition of each domain). The modified LCoGS six-component framework for the development of NSOAPs lists 'governance' and 'financing' as two further domains not addressed in the OReCS document.¹¹ Following consultation with experts from GICS and PGSSC, we included an additional domain called 'governance and financing' in the OReCS framework, specifically looking at the inclusion of children's surgical care in this domain. The domains exist within the wider surgical healthcare system, and graph 1 shows our understanding of how these domains interact and influence one another.

Analysing the NSOAPs and applying the OReCS framework

In the next step, we performed a directed content analysis of the six NSOAPs with the goal to validate or extend conceptually our previously developed framework.^{12 18} This deductive approach was used to test whether data were consistent with our framework.¹⁷ We hypothesised that little was known about the intersection between NSOAPs and children's surgery. Before conducting the analysis, we developed a standard charting scheme in Microsoft Excel according to the identified domains and key components to support categorising and coding of the data collected from the NSOAPs. To identify areas in the six NSOAPs related to children's surgery, we conducted a text field search ("child/ren", "p[a[ediatric", "age") and scanned

the full text in case we did not capture all references to children. For the Senegalese NSOAP, we performed the analysis in French and later translated the identified text parts into English. One author (SW) first compiled the collected data in a Microsoft Word document and consequently coded it according to the domains and key components of our framework (online supplemental file 1).¹⁹ We did not use software for the qualitative analysis due to the small number of documents analysed (GICS OReCS and six NSOAPs), as well as a search focus on themes rather than a defined number of search terms. A second author (PT) scanned the six NSOAPs, as well as the collected and coded data. Discrepancies in coding were resolved by clearly defining the framework domains and resolving differences in data inclusion.

RESULTS

Overview of NSOAPs analysed

This study analysed the NSOAPs of Ethiopia, Nigeria, Rwanda, Senegal, Tanzania and Zambia. Following the conventional analysis approach, we adapted six domains from the GICS OReCS document and one domain from the LCoGS six-component framework for NSOAPs to guide our review of existing NSOAPs and policy documents (graph 1). [Table 1](#) provides an overview of the OReCS framework domains addressed in the respective policies.

Human resources, workforce and training

The NSOAPs of Ethiopia, Nigeria, Senegal, Tanzania and Zambia addressed the human resources for children's surgical care. The need for additional paediatric surgeons was noted by Nigeria and Zambia. Additionally, Nigeria specified the number of paediatric nurses and Zambia included children's anaesthesia providers.

Nigeria, Rwanda, Tanzania and Zambia included training objectives specifically addressing the surgical care of children ([table 2](#)). Rwanda expressed the need to develop specialty training programmes. Tanzania aimed to decrease financial barriers to enter training, especially in rural areas. Tanzania and Zambia mentioned training objectives for the recognition of surgical conditions, while Nigeria, Tanzania and Zambia addressed objectives for skills training. Nigeria included guidelines and protocols; further, Nigeria and Tanzania mentioned training for the referral procedure.

Infrastructure

All six countries included an outline of their respective surgical healthcare system infrastructure (online supplemental table 1). Nigeria included non-governmental facilities in the overview. Zambia labelled the facility types as levels without specifying these further. None of the six countries mentioned an existing national children's hospital in their respective NSOAP; however, Nigeria mentioned the establishment of national and regional children's hospitals. Nigeria also outlined strategies to

Table 1 OReCS framework domains addressed in analysed NSOAPs

Country (years)	OReCS framework domains						
	Human resources and training	Infrastructure	Service delivery	Equipment and supplies	Research, evaluation & QI	Advocacy and awareness	Governance and financing
Ethiopia (2016–2020) ³⁶	✓	✓	✓		✓	✓	
Nigeria (2019–2023) ²⁰	✓	✓	✓	✓	✓		✓
Rwanda (2018–2024) ³⁷	✓	✓					
Senegal (2014–2018) ³⁸	✓	✓					
Tanzania (2018–2025) ³⁹	✓	✓	✓				✓
Zambia (2017–2021) ⁴⁰	✓	✓	✓				✓

NSOAPs, National Surgical, Obstetric and Anaesthesia Plans; OReCS, Optimal Resources for Children's Surgery; QI, quality improvement.

increase capacity for advanced surgical care and intensive care at third-level facilities, while Zambia included level 2 and level 3 facilities. Nigeria further addressed transportation and the equipment of ambulances for children (table 2).

Service delivery

The NSOAPs of Ethiopia, Nigeria, Tanzania and Zambia outlined tasks and responsibilities for healthcare facilities (figure 1). Nigeria covered children's surgical care for each facility type, bearing the largest resemblance with the recommendations outlined in the OReCS document. Ethiopia and Zambia mentioned tasks and responsibilities addressing children's surgical care for one and Tanzania for two types of healthcare facilities; these are outlined combined with adult surgical care in their policies.

Nigeria further outlined strategies for all four key components of children-specific service delivery, including an essential surgical package at all facilities, advanced surgical care at tertiary facilities, an efficient referral system based on OReCS, and the integration of care into the transportation and referral system. Zambia planned to increase the number of level 2 and 3 facilities providing surgery and anaesthesia for children (table 2).

Equipment and supplies

Nigeria addressed children-specific equipment, consumables and supply chain management (table 2).

Research, evaluation and quality improvement

Ethiopia, Nigeria and Zambia mentioned quality improvement strategies in their respective NSOAPs. None of the NSOAPs mentioned children-specific research (table 2).

Advocacy and awareness

The NSOAP of Ethiopia outlined an awareness strategy for the surgical care of children targeting healthcare workers (table 2).

Governance and financing

The Nigerian NSOAP addressed children's surgical care as a separate component from adult surgical care. It also included a section on healthcare governance and leadership specifically addressing children's surgery, which entails strategic targets, activities and responsibilities, as well as means of measuring the implementation. Tanzania and Zambia listed costs to train paediatric surgeons; in addition, Tanzania specified the costs for skills training. Nigeria stated that specific funding for children's surgery is not available.

DISCUSSION

NSOAPs have emerged as a viable path to coordinate national efforts to improve surgical, obstetric and anaesthesia care in LMICs. Despite the intent of the analysed NSOAPs to include all surgical care, the surgical care of children, who constitute a large proportion of the population in many LMICs, does not receive sufficient attention. Our findings suggest that all six NSOAPs addressed two or more domains outlined in the OReCS framework. These were, however, often combined with adult surgical care and got lost in typically adult objectives and recommendations that were not specific to the unique needs of children. Rather, children's surgery should be included as an integral and specific component of NSOAPs, and addressed separately to adult surgical care (box 1 provides recommendations for the inclusion of children's surgery in NSOAP policies).

A number of countries performed a surgical needs assessment prior to the development of their NSOAP. Nigeria performed a children-specific needs assessment and also included paediatric nursing care, using a children's surgical assessment tool developed by GICS and PGSSC based on the WHO assessment tool.²⁰ Children-specific needs assessments support the mapping of available human resources and infrastructure for children,

Table 2 Practice examples for the inclusion of children's surgical care outlined in NSOAPs

Domains	Key components					
Training	Recognition of surgical conditions		Skills training	Guidelines and protocols	Referral procedure	Specialist training
	<ul style="list-style-type: none">► Recognition of paediatric surgical disease by health centre and community health workers	<ul style="list-style-type: none">► Essential children's surgery package provided by family physicians and general duty doctors► Emergency response staff adequately trained for resuscitation and emergency care► Treatment of minor burns► SAFE Paeds training at level 1 facilities► SAFE Paeds Anaesthesia Program for anaesthesia providers		<ul style="list-style-type: none">► Clear outline of care by different providers► Standard operating procedures for management of children's surgical diseases at levels of healthcare	<ul style="list-style-type: none">► Prompt referral to specialist paediatric surgical providers in local and regional secondary and tertiary facilities► Surgical referral pathway known to all health centre and community workers	<ul style="list-style-type: none">► Developing curriculum for subspecialist fellowship training programme► Decrease of financial barriers to entry (esp. rural areas)
Infrastructure	Paediatric surgical care and subspecialist care		Paediatric critical care	Transportation		
	<ul style="list-style-type: none">► One national children's hospital and regional children's hospitals	<ul style="list-style-type: none">► Paediatric and neonatal ICU at tertiary (and some secondary) facilities► Critical care beds equipped for children or dedicated ICU for children at secondary facilities providing paediatric surgery		<ul style="list-style-type: none">► Resources and infrastructure for emergency transport of children► Appropriately equipped and maintained ambulances		
Service delivery	Paediatric surgical care and subspecialist care		Paediatric critical care	Referral system	Transportation	
	<ul style="list-style-type: none">► Essential surgical package at all facilities► Advanced surgical care at tertiary facilities	<ul style="list-style-type: none">► Adequate and appropriate staffing		<ul style="list-style-type: none">► Efficient referral system based on OReCS	<ul style="list-style-type: none">► Care of children integrated into existing and planned prehospital and ambulance system	
Equipment and supplies	Children-specific equipment		Children-specific consumables		Supply chain management system	
	<ul style="list-style-type: none">► Availability of appropriate children's modes and sizes for all equipment and instruments at all levels of healthcare► Appropriately equipped and maintained ambulances	<ul style="list-style-type: none">► Availability of appropriate children's sizes for all consumables and supplies at all levels of healthcare		<ul style="list-style-type: none">► Adequate and regular supply of medical and surgical materials specific for neonates and children within an efficient procurement and logistics management system		
Quality improvement and research	Structural improvement		Process improvement		Outcome improvement	
	<ul style="list-style-type: none">► Regular audit and efficient monitoring of quantity and shelf life of supplies within an integrated distribution network	<ul style="list-style-type: none">► Mentorship for level 2 providers► Having mothers close to babies for paediatric surgeries				
Advocacy and awareness	<ul style="list-style-type: none">► Campaign targeting healthcare professionals both directly working in surgery as well as more broadly working on maternal, newborn and child health issues (ie, health service managers, surgeons, health workers, health trainees and professional associations)					
Governance and financing	Governance		Financing			
	<ul style="list-style-type: none">► Integration of children's component of NSOAP into NCHP► Strategic targets, activities, responsibilities and means of verification		<ul style="list-style-type: none">► Budget plan for human resources and training			
Empty field=information not mentioned in NSOAPs. ICU, intensive care unit; NCHP, National Child Health Policy/Plan; NSOAPs, National Surgical, Obstetric and Anaesthesia Plans; OReCS, Optimal Resources for Children's Surgery; SAFE Paeds, Safer Anaesthesia from Education-Paediatric Anaesthesia.						

	Resuscitation & Stabilisation	Anaesthesia	Trauma	Non-trauma	Infection	Tumours	Congenital anomalies
OReCS	BLS	Local anaesthesia for minor procedures	Simple wounds, Splinting of closed+ non-displaced fractures, 1st degree burns < 10% TBSA	Circumcision, Foreign body removal in ear and nose	Superficial abscesses	Screening	Screening
	PALS	General anaesthesia, Refer more complicated cases	Laparotomy, Closed and open fractures, Diagnosis and stabilization of neurological trauma, Burns <10% TBSA	Intestinal obstruction, Foreign body removal in airway and esophagus	Abscesses, septic arthritis, Thoracostomy tube for empyema, Drainage and debridement of osteomyelitis	Benign tumours	Colostomy for imperforate anus, Inguinal hernia repair in older children
		All types of anaesthesia, some complex cases (ASA III)	All trauma		All surgical infections	All tumours	All congenital anomalies
		Complex cases with comorbidities (All ASA)					
		Complex cases with comorbidities (All ASA)					
Ethiopia				Intussusception, Foreign body removal			Colostomy for ano-rectal malformation
Nigeria	BLS	Local anaesthesia for minor procedures	1st degree burns <10% TBSA	Circumcision	Screening, Superficial abscesses	Screening	Screening
	PALS	General anaesthesia (ASA I+II), Refer ASA >II	Laparotomy, Closed and open fractures, Neurological trauma diagnosis and stabilisation, Burns <10%	Appendicitis, Intestinal obstruction, Foreign body removal	Abscesses, Septic arthritis, Drainage and debridement of osteomyelitis	Benign tumours	Inguinal hernia repair in older children
		All types of anaesthesia	All trauma		All surgical infections	All tumours	All congenital anomalies
Tanzania	SAFEpeds						
	PALS						
Zambia	SAFEpeds		Surgical emergencies and burns				Screening

Figure 1 OReCS recommendations and country comparison of tasks and responsibilities for children's surgical care of different types of healthcare facilities outlined in the NSOAPs. ■ health centres; ■ first-level hospitals; ■ second-level hospitals; ■ third-level hospitals; ■ national children's hospitals. The table includes countries that specified tasks and responsibilities; Rwanda and Senegal were not included for this reason. Tasks and responsibilities are labelled for the lowest mentioned healthcare facility level, assuming that higher facility levels are able to meet the requirements mentioned for lower levels. Empty field=information not mentioned in NSOAPs. ASA, American Society of Anesthesiologists physical status classification system to assess the fitness of patients before surgery; BLS, Basic Life Support; NSOAPs, National Surgical, Obstetric and Anaesthesia Plans; OReCS, Optimal Resources for Children's Surgery; PALS, Paediatric Advanced Life Support; SAFE Paeds, Safer Anaesthesia from Education-Paediatric Anaesthesia; TBSA, total body surface area.

which are currently not widely established. Three further capacity assessment tools for children's surgery have been identified,²¹ of which the Pediatric Surgery Personnel, Infrastructure, Procedure, Equipment and Supplies Survey was developed specifically for LMICs to assess paediatric surgical capacity in West Africa.²² Robust needs assessments with respect to children's surgical care are

critical to ensure that the needs of children are met while developing NSOAPs.

Scaling up capacity for children's surgical care

Due to the specialised nature of children's surgical care, specific infrastructure needs are required to ensure high-quality children's surgical care. However, the majority

Box 1 Recommendations for the inclusion of children's surgical care in NSOAP policies

General

- ⇒ Identify regional and national paediatric surgical societies who can act as stakeholders in the process of strategic planning.
- ⇒ Include at least one paediatric surgeon during the NSOAP process.
- ⇒ Perform children-focused needs assessment prior to developing an NSOAP (see GICS WHO-PGSSC assessment tool).
- ⇒ Address the unique surgical needs of children as a separate component from adult surgical care in the NSOAP.

Human resources and training

- ⇒ Establish existing and needed human resources and specifically include paediatric anaesthesia and nursing care.
- ⇒ Clearly outline training objectives for all types of healthcare facilities.⁴¹

Infrastructure

- ⇒ Clearly outline the surgical care system for children and clarify the level of care for each healthcare facility type in order to optimise triage.
- ⇒ Use a needs-based assessment for optimising location of healthcare facilities with paediatric surgical capabilities.

Service delivery

- ⇒ Outline tasks and responsibilities for the various types of healthcare facilities; refer to the GICS OReCS document for guidance.
- ⇒ Identify or develop a regional triage system for surgical patients including organised referral centres and patient transport agencies.

Equipment and supplies

- ⇒ Perform facility-level assessments of existing paediatric facilities to determine ways to optimise delivery of paediatric surgical care in these facilities using the GICS tool.⁴²

Research, evaluation and quality improvement

- ⇒ Establish a local research team with the mission to examine the delivery of paediatric surgical care and monitor implementation.
- ⇒ Research objectives for various levels of healthcare facilities that can be found in the GICS OReCS document.⁴¹

Governance and financing (derived from LCoGS six-component framework for NSOAPs)

- ⇒ Specify implementation and accountability mechanisms and establish strong leadership.
- ⇒ Include means of measuring progress and achieving set targets (eg, annual reports, progress tracker).
- ⇒ Allocate resources specifically to the surgical care of children.

GICS, Global Initiative for Children's Surgery; LCoGS, Lancet Commission on Global Surgery; NSOAPs, National Surgical, Obstetric and Anaesthesia Plans; OReCS, Optimal Resources for Children's Surgery; PGSSC, Program in Global Surgery and Social Change.

of hospitals in LMIC settings lack capabilities to provide for children with critical injury and illness.²³ The 30-day mortality for abdominal emergency surgery in LMICs was highest in neonates and decreased with increasing age.²⁴ Younger children, especially neonates and infants, are a particularly critical group, requiring more complex and specialised surgical health services. In comparison, surgical care for older children is more amenable to task shifting with adult surgeons performing operations and treating children in this age group.²⁵ Nevertheless, children of all ages undergoing emergency surgery had better outcomes when managed by children's surgeons,

emphasising the importance of developing children's surgical capacity.²⁶

Shortages of equipment and resources are further issues, with neonatal intensive care units or general intensive care units available in only about half of the tertiary facilities surveyed in West Africa.²² Moreover, a study on paediatric surgical capacity in Africa found that burn units were not available in Senegal and Zambia.²⁷ The OReCS framework highlights the need for at least one specialised children's facility in each country, and additional infrastructure to ensure a robust regional triage system for complex paediatric surgical patients. In Brazil, for example, geographical access to children's surgical care varies widely, which shows the need for coordinated efforts to paediatric facility placement.²⁸ We found that none of the six countries analysed mentioned an existing national children's hospital; however, Nigeria's policy called for the establishment of national and regional children's hospitals. Zambia additionally called for an increase in the number of tertiary referral hospitals. This represents a way for national governments to help coordinate the construction of children's hospitals in locations that are optimal for care provision. Further work mapping geographical access to surgery could help optimise the placement of these types of healthcare facilities.

The need to address workforce shortages

Shortages of trained workforce among all types of healthcare workers are prevalent in LMICs.²² Eight African countries with 185 million children under the age of 15 years reported 231 children's surgeons.³ Nigeria had 1.1 paediatric surgeons per million children, while Malawi had 0.17 per million children; in comparison, the USA had 20.5 paediatric surgeons per million children.³ In a countrywide survey conducted in Sierra Leone, 17.6% of children reported a potentially treatable surgical condition, yet, the country had no registered paediatric surgeon.²⁹ Moreover, the number of facilities providing surgical care for children is insufficient to meet the need, with a geographical distribution skewed towards urban areas. Nearly 90% of the health workforce trained in paediatric care is located in large tertiary hospitals primarily situated in urban areas, while 75% of the population lives in rural areas.^{30 31} Factors such as a lack of funding, limited training opportunities and insufficient political support have been identified.⁵ The NSOAPs of Nigeria, Rwanda and Zambia specifically addressed the need for additional children's surgeons through increased training, decreasing financial barriers for trainees and standardising skills training. These efforts can act as a roadmap for other countries embarking on NSOAPs and aiming to expand the size of their children's surgical workforce. In addition, however, there is a need for programmes that support rural surgeons and those who practise outside of large urban areas. This can help improve access to care for rural populations, especially in countries with limited interfacility transport systems in place.

Governance and financing of children's surgical care

Governance has recently been added as a sixth framework component for NSOAPs as previously outlined by the LCoGS.^{1 11} Zambia performed a stakeholder analysis in their NSOAP, while Nigeria's policy addressed the surgical care of children as a component separate from adult surgical care. These examples highlight the importance of involving children's surgery providers in the development process to ensure the surgical needs of children are addressed accordingly. A roadmap for including children's surgery in the NSOAP planning process is available.³² To ensure accountability, specific targets and means of measuring these need to be included and reported on regularly. This can be, for instance, in the form of annual reports or a progress tracker. Tanzania and Zambia included budget plans specifically addressing training for children's surgical care, which listed costs to train children's surgeons; additionally, Tanzania specified the costs for skills training. From a health economic perspective, surgical care for children is cost-effective and provides potential long-term economic and social benefits, considering that these interventions take place at a young age.³³ The overall burden of disease is measured using disability-adjusted life years (DALYs), which combines the number of years lost due to ill-health, disability or premature death. For example, surgery for cleft lip and palate repair (US\$47.74 per DALY) is more cost-effective compared with HIV treatment (US\$453.74–US\$648.20 per DALY),³⁴ while paediatric inguinal hernia

repair (US\$12.41 per DALY) is more cost-effective compared with insecticide-treated bed nets to prevent malaria (US\$41 per DALY).³⁵ Cost-effectiveness analysis can aid the comparison of the relative costs of different interventions, which in the case of children's surgical interventions can avert long-term disability and the need for medical care in the future. Further research will be needed to support evidence-based priority setting in the local context and the consequent allocation of resources.

Limitations

This study contains several limitations. There are a variety of health policy analysis frameworks, and the authors used the Collins' framework for its simplicity and familiarity. Policy formulation is not a linear process that can be separated into several domains, but rather an evolving and integrated process that involves input from various stakeholders and undergoes multiple rounds of discussion. Using a framework approach for the analysis makes it seem that the framework domains do not interact; however, the domains are all connected in the wider surgical healthcare system and integral for its functioning. For example, increasing infrastructure without adequate staffing will not lead to improved care, nor the other way around. Standalone domains do not allow for an evaluation and understanding of the processes of the policy development and implementation, and which domains are necessary for others to evolve. Figure 2 visualises how these domains interact in the wider healthcare

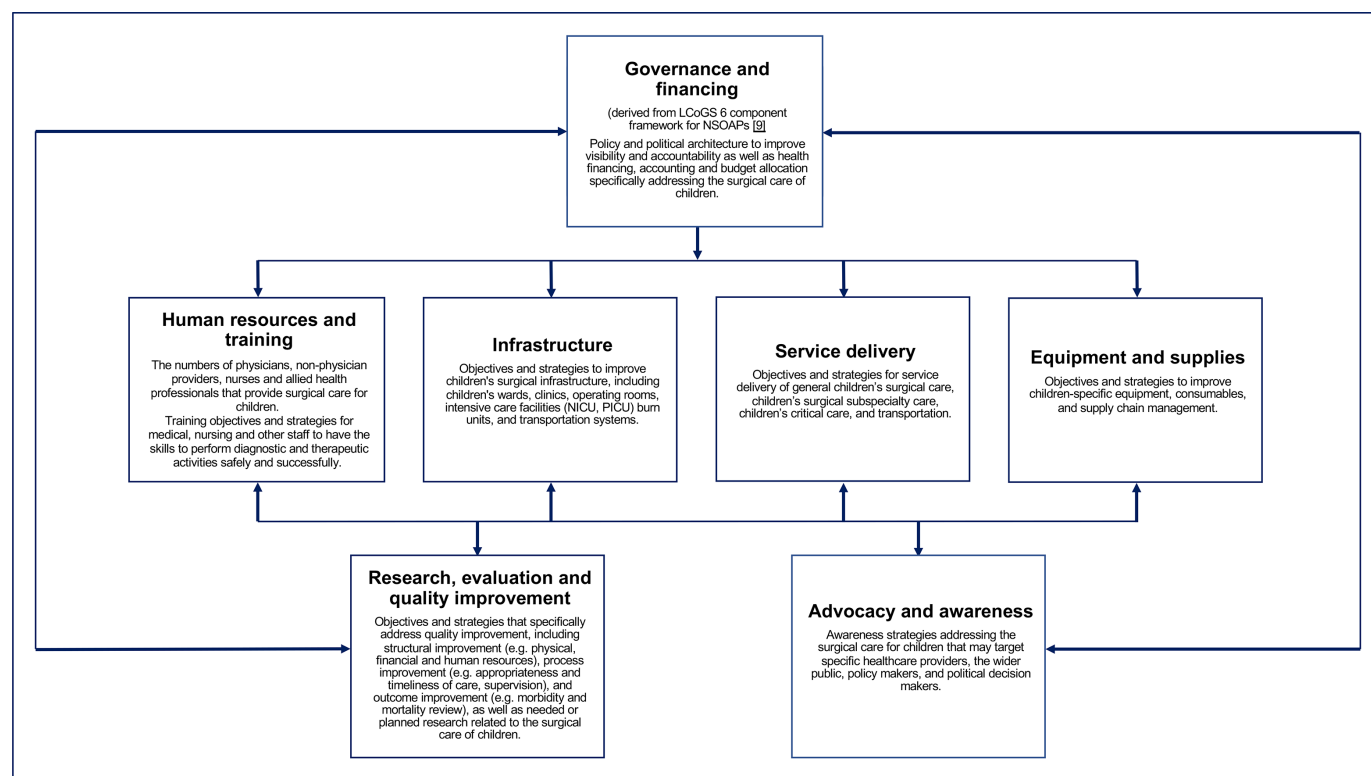


Figure 2 The seven OReCS framework domains. LCoGS, Lancet Commission on Global Surgery; NICU, neonatal intensive care unit; NSOAPs, National Surgical, Obstetric and Anaesthesia Plans; OReCS, Optimal Resources for Children's Surgery; PICU, paediatric intensive care unit.

system (figure 2); however, due to a lack of evidence, the figure is based on the authors' understanding and experiences and requires further research. Biases in the selection process of the domains may have been involved due to one researcher reading the OReCS document in detail and selecting the initial themes for the framework. In addition, the scope of our study was not designed to include key provider aspects such as the financing of healthcare and healthcare facilities, nor user aspects such as insurance coverage and patient-specific factors. We applied a standardised framework to code and analyse the NSOAP policies, whereas the NSOAP process is not standardised. Our analysis possibly missed crucial information on structures and resources that are available but not mentioned in the NSOAPs, such as paediatric workforce numbers in countries. The OReCS document was developed to provide guidance for developing children-focused NSOAPs; however, recognising and prioritising the unique surgical needs of children are currently not widely established. As this study only included information that specifically referred to children, it likely underreported on strategies that included, but did not name children. Additionally, we identified two further NSOAPs that have been completed but are not yet available for review, namely of Madagascar and Pakistan. These policies warrant further analysis in the future.

CONCLUSION

This study highlights practice examples for the inclusion of children's surgical care in NSOAPs and provides recommendations based on the GICS OReCS framework for the development of future policies. The OReCS framework can be used to assist planning on a national level in settings where children's surgical care is included in the national surgical, obstetric and anaesthesia process.

Author affiliations

¹Harvey E Beardmore Division of Pediatric Surgery, McGill University Health Centre, Montreal, Ontario, Canada

²Manchester University NHS Foundation Trust, Manchester, UK

³Program in Global Surgery and Social Change, Harvard Medical School, Boston, Massachusetts, USA

⁴Department of General Surgery, Rutgers Robert Wood Johnson Medical School, New Brunswick, New Jersey, USA

⁵Division of Paediatric Surgery, Department of Surgery, National Hospital, Abuja, Nigeria

⁶Center for Essential Surgical and Acute Care, Interactive Research & Development, Karachi, Pakistan

⁷SADC—Wits Regional Collaboration Centre for Surgical Healthcare, Department of Surgery, University of the Witwatersrand Faculty of Health Sciences, Johannesburg, South Africa

⁸Division of Pediatric General & Thoracic Surgery, Seattle Children's Hospital, Seattle, Washington, USA

⁹Department of Plastic and Oral Surgery, Boston Children's Hospital, Boston, MA, USA

¹⁰Department of Pediatric Surgery, University Medical Centre Groningen, Groningen, The Netherlands

Twitter Paul Truche @ptrucheMD and John G Meara @johnmeara

Acknowledgements SW acknowledges financial support from the Studienstiftung des deutschen Volkes (German Academic Scholarship Foundation). The authors

would kindly like to thank Nishali Patel and Sarai Keestra for providing feedback on earlier versions of the manuscript.

Contributors SW and DP conceived of the study and act as guarantors. Conceptualisation—SW, EG and DP. Methodology—SW, EG and DP. Data curation—SW and PT. Formal analysis—SW, PT, LS, JM and DP. Writing (original draft)—SW and PT. Writing (review and editing)—SW, PT, EA, LS, EMM, SG, EG, JM, ThvD and DP. SW and DP conceived the study and act as guarantors.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval Ethical approval was not required as the study only included publicly available documents and information.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository. All data relevant to the study are included in the article or uploaded as supplemental information. All data relevant to the study are publicly available and are included in the article or uploaded as supplemental material.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Sabrina Wimmer <http://orcid.org/0000-0003-3040-7242>

Emmanuel Ameh <http://orcid.org/0000-0003-2386-3039>

Dan Poenaru <http://orcid.org/0000-0002-6267-6140>

REFERENCES

- 1 Meara JG, Leather AJM, Hagander L, *et al*. Global surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *Lancet* 2015;386:569–624.
- 2 Mullapudi B, Grabski D, Ameh E, *et al*. Estimates of number of children and adolescents without access to surgical care. *Bull World Health Organ* 2019;97:254–8.
- 3 Krishnaswami S, Nwomeh BC, Ameh EA. The pediatric surgery workforce in low- and middle-income countries: problems and priorities. *Semin Pediatr Surg* 2016;25:32–42.
- 4 Wright N, Jensen G, St-Louis E. Global initiative for children's surgery: a model of global collaboration to advance the surgical care of children. *World J Surg* 2019;43:1416–25.
- 5 Oldham KT. Optimal resources for children's surgical care. *J Pediatr Surg* 2014;49:667–77.
- 6 GBD 2015 Child Mortality Collaborators. Global, regional, National, and selected subnational levels of stillbirths, neonatal, infant, and under-5 mortality, 1980–2015: a systematic analysis for the global burden of disease study 2015. *Lancet* 2016;388:1725–74.
- 7 Grabski D, Ameh E, Ozgediz D. Optimal resources for children's surgical care: executive summary. *World J Surg* 2019;43:978–80.
- 8 Farmer PE, Kim JY. Surgery and global health: a view from beyond the OR. *World J Surg* 2008;32:533–6.
- 9 Debas HT, Donkor P, Gawande A, *et al*. Disease control priorities third edition essential surgery. The World Bank, 2015. Available: <http://dcp-3.org/surgery>
- 10 Sixty-Eight World Health Assembly, WHA68. Strengthening emergency and essential surgical care and anaesthesia as a

- component of universal health coverage. 2015. Available: https://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_R15-en.pdf?ua=1
- 11 Truché P, Shoman H, Reddy CL, *et al.* Globalization of national surgical, obstetric and anesthesia plans: the critical link between health policy and action in global surgery. *Global Health* 2020;16:1.
 - 12 Hsieh H-F, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res* 2005;15:1277–88.
 - 13 Hall DM, Steiner R. Policy content analysis: qualitative method for analyzing sub-national insect pollinator legislation. *MethodsX* 2020;7:100787.
 - 14 Program in Global Surgery and Social Change, Harvard Medical School. National surgical, obstetric and anesthesia planning; Available: <https://www.pgssc.org/national-surgical-planning>
 - 15 Collins T. Health policy analysis: a simple tool for policy makers. *Public Health* 2005;119:192–6.
 - 16 Fuzhan Nasiri D, Nateque Mahmood M, Prasad Dhakal S, *et al.* Asset management policies and guidelines of different states in Australia. *J Facil Manag* 2014;12:286–302.
 - 17 Thomas DR. A general inductive approach for analyzing qualitative evaluation data. *Am J Eval* 2006;27:237–46.
 - 18 Potter WJ, Levine-Donnerstein D. Rethinking validity and reliability in content analysis. *J Appl Commun Res* 1999;27:258–84.
 - 19 Gibbs GR. *Qualitative research kit: analyzing qualitative data*. London, England: SAGE Publications, Ltd, 2007.
 - 20 Nigeria Federal Ministry of Health. National surgical, obstetrics, anaesthesia & nursing plan (NSOANP) for Nigeria - strategic priorities for surgical care (straps) - planning for a future of equity, safety & progress, 2019-2023. 2019. Available: https://6cde3faa-9fe6-4a8d-a485-408738b17bc2.filesusr.com/ugd/d9a674_1f7aa8161c954e2dbf23751213bc6f52.pdf
 - 21 Yousef Y, St-Louis E, Baird R, *et al.* A systematic review of capacity assessment tools in pediatric surgery: global assessment in pediatric surgery (gaps) phase I. *J Pediatr Surg* 2019;54:831–7.
 - 22 Okoye MT, Ameh EA, Kushner AL, *et al.* A pilot survey of pediatric surgical capacity in West Africa. *World J Surg* 2015;39:669–76.
 - 23 Slusher TM, Kiragu AW, Day LT, *et al.* Pediatric critical care in resource-limited settings-overview and lessons learned. *Front Pediatr* 2018;6:49.
 - 24 Collaborative G. Determinants of morbidity and mortality following emergency abdominal surgery in children in low-income and middle-income countries. *BMJ Glob Health* 2016;1:e000091.
 - 25 Federspiel F, Mukhopadhyay S, Milsom PJ, *et al.* Global surgical, obstetric, and anesthetic task shifting: a systematic literature review. *Surgery* 2018;164:553–8.
 - 26 Shah AA, Shakoor A, Zogg CK, *et al.* Influence of sub-specialty surgical care on outcomes for pediatric emergency general surgery patients in a low-middle income country. *Int J Surg* 2016;29:12–8.
 - 27 Toobaie A, Emil S, Ozgediz D, *et al.* Pediatric surgical capacity in Africa: current status and future needs. *J Pediatr Surg* 2017;52:843–8.
 - 28 Vissoci JRN, Ong CT, Andrade L de, *et al.* Disparities in surgical care for children across Brazil: use of geospatial analysis. *PLoS One* 2019;14:e0220959.
 - 29 Groen RS, Samai M, Petroze RT, *et al.* Household survey in Sierra Leone reveals high prevalence of surgical conditions in children. *World J Surg* 2013;37:1220–6.
 - 30 Bickler SW, Telfer ML, Sanno-Duanda B. Need for paediatric surgery care in an urban area of the Gambia. *Trop Doct* 2003;33:91–4.
 - 31 Chirdan LB, Ameh EA, Abantanga FA, *et al.* Challenges of training and delivery of pediatric surgical services in Africa. *J Pediatr Surg* 2010;45:610–8.
 - 32 Seyi-Olajide JO, Anderson J, Kaseje N, *et al.* n.d. Inclusion of children's surgery in national surgical plans and child health programmes: the need and roadmap from global initiative for children's surgery [Personal communication].
 - 33 Saxton AT, Poenaru D, Ozgediz D, *et al.* Economic analysis of children's surgical care in low- and middle-income countries: a systematic review and analysis. *PLoS One* 2016;11:e0165480.
 - 34 Chao TE, Sharma K, Mandigo M, *et al.* Cost-effectiveness of surgery and its policy implications for global health: a systematic review and analysis. *Lancet Glob Health* 2014;2:e334–45.
 - 35 Eeson G, Birabwa-Male D, Pennington M, *et al.* Costs and cost-effectiveness of pediatric inguinal hernia repair in Uganda. *World J Surg* 2015;39:343–9.
 - 36 Federal Ministry of Health of Ethiopia. National safe surgery strategic plan - saving lives through safe surgery (salts) strategic plan 2016-2020. 2017. Available: https://6cde3faa-9fe6-4a8d-a485-408738b17bc2.filesusr.com/ugd/d9a674_229834ef81bd47ee9cd72f94be1739fe.pdf
 - 37 Rwanda. National surgical, obstetrics and anesthesia plan 2018-2024. n.d. Available: https://6cde3faa-9fe6-4a8d-a485-408738b17bc2.filesusr.com/ugd/d9a674_c5c36059456a416480fd58fd553ef302.pdf
 - 38 Sénégal Ministère de la Santé et de l'Action Sociale. Plan stratégique de développement de l'Offre de soins chirurgicaux au Sénégal (PSDOS), 2014-2018; 2013.
 - 39 The United Republic of Tanzania, Ministry of Health, Community Development, Gender, Elderly and Children. National surgical, obstetric and anesthesia plan (NSOAP), 2018-2025. 2018. Available: https://6cde3faa-9fe6-4a8d-a485-408738b17bc2.filesusr.com/ugd/d9a674_4daa353b73064f70ab6a53a96bb84ace.pdf
 - 40 Republic of Zambia, Ministry of Health. National surgical, obstetric, and anaesthesia strategic plan (NSOASP), 2017-2021. 2017. Available: https://6cde3faa-9fe6-4a8d-a485-408738b17bc2.filesusr.com/ugd/d9a674_70f6813fe4e74c4d99eb028336a38745.pdf
 - 41 Global Initiative for Children's Surgery. Optimal resources for children's surgical care - I. guidelines for different levels of care. 2019. Available: <https://www.globalchildrenssurgery.org/wp-content/uploads/2019/03/ORECS-Supplement-1.pdf>
 - 42 Global Initiative for Children's Surgery. Optimal resources for children's surgical care - II. supplies, equipment and infrastructure. 2019. Available: <https://www.globalchildrenssurgery.org/wp-content/uploads/2019/03/ORECS-Supplement-2.pdf>