# The Global Initiative for Children's Surgery: Optimal Resources for Improving Care

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## Abstract

**Background** The Lancet Commission on Global Surgery reported that 5 billion people lack access to safe, affordable surgical care. The majority of these people live in low-resource settings, where up to 50% of the population is children. *The Disease Control Priorities* (Debas HTP, Donkor A, Gawande DT, Jamison ME, Kruk, and Mock CN, editors. Essential Surgery. Disease Control Priorities. Third Edition, vol 1. Essential Surgery. Washington, DC: World Bank; 2015) on surgery included guidelines for the improvement of access to surgical care; however, these lack detail for children's surgery.

**Aim** To produce guidance for low- and middle-income countries (LMICs) on the resources required for children's surgery at each level of hospital care.

**Methods** The Global Initiative for Children's Surgery (GICS) held an inaugural meeting at the Royal College of Surgeons in London in May 2016, with 52 surgical providers from 21 countries, including 27 providers from 18 LMICs. Delegates engaged in working groups over 2 days to prioritize needs and solutions for optimizing children's surgical care; these were categorized into infrastructure, service delivery, training, and research. At a second GICS meeting in Washington in October 2016, 94 surgical care providers, half from LMICs, defined the optimal resources required at primary, secondary, tertiary, and national referral level through a series of working group engagements.

**Results** Consensus solutions for optimizing children's surgical care included the following:

- Establishing standards and integrating them into national surgical plans.
- Each country should have at least one children's hospital.
- Designate, facilitate, and support regional training hubs covering all
- children's surgical specialties.
- Establish regional research support centers.

An "Optimal Resources" document was produced detailing the facilities and resources required at each level of care.

**Conclusion** The Optimal Resources document has been produced by surgical providers from LMICs who have the greatest insight into the needs and priorities in their population. The document will be refined further through online GICS Working Groups and the World Health Organization for broad application to ensure all children have timely access to safe surgical care.



**Keywords**

- GICS
- global health
- pediatric surgery


## Introduction

That surgery is necessary as a part of universal health coverage (UHC) and that many millions lack access to surgical care is now increasingly being recognized, if not yet well measured. Historically, surgical programs have not generally been a focus of global health efforts for many reasons, perhaps most of all due to the perceived cost of scaling up delivery. However, recent economic studies have shown that surgery is a "good buy" even for the world's most resource-constrained countries.[1] Furthermore, the world's leading economists have ranked access to surgical care as one of the eight most important interventions to improve welfare of the world's poor.[2]

The burden of surgical disease largely falls on low-resource settings where, by definition, providers, governments, and other stakeholders are largely unequipped to meet these challenges alone. Although largely unmeasured, the estimated burden is staggering: 5 billion people are lacking access to surgical care and 30% of the total global burden of disability and death are due to diseases that are treatable with surgery.[3,4] In sub-Saharan Africa, for example, population surveys estimate that 56 million people currently require a surgical procedure.[5] This includes progressively disabling existing untreated surgical diseases such as birth defects, untreated injuries, cancers, and chronic infections, among others. In addition to this existing burden, health systems have to cope with the daily burden of emergency surgery cases that are immediately life-threatening.

Prior efforts to address the burden have included surgical missions focused on direct service delivery such as operative camps, training and educational outreaches, and capacity building initiatives. In the past several years, the *Disease Control Priorities*, Third Edition (DCP3; World Bank), Lancet Commission on Global Surgery, and other stakeholders have highlighted the critical need for improving surgical care worldwide.[3,6] Consequently, the World Health Assembly passed a resolution (A68/15) on strengthening emergency and essential surgical care and anesthesia as a component of UHC.[7,8] None, however, have explicitly addressed the unique surgical needs of children and the resources required to meet

these needs in low-resource settings, where children represent up to 50 to 60% of the population. There is a gross mismatch between the child population and the physician population. Global efforts directed at reducing the high rates of infant and under-five mortality rate of children have overlooked the surgical needs of children, and thus the disparity between the child population and surgical providers trained in the care of children is even larger.

The *Disease Control Priorities*, in addition to making strides in quantifying the global burden of surgical disease, produced guidelines for the resources that should be available at each level of hospital care; however, these lack detail for children's surgery.[6] Children comprise up to half of the population in the lowest-resource areas and have high levels of surgical need.[9] Furthermore, children have conditions distinct from those that affect adults (e.g., serious birth defects), and children have unique anatomy and physiology that requires the care of practitioners with specialized training.

The Global Initiative for Children's Surgery (GICS) was initially formed in the fall of 2016. The aim of GICS was to address previously overlooked children's surgical issues and to bring together providers and implementers of surgical services for children with health, advocacy, and policy experts to analyze the current state of surgical care for children in low- and middle-income countries (LMICs), to develop global, regional, national, and local priorities to improve the delivery of surgical care for children in LMICs, to create action plans, and to identify and bring together resources to accomplish these plans. The proposed membership was to include children's surgical care providers in the first phase and to expand to include potential implementers and funders in subsequent phases.

An inaugural meeting was held in London at the Royal College of Surgeons in May 2016.[10] Providers of surgical care from LMICs were sponsored to attend. The funds for sponsorship were from individuals, nongovernmental organizations (NGOs) or philanthropic organizations, and professional organizations. Fifty-two surgical providers from 21 countries, including 27 providers from 18 LMICs, attended the meeting. Delegates engaged in working groups over 2 days to prioritize needs and solutions for optimizing children's surgical care.

The consensus outcome from the first GICS meeting detailed in this article is the creation of "optimal resource" guidelines in an attempt to describe resources required for children's surgery at each level of hospital care, with the goal of standardization to enable the guidelines to be applied across diverse settings at varied levels.

## Methods

The Optimal Resources for Children's Surgery (OReCS) guidelines were created over the course of 1 year in four main phases: (1) establishment of priority subjects for inclusion, (2) creation of working groups and integration of specialty specific recommendations, (4) revision and input from GICS participants, and (5) establishment of a working relationship based on OReCS with professional and other international health organizations.

The plan and subject matter to be addressed in OReCS was decided at the GICS inaugural meeting in London on May 2016. Fifty-two surgical providers from 21 countries, including 27 providers from 18 LMICs, met for two days to discuss the lacunae in children's surgical care. Through working group discussions, it was immediately apparent that there was a need for unifying guidelines to improve access to and safety of surgery for children. The group decided to undertake this task, focusing on key areas identified in premeeting participant surveys. These areas, which also formed the working group divisions during the meeting, were infrastructure, service delivery, training, and research. For each level of care, from the primary care/first access clinics to national children's hospitals (NCHs) as defined in the *Disease Control Priorities in Developing Countries,* Third Edition (DCP3),[6] OReCS would enumerate the optimal resources for children's surgical care, including supplies, equipment, and infrastructure; procedures available; the optimal training for providers of surgical care; and associated research efforts.

A second GICS meeting was held in October 2017 in Washington, District of Columbia, United States, with several aims under the theme of implementation of action plans identified in the first meeting. One major aim was to increase the diversity of input into OReCS. Ninety-four participants (including 80 surgical providers) representing 76 institutions and organizations from 38 countries (30 LMICs) met for two days. Through participant consensus, the decision was made to separate OReCS by hospital levels based on DCP3. Participants were divided into four working groups, each addressing a specific hospital level, and one combining two hospital levels, each chaired by care providers from LMICs. The DCP3 types of facility were adapted for children to include primary health center (PHC), first-level hospital (1LH), second-level hospital (2LH), third-level hospital (3LH), and NCH. The NCH addition was strongly supported by participants as an adaptation of the DCP3 hospital levels to include all subspecialties, research, and education for the further sustainable advancement of children's surgery in a region or country. To include subspecialty specific information as well as to address administrative requirements for each hospital level, after the Washington meeting, members of GICS were given the opportunity to join one or more of 16 working groups as described in ►Table 1. Each group was to be chaired by an LMIC provider and come to consensus through online communication prior to submitting a detailed template.

Each working group was asked to provide input regarding conditions to be treated, as well as requirements for training, infrastructure, equipment and supplies, and staff at each of the five hospital levels. All available input from the working groups was integrated into OReCS by the primary authors of this article.

## Results

Four general consensus solutions were derived from the premeeting surveys and working group discussions for

**Table 1** OReCS working groups

| |
|---|
| Anesthesia |
| Critical Care |
| Pediatric Cardiac Surgery |
| Pediatric Oral and Maxillofacial Surgery |
| Pediatric Otolaryngology Surgery |
| Pediatric General Surgery |
| Pediatric Neurosurgery |
| Pediatric Ophthalmology |
| Pediatric Orthopaedic Surgery |
| Pediatric Plastic Surgery |
| Pediatric Trauma Care |
| Pediatric Urology |
| Financing, Advocacy, and Policy |
| Infrastructure, Standards, and Verification |
| Research and Quality Improvement |
| Workforce, Training, and Human Resources |

improving access to safe children's surgery for all regardless of geography, income, or socioeconomic status:

- To establish standards and integrate them into national surgical plans.
- To ensure each country has at least one specialized children's surgical center.
- To develop a mechanism to designate and support regional training hubs covering all children's surgical specialties.
- To establish regional research support centers.

Prioritization of pressing needs requires creation of templates that can be used for reliable gap analysis to better inform decision-makers on the best utilization of resource in a specific context. To establish these priorities in a standardized fashion, three levels of care complexity were defined: basic, intermediate, and advanced. When considering the level of care complexity appropriate for various hospital types within a health care system, a model comparable to the *WHO Guidelines for essential trauma care*[11] was used to differentiate desirable care from essential care. As the name implies, the designation "essential care" signifies that a service, treatment, or procedure could and should be provided to children at the health facility in question, regardless of the health authority's financial limitations. However, "desirable care" designates a service, treatment, or procedure whose availability would increase the probability of a favorable outcome in children with surgical conditions.

Specific national surgical plans may differ; therefore, areas with a higher density of resources may designate "desirable care" interventions as "essential" in their own setting. Recommendations for level of care complexity by hospital type are presented in ►**Table 2**. Specialty and discipline-specific working groups generated consensus statements regarding the specific resources salient to different domains of children's care delivery. The 16 thematic and specialty working groups included pediatric general surgery, pediatric trauma, urology, neurosurgery, orthopedics, plastic surgery, otolaryngology, ophthalmology, oral surgery, cardiac surgery, anesthesia and intensive care, nursing, research, training and human resources, and advocacy. For each level of hospital care, optimal resources were specified by the working groups along the following four axes: infrastructure (equipment, utilities, supplies), service delivery (medical conditions, procedures), training (specialization, allied health professionals), and quality (academic research, quality control). These recommendations are summarized in ►**Table 3**.

### Optimal Resources for Community Facilities and Primary Health Centers

The scope of practice in community facilities and PHCs should focus on screening for surgical conditions, resuscitation of ambulatory patients presenting with acute surgical illness, and appropriate referral to higher-level health care facilities (►**Table 4**). No specialized infrastructure is desirable, whereas basic antiseptic, dressing, and suture materials are expected. General anesthesia is neither desirable nor expected for patients of any age in this setting. Surgical interventions should be limited to basic life support, wound care, management of closed nondisplaced fractures, first-degree burn care, incision and drainage of superficial abscesses, circumcision using a simple plastic guide device (e.g., Plastibell), and removal of visible foreign bodies from ears and nose. Staffing by primary care providers is expected, and experience with screening for surgical diseases and

**Table 2** Recommended level of care by facility type

| Type of facility/platform | Level of care | | |
|---|---|---|---|
| | Basic | Intermediate | Complex/advanced |
| Community facility and primary health center | E | – | – |
| Primary referral hospital | E | E | – |
| Secondary/tertiary hospital | E | E/D[a] | D |
| National children's Hospital | E | E | E |

Abbreviations: E, expected; D, desirable.
[a]This level of care is essential for tertiary facilities and desirable for secondary facilities.

**Table 3** Initial overview OReCS, as proposed to working groups

| Type of facility (based on DCP3 classification) | Level of care[a] | Responsibilities | General anesthesia | Optimal resources for children's surgical care | | | | Training | Research | Quality and safety |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Human resources | Required skills | Infrastructure | Equipment and supplies | | | |
| Community facility and primary health center | I | Screening for surgical disease<br>Resuscitation<br>Referral to higher levels of care | No | Existing personnel | Basic assessment and treatment skills | Existing infrastructure | Wound care supplies | Birth attendants' training in identification and prompt referral of visible congenital anomalies | Generate population-based data on the prevalence of congenital surgical conditions | CME/CPD<br>Periodic supervision and mentoring |
| First-level hospital | I, II | 24/7 emergency surgical care<br>Diagnosis and treatment of common surgical diseases<br>Referral to secondary or tertiary level | Yes, not including complex cases and minimal comorbidity (limit of ASA I or II) | Existing personnel | Skills to treat emergency and essential childhood surgical conditions | Children's ward<br>Functional operating room | Emergency and essential surgical equipment and supplies for children | Identification and treatment of an essential package of children's surgical conditions | Studies of prevalence, burden of disease, access to care, and injury epidemiology | CME/CPD<br>Periodic supervision and mentoring<br>M&M review |
| Second- and third-level hospital | I, II, III | Comprehensive surgical care for children[b] | Yes, including complex cases and comorbidities (all ASA) | Specialists in all areas of children's surgical care provided | Advanced surgical and anesthesia skills in all areas of children's surgical care | Children's wards, clinics, operating rooms, NICU, PICU, burn unit | Equipment and supplies to fully support services provided | Basic surgical training in treatment of essential conditions | Pediatric surgical database for both epidemiological and outcome purposes | CME/CPD<br>Periodic supervision and mentoring<br>M&M review<br>Trauma conference<br>Tumor Board |
| National children's hospital | I, II, III | Comprehensive surgical care of children, especially multidisciplinary and chronic care<br>Training, education and research in all children's surgical specialties<br>Development of standards of care<br>Advocacy | Yes, including complex cases and comorbidities (all ASA) | Specialists in all areas of children's surgical care provided | Advanced surgical and anesthesia skills in all areas of children's surgical care | Children's wards, clinics, operating rooms, NICU, PICU, burn unit | Equipment and supplies to fully support services provided | Subspecialist training to meet the essential package<br>Multidisciplinary focused training integrating all members of the advanced health care delivery team | Epidemiological and outcome studies on all surgical conditions referred<br>Higher-level interventional studies | CME/CPD<br>Periodic supervision and mentoring<br>M&M review<br>Trauma conference<br>Tumor Board |

Abbreviations: ASA, American Society of Anesthesiologists; CME, continuing medical education; CPD, continuing professional development; DCP3; Disease Control Priorities, Third Edition; NICU, neonatal intensive care unit; PICU, pediatric intensive care unit.

Note: Second- and third-level hospitals were combined into one group.

[a]Levels of care defined as basic (I), intermediate (II), and complex/advanced (III).

[b]Level of care delivered at secondary and tertiary hospitals may vary considerably by resources available in a country.

**Table 4** Outline table for desirable resources at each WHO level of care

| Type of facility (based on DCP3 classification) | | Community facility and primary health center | First-level hospital | Second-/third-level hospital | National children's hospital |
|---|---|---|---|---|---|
| **Level of care**[1] | | **I** | **I, II** | **I, II, III** | **I, II, III** |
| **Responsibilities** | | Screening for surgical disease | Resuscitation<br>Referral to higher levels of care<br>Emergency surgical care<br>Diagnosis and treatment of common surgical diseases | 24/7 emergency surgical care,<br>Comprehensive surgical care for children[2] | Comprehensive surgical care for children, especially children who require multidisciplinary and chronic care<br>Referral to secondary or tertiary level<br>Training, education, and research in all children's surgical specialties<br>Development of standards of care<br>Advocacy |
| **Age treated** | | All | All | All | All |
| **General anesthesia** | | No | Yes, not including complex cases and minimal comorbidity (limit of ASA I or II) | Yes, including some complex cases and comorbidities (limit of ASA III) | Yes, including complex cases and comorbidities (all ASA) |
| **Optimal resources for children's surgical care** | **Human resources** | Existing personnel<br>Community Health workers | Existing personnel<br>Anesthesia provider | Specialists in some areas of children's surgical care provided (level II)<br>Specialists in all areas of children's surgical care provided (level III)<br>Pediatric anesthesia provider (level III) | Specialists in all areas of children's surgical care provided |
| | **Required skills** | Basic assessment and treatment skills | Skills to treat emergency and essential childhood surgical conditions | Advanced surgical and anesthesia skills in all majority of children's surgical care | Advanced surgical and anesthesia skills in all areas of children's surgical care |
| | **Infrastructure** | Existing infrastructure | Children's ward<br>Functional operating room | Children's wards, clinics, operating rooms, NICU, PICU<br>Burn unit (level III) | Wards, clinics, operating rooms, NICU, PICU, burn unit |
| | **Equipment and supplies** | Wound care supplies | Emergency and essential surgical equipment and supplies for children | Equipment and supplies to fully support services provided | Equipment and supplies to fully support services provided |

**Table 4** (*Continued*)

| Type of facility (based on DCP3 classification) | Community facility and primary health center | First-level hospital | Second-/third-level hospital | National children's hospital |
|---|---|---|---|---|
| **Level of care**[1] | I | **I, II** | **I, II, III** | **I, II, III** |
| **Quality and safety** | CME/CPD<br>Periodic supervision and mentoring | CME/CPD<br>Periodic supervision and mentoring<br>M&M review | CME/CPD<br>Periodic supervision and mentoring<br>M&M review<br>Trauma conference<br>Tumor Board | CME/CPD<br>Periodic supervision and mentoring<br>M&M review<br>Trauma conference<br>Tumor Board |

Abbreviation: ASA, American Society of Anesthesiologists; CME, continuing medical education; CPD, continuing professional development; DCP3; Disease Control Priorities, Third Edition; NICU, neonatal intensive care unit; PICU, pediatric intensive care unit.

minor procedures described previously is desirable. Supervision, mentoring, and continuing medical education (CME) are expected.

### Optimal Resources for First-Level Hospital Centers

The scope of practice in 1LHs should focus on resuscitation, emergency surgical care, diagnosis and treatment of common surgical diseases, and referral to higher levels of care (Table 4). The ability to perform surgery under general anesthesia in patients of all ages with minimal comorbidities (i.e., American Society of Anesthesiologists [ASA] class 1 and class 2) is expected, which entails specific infrastructure and provider requirements. A children's ward, functional operating room, and supplies for emergency general surgical procedures are expected. Existing personnel should include an anesthesia provider and a surgeon possessing the skills required for treatment of emergency and essential children's surgical conditions. In addition to CME and supervision, mortality and morbidity rounds are expected.

### Optimal Resources for Second- and Third-Level Hospital Centers

The scope of practice in second and third-level hospitals (Table 4) should focus on provision of 24-hour per day emergency surgical care as well as comprehensive elective surgical care for children. Therefore, the capacity to perform more complexes surgical cases in patients of all ages with moderate comorbidity (i.e., ASA up to 3) is expected. In addition to first-level infrastructure, clinics, and pediatric intensive care units, as well as burn units are expected in 3LHs, while desirable in 2LHs. As a result, specialists in most areas of children's surgical care are desirable in 2LHs, and expected in 3LHs. Advanced surgical and anesthesia skills in a majority of children's surgical procedures is expected. In addition to quality requirements of the first-level facility, trauma conferences and tumor boards are expected.

### Optimal Resources for National Children's Hospitals

The scope of practice in NCHs should focus on providing comprehensive surgical care to children of all ages, especially those who require multidisciplinary and chronic care (Table 4). The capacity to perform surgery and anesthesia of any complexity is expected. Therefore, complete pediatric infrastructure is required, including a neonatal intensive care unit. Specialists in all areas of children's surgical care are expected, with availability of support staff and allied health professionals with expertise in children. Additional quality expectations include multidisciplinary meetings, research, academic and educational activities, and provision of specialized training.

## Discussion and Conclusion

The provision of adequate surgical care to all children will, by preventing death or treating disability, allow more children to live up to their full potential.[12–14] Some of the leading causes of death of young people are treatable with surgery. One major cause of neonatal (first 28 days of life) death

worldwide is congenital anomalies, many of which are treatable with surgery. Congenital anomalies will only increase in importance as infectious diseases are better controlled. An estimated 94% of congenital anomalies currently occur in LMICs, where primary prevention through vaccination and dietary nutrients are inadequate.[15] Trauma in general and car crashes in particular are the leading cause of death among 10- to 24-year-olds.[16] Many trauma-related deaths are preventable with timely and appropriate care. Simultaneous efforts toward prevention and to meet the existing need for treatment of surgical disease are need.

It is often possible to address the unmet need for surgical care for children using available resources; the supplies and personnel needed to provide surgical care for children are frequently limited by lack of planning not funds. Children, and particularly their unique needs for surgical care, have been left out of many national health plans. As efforts toward achieving health targets continue, children must be explicitly included. Furthermore, the surgical care must meet the highest standards and measure outcomes.

The Optimal Resources document was produced through an iterative effort with input from surgical providers from LMICs—those who have the greatest insight into the needs and priorities in their populations. It follows on a similar effort in North America to ensure that all children receive surgical care in the appropriate environment to achieve the best possible outcomes.[17] Data from the global North have shown improved outcomes for congenital heart surgery in child-specific care centers.[18] More research is needed from the global South, but there is reason to suspect that outcomes will similarly be better from specialized centers.

These templates indicate research activities, though distinct from the physical and personnel resources, as it will be through understanding the epidemiology of pediatric surgical disease and the outcomes of treatment that progress will be made. Thus, we have highlighted the need for data collection and analysis at each level of care, with the aim that these data will be locally owned and used for quality improvement.

Initial suggested uses of this document included self-assessment, regional and national assessments of facilities stratified by level of care, local modification of resource allocation based upon assessments, advocacy from the local level to local, regional, and national authorities to address shortfalls with budget reallocation, policy changes at all levels based upon assessments and targeted requests for funding, specific materials, or infrastructure, and/or targeted training from NGOs, governments, and other organizations. In some contexts, as in the North American example, the Optimal Resources document may be used to establish accreditation for centers as a method of assuring quality care practices through external review. This may be achievable on a national or regional level. A future role for GICS may be in facilitating or aiding in the development of accreditation arms of professional bodies, as has been done in the United States.[17,18]

In summary, we have introduced optimal resources in terms of which procedures should be performed at each level of hospital, the personnel and training required, the physical resources, and ongoing educational and research activities that will aid in the optimal functioning of the system of care for children with surgical disease. It is specific, yet broadly applicable. These optimal resource templates are designed to be flexible in application and at the same time to set benchmarks that may be used by providers, planners and policy makers, donors, and others to achieve concrete improvement goals. The standards may be approached from many angles: the complexity of care, level of facility, and essential versus desirable capabilities. It is not prescriptive, but a starting point. It is our hope that this document may help with reprioritization of resources at the local, national, and international levels.

## Limitations

A limited number and diversity of providers gave input into the document, and it is by no means comprehensive. The document will continue to be refined as endorsement from professional and international societies are sought. An in-person meeting in Vellore, India, will be the forum for final review and acceptance of the document.

### Conflict of Interest

None.

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