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From outreach to ownership: building sustainable paediatric surgical capacity at a secondary hospital in rural Tanzania. A ten-year experience

Boniphace Tresphory,¹ Alessandro Calisti,² Elide Ambrosetti,¹ Grazia Andriani,³ Giovanna Maria Cangi,² Giovanni Giuliani,⁴ Bahati Kamwezi,¹ Agnes Mlawa,¹ Andrea Joseph Mombo,⁵ Paola Presutti,⁶ Bruno Turchetta⁷

¹Surgical Department, Surgery, Consolata Hospital, Ikonda-Makete, Tanzania; ²Pediatric Surgery, San Camillo Forlanini Hospital, Rome, Italy; ³Ada Manes Foundation for Children, Italy; ⁴Anaesthesiology, Ospedale Infermi, Rimini, Italy; ⁵Surgical Department, Urology, Consolata Hospital, Ikonda-Makete, Tanzania; ⁶Anaesthesiology, San Camillo Forlanini Hospital, Rome, Italy; ⁷Anaesthesiology, Fondazione Mangiagalli, Milan, Italy

Abstract

Sub-Saharan Africa has a critical shortage of paediatric surgical resources. Specialists are concentrated in urban centres, leaving rural areas underserved; peripheral hospitals lack trained providers, contributing to suboptimal care. Underdiagnosis and limited surveillance conceal the true disease burden. Short-term outreach has not produced sustainable improvements. Consistent with the Global Surgery 2030 framework, this study holds that sustainable paediatric surgical access requires a deliberate transition from episodic, vertical outreach to a horizontal, locally governed system that is embedded within existing health services and referral networks. This retrospective programme evaluation investigates how a participatory approach at a secondary hospital in Tanzania's rural context can strengthen local providers' capacity and enable the facility to serve as a paediatric surgical hub. A 404-bed charitable secondary-level hospital in the Southern Tanzanian Highlands, 800 km from the nearest tertiary centre, hosted the programme from 2016 to 2026. It evolved from short-term outreach into ongoing training, mentorship, and joint goal-setting, through which local staff acquired skills to manage paediatric cases via surgical tutoring, anaesthesia upgrading, nurse empowerment, and remote consultation. Paediatric procedures rose from 7.2% to 11.9% of total surgical activity (two-sided $p < 10^{-16}$), with a 102.4% increase in general surgical and urological procedures. Local surgeons are now performing all procedures autonomously. The most recent caseload includes many major conditions, with generally favourable outcomes; however, neonatal mortality remains high, mainly due to late referrals and the absence of dedicated postoperative facilities. A participatory approach identified previously unrecognised needs and supported the development of sustainable local capacity. Ongoing training, structured mentorship, and a gradual transfer of responsibility enhanced autonomous practice and increased patient recruitment. Context-sensitive partnerships and sustained educational investment supported skill retention, institutional learning, and the integration of new practices into routine care. These elements are essential to expanding paediatric surgical services in under-resourced settings.

Key words: children, paediatric surgery, low resource, participatory approach, capacity building.

Correspondence to: Alessandro Calisti, Pediatric Surgery, San Camillo Forlanini Hospital, Circonvallazione Gianicolense 87, 00152 Roma, Italy.
E-mail: sanca46@gmail.com

Background

Tanzania, like much of Sub-Saharan Africa (SSA), faces a severe shortage of paediatric surgical resources despite national investment and international partnerships.¹ Children under 15 constitute nearly half the population, yet there is only one paediatric surgeon per six million children—far below the ratio needed for adequate survival in serious cases—compared with one per 100,000 in High-Income Countries (HIC). Although more than 15 local paediatric surgeons had been trained by late 2023, these services are still concentrated in a few major cities.

More than 70% of the population lives in rural areas where prompt surgical access is difficult; nearly half of children with serious conditions cannot reach surgical care within two hours.

Most primary and secondary centres cannot manage neonates or complex paediatric cases, which are handled by general practitioners or surgeons without specialised training. Even basic procedures may deviate from guidelines, causing preventable morbidity. Poor access, underdiagnosis, and absent surveillance likely conceal a substantial burden of congenital anomalies and related deaths, distorting the apparent disease spectrum relative to better-resourced settings.²

Paediatric anaesthesia faces similar constraints. Only a few tertiary centres formally recognise it as a speciality; in rural regions, nurses and Non-Physician Anaesthesia Providers (NPAPs) provide most care, many of whom lack specialised paediatric training and work in environments below minimum safety standards.³⁻⁸ Perioperative nursing care is hampered by workforce shortages,

inconsistent training, and limited professional recognition.⁹ Postoperative management frequently falls to nurses insufficiently involved in perioperative planning, increasing complication risk.

A decentralised hub-and-spoke model has been proposed to meet these challenges by bringing essential surgical services closer to rural populations. Many paediatric conditions can be safely managed at secondary-level facilities by general surgeons with additional paediatric training, given clear referral pathways and shared protocols are in place.^{10,11} Establishing such networks requires ongoing system strengthening and long-term capacity building.¹²

The 2015 Lancet Commission on Global Surgery (LCGS), in its Global Surgery 2030 Framework,³ advocated for Middle- and Low-Income Countries (LMIC) a shift from short-term, disease-focused outreach to participatory, bottom-up health system strengthening through National Surgical Plans (NSPs).^{13,14} This report describes the evolution of a paediatric surgical programme at a secondary hospital in rural Tanzania¹⁵—from episodic outreach to a participatory model focused on identifying local assets, co-designing solutions, and building sustainable capacity through ongoing training and mentorship—with the goal of establishing the facility as a peripheral paediatric surgical hub delivering safe, autonomous care and coordinating regional referrals. This approach embodies the LCGS's call to move away from expert-driven, short-term surgical missions—criticised for limited accountability, fragmented care, and weak inclusion in national systems—toward locally anchored models emphasising long-term mentorship, institutional ownership, and NSPs alignment, in which external partners act as facilitators rather than service substitutes and success is measured by progressive local autonomy rather than procedural volume.

Materials and Methods

Study design

This retrospective, descriptive case study assessed the transition from short-term outreach to a participatory, skill-enhancement model intended to transform a secondary hospital in the Southern Tanzanian Highlands into a local paediatric surgical hub. Objectives included raising awareness of paediatric surgical conditions, improving access to quality care, ensuring timely diagnosis, introducing updated surgical procedures, and strengthening referral pathways. Consistent with Global Surgery 2030 Framework principles, the programme prioritised secondary-level system strengthening—encompassing multidisciplinary workforce training, locally led clinical governance, protocol standardisation, referral coordination, and progressive transfer of responsibility—rather than short-term service delivery by visiting teams. Outreach activities were structured as time-limited educational catalysts within a long-term, locally owned strategy rather than stand-alone surgical missions.

Setting

Consolata Hospital Ikonda (CHI) is a 404-bed secondary-level charitable hospital serving 250–300 outpatients daily from Makete District and surrounding areas (catchment ~10 million), 800 km from the nearest tertiary centre. In 2025, CHI recorded 17,770 admissions and 1,451 deliveries; the surgical team (two general surgeons, one urologist, one orthopaedic surgeon) performed 7,565 major and 2,134 minor procedures. Diagnostic facilities include Ultrasound (US), Computed Tomography (CT), Magnetic Resonance (MRI), laboratory services, and a blood bank. Since

2006, CHI has provided free care to 5,000–6,000 children under 10 years old from Makete District.

Italian volunteers had long supported CHI through short-term outreach missions involving surgeons, orthopaedists, Ears, Nose, Throat (ENT) specialists, urologists, and paediatricians. A formal partnership with the Catholic University of Rome's School of Medicine was established in 2014.

From June 2016, a multidisciplinary paediatric surgical team from San Camillo-Forlani Hospital (Rome), also including specialists from other Italian institutions, conducted biannual voluntary, self-funded visits, each lasting 3–4 weeks, using their annual leave. Visits were suspended during COVID-19 restrictions. The Ada Manes Foundation for Children–Italy also provided ongoing medical volunteer support.

Methods

Outreach visits were conducted by a team comprising one or two paediatric surgeons, an anaesthetist, and one or two nurses, working alongside local general surgeons to reduce the paediatric surgical burden, raise awareness, improve diagnostic skills, and support treatment or referral decisions. From 2019 onward, the visiting team's action focused on expanding local providers' skills and confidence through multidisciplinary visits, joint goal-setting with hospital leadership, structured allied-health training, and progressive on-the-job supervision, including regular feedback, mentorship, clinical audits, electronic educational resources, and remote consultations, all of which were sustained throughout the COVID-19 pandemic. Messaging platforms were used as an exceptional support tool for tele-expertise between healthcare professionals, although a gradual move towards more secure systems would be desirable. Key intervention areas were the following.

Surgical skills training

The programme prioritised training general surgeons to manage primarily general surgical and urological paediatric conditions independently, through supervised exposure to congenital and acquired neonatal and paediatric pathologies, supported by evidence-based guidelines for complex case management and timely referral. Emphasis was placed on paediatric colorectal diseases—a leading cause of intestinal obstruction at secondary-level facilities, requiring staged procedures and long-term follow-up rarely available outside referral centres—with capacity building focused on Anorectal Malformations (ARM) and Hirschsprung's Disease (HSCR), including Posterior Sagittal AnoRectoPlasty (PSARP) and advanced HSCR procedures (stapler-assisted Duhamel; endorectal De La Torre pull-through). Post-PSARP follow-up and dilatation protocols were actively promoted. The goal was a complete transfer of paediatric surgical management to local surgeons, with continued on-site and remote mentorship. Since 2024, the Jepa Limmat Foundation has supported advanced surgical training through COSECSA (College of Surgeons of East, Central and Southern Africa) programmes.

Paediatric anaesthesia and postoperative support

From 2019, a comprehensive paediatric anaesthesia and critical care component was implemented. Structured training improved regional anaesthesia skills (spinal and caudal blocks), now safely performed by local NPAPs under supervision, along with advances in perioperative monitoring, airway management, fluid and haemodynamic control, and safe general anaesthesia for

complex cases, supported by ongoing mentorship, theoretical teaching, and establishment of a seven-bed intensive care unit with paediatric capabilities.

Nursing empowerment in perioperative paediatric care

Strengthening nursing education, regulation, and support was a priority. Visiting nurses provided hands-on training in paediatric care, safe surgical practices, infection prevention, postoperative bowel management, and nutritional support for HSCR patients, with the aim of developing local nurses as educators and leaders capable of training colleagues, caregivers, and families in postoperative home care. Multidisciplinary collaboration and nurse participation in education were actively encouraged.

Improving paediatric preoperative diagnostics

Although CT is available at CHI, its use is limited by radiation concerns and resource shortages, and it is reserved mainly for head trauma and intra-abdominal masses. Most paediatric imaging relies on US and plain or contrast radiography, with US preferred for safety and availability;¹⁶ surgeon-performed US with basic radiology training was encouraged to compensate for limited specialist availability.^{17,18} Plain radiography is used to evaluate trauma, respiratory infections, and bowel obstruction; contrast studies (barium enema, distal colostogram) remain essential for diagnosing HSCR and ARM subtypes. A Micturating Cystourethrogram (MCUG) is also essential for diagnosing vesicoureteral reflux and urethral valves. The absence of fluoroscopy significantly limits the diagnostic value and safety of these contrast studies. When fluoroscopy could not be performed, spot radiographs for HSCR and ARM did not fully replace real-time fluoroscopic guidance, and such examinations were not considered equivalent or definitive. Results for HSCR needed to be integrated with rectal biopsy findings, which remain the diagnostic gold standard.

Data collection

Retrospective data on all paediatric surgical procedures were extracted from theatre logs and coded using ICD-10. Programme impact was assessed by trends in patient recruitment (≤ 15 years), changes in case mix, and the proportion of procedures performed independently by local surgeons. Key reference years were 2016 (programme initiation), 2022 (post-COVID-19 resumption),¹⁹ and 2025 (most recent available hospital data). Variables included demographics, diagnoses, procedure types, major complications, and in-hospital mortality.

Data analysis

Data were entered and analysed using GraphPad Prism 8.4.0. Age differences by sex were evaluated using an unpaired t-test. Changes in paediatric procedure rates and case mix over time were assessed using a two-proportion z-test.

Ethical aspects

The study was conducted in accordance with the Declaration of Helsinki and relevant local ethical standards.

STROBE compliance statements

This retrospective observational study is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. All applicable checklist items

have been addressed, and deviations due to study design are transparently reported.

Results

Short-term outreach phase (2016–2019)

Over 30 weeks between 2016 and 2019, 715 children were referred; 360 general paediatric surgical conditions were diagnosed in 316 patients and 90 specialist conditions in 90 patients. In total, 357 primary and minor procedures were performed, mainly by visiting specialists with local support.

Spectrum of diseases managed

From 2016 to 2019, congenital abnormalities accounted for 82% of paediatric surgical cases observed by the visiting team: Hernias (58.9%), Hypospadias (14%), and Undescended Testes (12%) were most common. ARM (3.8%) and HSCR (2.3%) were the leading causes of acute intestinal obstruction. Of 16 neoplasms, five (31%) were Wilms tumours, all presenting too late for resection and requiring referral for adjuvant therapy where financially feasible. A limited number of Congenital Anomalies of Kidney and Urinary Tract (CAKUT) cases (1.7%), including Congenital Urethral Valves, and Vesicoureteral Reflux with severe dilatation and sepsis, were managed; other common conditions were referred only if atypical.

Identification of priorities

Priorities included standardising inguinal herniorrhaphy, promoting earlier orchidopexy, implementing simple techniques for distal hypospadias, and discouraging complex proximal repairs. A divided sigmoid stoma was recommended for new ARM cases. High complication rates were associated with improperly sited loop colostomies for ARM and HSCR, which had been frequently performed at CHI.

Participatory approach phase (2019 onward)

Paediatric procedures (≤ 15 years) at CHI numbered 509 (7.2% of total surgeries) in 2016, rising—after a temporary COVID-19 decline—to 948 in 2022 and 1,156 (11.9%) in 2025 (two-sided $p < 10^{-16}$) (Figure 1), with an increasing proportion performed autonomously by local surgeons. In 2025, 1,040 paediatric patients underwent a mean of 1.1 procedures each; mean age at admission was 5.9 years (median 4.16), with 46% under 5 years (Figure 2). The male-to-female ratio was 1.27:1; mean age was slightly higher in females (6 years) than in males (5.8 years; $p < 0.001$). Thirteen neonatal cases were treated (M/F 7/6).

The main causes of admission—upper respiratory, intra-abdominal, and soft tissue infections, congenital hernias, and trauma—accounted for 73% of procedures. ENT surgery comprised mainly adenotonsillectomies. Trauma occurred at a mean age of 7 years (range 10 months–15 years, median 6), twice as often in males, with upper-limb fractures predominating.

Table 1 compares surgical volumes in 2016 and 2025. Hospital data from 2016 reflects the paediatric surgical workload before it was influenced by the outreach programme's activities. Apart from Orthopaedic and ENT procedures, which were already performed autonomously at CHI in 2016, the volume of general surgical and urological surgeries increased by 102.4% in 2025. Congenital anomalies other than hernias increased from 26 to 92 patients annually, requiring 155 procedures (~1.6 per patient); their proportion rose from 5.3% to 8.8% ($p = 0.02$).

The prevalence of ARM and HSCR among congenital anomalies rose from 5.56% to 26.32% ($p < 0.05$) over the same period; ARM had the highest rate of multiple procedures (2.3 per patient). To minimise loss to follow-up after colostomy, eligible children remained hospitalised until definitive repair, thereby shortening the interval to PSARP. Ongoing challenges included adherence to post-PSARP dilatation protocols, timely colostomy closure, and follow-up attendance. Given the absence of home-use devices in SSA, families were discharged with disposable cervical bougie sets. Since 2022, colostomy reversal has been performed in 87.5% of ARM cases at CHI, with ~66% maintaining regular follow-up beyond one year.

HSCR with ARM became the leading indication for paediatric gastrointestinal surgery. Procedures included a stapler-assisted Duhamel and an endorectal De La Torre pull-through. Sphincterotomy was performed for short-segment aganglionosis, following rectal biopsy and barium enema. When a levelling

colostomy was required, a direct stoma pull-through was performed after confirming the presence of normal ganglion cells. One patient developed an anastomotic leak and a cuff abscess after De La Torre. At the six-month follow-up, all pull-through patients reported resolution of constipation.

Among 91 abdominal procedures for congenital or acquired conditions, the reoperation rate was 12% and the mortality 7.7%. Postoperative mortality among neonates with congenital anomalies was 38%, with most deaths occurring after surgery for small bowel obstruction. Underlying causes included anastomotic dehiscence, feeding-related nutritional failure requiring prolonged intravenous support, limited neonatal intensive care, inadequate postoperative monitoring, and late presentation due to delayed referral. The results should be interpreted with caution, given constraints in neonatal infrastructure, referral delays, and likely selection bias towards more severe cases. Several methodological weaknesses should be acknowledged. As a retrospective study, data collection relied on

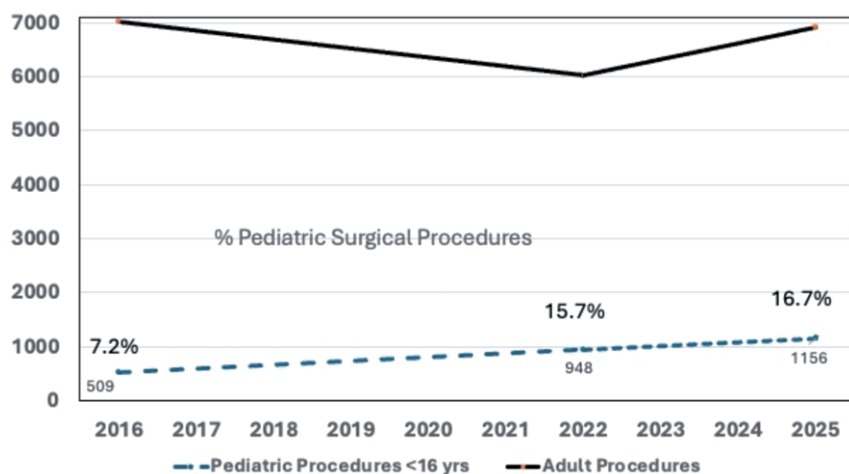


Figure 1. Trend in paediatric surgical procedures at CHI from 2016 to 2025.

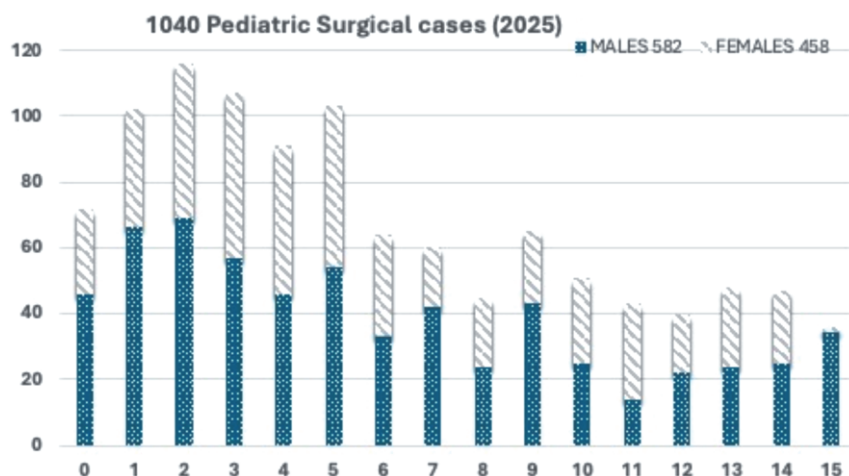


Figure 2. Distribution for age and gender of 1040 paediatric surgical cases in 2025.

existing theatre logs and hospital records, which may not capture all relevant variables or outcomes. The completeness and accuracy of the data may be affected by incomplete documentation, particularly for complications occurring after discharge or among patients lost to follow-up. Selection bias is possible, as more complex or emergency cases may have been prioritised for intervention and record-keeping. Additionally, our single-centre design and specific enabling resources may limit the wider applicability of the results. These factors may affect reported outcomes, and generalisability to other settings should be considered with caution.

Thirty urogenital procedures were performed, including eight for CAKUT. Complete tumour resection was achieved in 4/8 malignant cases. Other abdominal malignancies were unresectable at presentation, and biopsies were obtained before referral to a tertiary centre for adjuvant chemotherapy, when families could afford it.

Outcome figures for 2016 were not easily retrievable from Hospital records, and a comparison with the most recent data has not been possible. In 2025, the overall rate of significant complications (Clavien–Dindo III–V) was 6.7%, within the 5–10% range reported for comparable secondary-level SSA hospitals,^{27,28} and consistent with local benchmarks. Overall, in-hospital mortality was approximately 3.1%, falling to 1.5% for elective procedures, supporting the association between protocolised elective care, enhanced perioperative management, and improved outcomes. Access to services provided by tertiary centres and to children in underserved rural areas of SSA remains a major health issue. Although Tanzania has benefited from national investments and global partnerships, short-term

surgical missions usually struggle to sustain a durable impact due to limited follow-up, limited integration into local health systems, and inadequate adaptation to local contexts. Visiting teams may lack a complete understanding of local realities, and the uncritical adoption of HIC models can lead to inefficiency and unintended harm.²¹ Such limitations mirror broader critiques of vertical, short-term outreach models in global surgery, which may temporarily increase service output but rarely address the structural constraints that determine access, quality, and continuity of care. Without intentional embedding in local health systems, these models risk encouraging dependency, diverting local resources, and obscuring unmet needs. The LCGS therefore advocates reframing international surgical engagement—from episodic care provision to sustained, horizontal health system strengthening governed by local priorities and accountability mechanisms.

Our programme initially used a traditional outreach model, which quickly revealed a significant, previously unrecognised paediatric surgical burden. Rising referrals led to long waiting lists and high loss-to-follow-up rates, exposing the gap between episodic missions and local needs. Conditions requiring staged management and long-term surveillance, particularly ARM and HSCR, proved especially challenging; missed treatment steps, delayed follow-up, and poor attendance at reviews reflected financial constraints, long travel distances, and limited community health support. During this phase, informal feedback from patients and families highlighted barriers to care and informed efforts to adapt patient pathways and educational materials. As the

Table 1. Procedures and corresponding paediatric surgical cases (age ≤15 years) in 2016 and in 2025.

| | 2016 | | 2025 | |
|--|------------|------------|-------------|-------------|
| | Procedures | Cases | Procedures | Cases |
| Orthopedic surgery | 189 | 176 | 278 | 215 |
| • Trauma surgery | 150 | 142 | 205 | 159 |
| • Other orthopedic surgery | 39 | 36 | 73 | 56 |
| ENT surgery | 33 | 33 | 297 | 293 |
| • Adenotonsillectomies | 30 | 30 | 257 | 257 |
| • Other ENT surgery | 3 | 3 | 40 | 36 |
| General pediatric surgery and urology | 287 | 280 | 581 | 532 |
| Congenital hernias (inguinal/umbilical) | 186 | 186 | 322 | 322 |
| Other congenital anomalies | 30 | 26 | 155 | 92 |
| • Anorectal malformations | 3 | 2 | 37 | 16 |
| • Hirschsprung's disease | 2 | 1 | 34 | 14 |
| • Central nervous system | 2 | 2 | 8 | 8 |
| • Hypospadias | 7 | 7 | 10 | 10 |
| • Undescended testis | 9 | 9 | 10 | 10 |
| • Abdominal wall defects | - | - | 2 | 2 |
| • Biliary disorders | - | - | 4 | 4 |
| • Congenital small bowel obstructions | - | - | 5 | 4 |
| • CAKUT | 4 | 3 | 8 | 8 |
| • Others minor | 3 | 2 | 37 | 16 |
| Acquired gastrointestinal diseases | 18 | 15 | 50 | 49 |
| Neoplasm | 14 | 14 | 44 | 42 |
| • Benign tumours | 10 | 10 | 36 | 36 |
| • Malignant tumours | 4 | 4 | 8 | 6 |
| Other urological diseases | 16 | 16 | 5 | 5 |
| Miscellaneous | 20 | 19 | 29 | 25 |
| Total | 509 | 491 | 1156 | 1040 |

ENT, Ear, Nose and Throat; CAKUT, Congenital Anomalies of the Kidneys and of the Urinary Tract.

programme evolved, more attention was devoted to improving communication with caregivers, who were made aware of the importance of follow-up protocols to improve long-term outcomes. Local health providers participated in focus group discussions, providing input on service design, follow-up strategies, and communication approaches. This engagement ensured that the implemented changes addressed practical concerns and cultural expectations, and fostered community ownership and trust in the new model. These findings highlight well-documented limitations of short-term outreach for complex surgical conditions,²²⁻²⁶ though potential biases warrant acknowledgement: selective case reporting may underestimate the true disease burden, and loss to follow-up may lead to outcome misclassification, inflating the perceived impact of outreach. Furthermore, CHI's specific resources, partnerships, and infrastructure may limit generalisability; settings without similar enabling factors may yield different results. In response, the programme transitioned to a participatory, capacity-building approach in line with the LCGS and NSP frameworks.¹² Ongoing mentorship, shared goal-setting, and gradual transfer of responsibility enabled local providers to develop technical skills, clinical governance capacity, and confidence in independent case management. Critically, this process was both operational and philosophical: clear benchmarks for local autonomy and decision-making authority were progressively introduced, ensuring that visiting teams assumed a consultative role and that programme success was defined by local system performance rather than the intensity of external input. Remote consultation, including intraoperative support, complemented on-site training and sustained continuity during travel restrictions. Messaging apps may be considered acceptable in low-resource or humanitarian settings, in rural or isolated healthcare facilities, for emergency or time-critical decision support, and in situations where no certified platforms are realistically available. WHO guidance emphasises pragmatism in these constrained settings, prioritising access and continuity of care, while recommending gradual improvement towards more secure systems.

The rising trend in paediatric consultations, admissions, and procedures indicates both improved access and growing referral confidence in CHI as a regional centre. The 2025 disease spectrum and case mix closely resemble reports from other peripheral SSA facilities, where hernias, tonsillectomies, infections, trauma, and staged colorectal surgery predominate.²⁷⁻³⁰ Herniotomies and Adenotonsillectomies dominate rural workloads, though the need for paediatric herniotomy remains partially unmet.³¹ Rheumatic heart disease linked to untreated streptococcal infections has prompted proposals for less restrictive tonsillectomy criteria in LMIC; in rural SSA, chronic tonsillar disease is often underdiagnosed, contributing to recurrent infections, growth delay, and school absenteeism.³² Traumatic lesion management follows the age, sex, and prevalence distributions reported elsewhere.³³ The rising proportion of ARM and HSCR, and, more generally, of all paediatric surgical and urological conditions, likely reflects improved case identification and care-pathway retention rather than a true increase in incidence.

Persistently low neonatal referral rates are consistent with under-reporting, home deliveries, delayed recognition, and transport difficulties.³⁴⁻³⁷ Neonatal surgery continues to carry high morbidity and mortality, driven by late referrals, limited neonatal infrastructure, and shortages of specialised anaesthesia and critical care—challenges documented even at Tanzanian tertiary centres.³⁸⁻³⁹

The growing complexity of cases at CHI—including neonatal

emergencies and malignancies—likely contributes to the high complication and mortality rates observed in 2025. Although expanding local neonatal capacity may reduce certain risks, timely referral to super-hubs remains essential for selected cases, even as transport and financial barriers continue to impede centralisation.

Genitourinary procedures, particularly for undescended testis and distal hypospadias, remain below expected levels owing to low parental awareness and limited early detection. CAKUT is similarly underreported due to the absence of prenatal screening and diagnostic constraints.⁴⁰

Our experience confirms the feasibility and value of a participatory model for building paediatric surgical capacity at a secondary SSA hospital. CHI benefits from specific enabling factors—a charitable mission, long-standing international partnerships, and the ability to provide free care—that may limit replication in public district hospitals with fewer resources. Nonetheless, core programme elements—structured mentorship, shared protocols, surgeon-performed ultrasound, NPAP training, and nursing empowerment—are potentially adaptable and scalable throughout different settings.

Sustainable improvements in paediatric surgical care in SSA require broader health system strengthening, including sustained investment in human resources, infrastructure, neonatal services, and transport, as well as integration of paediatric surgical initiatives into national health policies. To achieve these goals, governments and donors should consider specific policy actions such as: establishing dedicated funding streams for paediatric surgical training programs and facility upgrades; developing incentive structures and career pathways to retain surgical and anaesthesia providers in rural areas; introducing regulations that mandate paediatric surgical data collection and reporting to inform planning and resource allocation processes; supporting the development and implementation of NSPs that explicitly include paediatric priorities; and enabling cross-sectoral investments in transport systems to ensure timely referrals. Collaboration between context-specific international partnerships and strong local leadership, guided by NSPs, builds resilient health systems in which secondary hospitals are better positioned to serve as paediatric surgical hubs, expanding timely access for underserved children.

Conclusions

This experience shows that a participatory model at a secondary hospital in Sub-Saharan Africa effectively builds local capacity, expands service coverage, and addresses unmet paediatric surgical needs. The CHI model benefits from context-specific advantages like strong international partnerships, a stable volunteer workforce, and free care, which may limit direct replication in underfunded public district hospitals lacking NGO support. However, key components can be adapted for settings with fewer resources. Hospitals without strong partnerships or free care can focus on locally led training, gradual skills transfer among generalist surgeons, task-sharing with non-physician anaesthesia providers, and peer-mentoring groups via virtual platforms or regional networks. Establishing shared protocols, promoting nurse empowerment, and basic ultrasound training can be implemented incrementally with support from regional or national authorities. Collaborating with government, academic, or NGO partners can fill resource gaps and ensure sustainability. These strategies enable tailoring of the model to various resource environments, broadening capacity building. Despite constraints, international initiatives

in resource-limited settings benefit from participatory, partnership-based approaches prioritizing local solutions, especially through NSPs. Elements like mentorship, shared protocols, ultrasound, NPAP training, and nurse empowerment are effective and adaptable. Ensuring long-term sustainability requires embedding continuous professional development, mentorship, and routine training within local teams, and supporting them with periodic audits and quality assurance. Collaboration with regional and national bodies provides ongoing training and maintains standards as external support declines. Success depends on assessing local resources, health systems, and stakeholder engagement. Strengthening paediatric surgical care in Africa requires coordinated strategies: training partnerships, including the integration of surgical training into curricula, and telemedicine support. Outreach should target referral networks, supplies, and audits. With commitment and adaptation, secondary hospitals can be effective surgical hubs, dependent on local policy support for workforce, neonatal care, and transport. From a Global Surgery 2030 perspective, sustainable paediatric surgical care can't rely on short-term missions but requires long-term partnerships, leadership, and system integration. Policymakers should prioritise partnership-driven, participatory models with capacity-building, audits, and adaptable frameworks to sustain services.

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