Case Report

PST PEDIATRIC SURGERY IN TROPICS
www.pediatricsurgeryintropics.com
editor@pediatricsurgeryintropics.com

Pediatric surgery in tropics

Jan-2026

ISSN 3049-3404 (online)

DOI : 10.70947/PST2026.21

Title

# Challenges of starting pediatric surgical services in a resource-limited location – experience at the Makunda Christian Hospital in Assam, India

Authors

Vijay Anand Ismavel *, Ann Miriam**
Email: ivijayanand@yahoo.in
Phone: +91 9365727334

Affiliation

Missions Department (Directorate)
Christian Medical College, Vellore
India

Keywords: “Resource-limited paediatric surgery”

Source of Funding: No funding used

Conflict of Interest: No conflict of interest

Introduction:

The greatest transformational impact achieved by starting a new service occurs in those locations where the service is most difficult to access and therefore service utilization is the lowest. However, these locations are also associated with the greatest challenges which include geographical factors, institutional factors and

patient factors besides issues related to the specialty. Our article explores these issues from the experience of the authors in starting pediatric surgical services in a remote rural part of northeast India. We also discuss possible solutions and ways forward for those considering similar initiatives in other parts of the developing world.

Background:

The Makunda Christian Leprosy and General Hospital was started in 1951 as a leprosy colony by American Baptist missionaries. The hospital was closed in the early 1980s when expatriate staff were asked to leave the country. In the following 10 years, the staff at the hospital sold its equipment to pay themselves salaries leading to loss of electricity, running water and other essentials. Two doctors joined the hospital in 1992 and restarted services in 1993. They went for their higher studies in Pediatric Surgery and Anesthesia and returned in 2000 to establish the only pediatric surgical service at that time in the southern half of northeast India, a part of India wedged between Bangladesh in the west and Myanmar in the east. They continued to serve at the institution for the following 20 years. This article describes the challenges faced and draws learnings from their experience of starting the new service at this remote location to provide suggestions for similar initiatives in low-resource settings.

Problem statement:

Low-resource settings in the rural developing world present with a host of challenges which are general to the starting of any medical service with some that are specific to pediatric surgery. This article considers both the general and specific challenges encountered by the authors in their nearly 30 years of service at the Makunda Christian Hospital located in south Assam’s Karimganj District, close to the borders with Tripura and Mizoram states in India and to the international border with Bangladesh.

Each of the challenges are discussed and internal insights from interventions made are described. Since many of these challenges would be encountered in similar settings across the developing world, the authors hope that their experience would assist other teams with their plans to establish similar services.

Materials and methods:

A description of the setting, initial facilities, challenges and actions taken to manage them form the first part of this section. This is followed by a brief discussion on an external study on the business model of the hospital with specific focus on pediatric surgery.

Results:

The setting – Makunda Christian Leprosy and General Hospital was started in 1951 as a large leprosy colony. After a few years, an American missionary doctor, Dr. Gene Burrows, was appointed and he managed the colony as well as many non-leprosy patients who came to him for care for 25 years. In the early 1980s, all the

expatriate staff were asked to leave the country and were not permitted to re-enter. With no medical staff and loss of patients and external support, the hospital closed.

Motivation to restart – the authors did their medical training in the south Indian state of Tamil Nadu. They wanted their lives to produce transformational impact, a consequence of their decision to follow a career in missionary service. Choice of location was decided by the formula: Potential for transformational impact = population / number of others like you in that location. They therefore searched for a location that was thickly populated but had few hospitals or doctors. To this wish list, they added a large campus that could accommodate future growth. Through a series of circumstances, they were led to this remote hospital in Assam.

Initial situation – The staff at the hospital had been paying themselves salaries by selling its assets, including its generators and vehicles. Thus, the hospital was on the verge of collapse, with no electricity, no patients, no funds and no support. The staff were rebellious and with the large amount of land, there were several serious legal issues. The nearest phone was 50 kms away and was often not in service. The roads were in bad condition and during periodic floods, would be completely unusable for weeks. Oxygen had to be brought from 400 kms away, 12 hours by road in good weather.

However, the surrounding forests were full of people. With the nearest reliable secondary level hospitals being 100-200 kms in different directions, the opportunities were enormous. There were two active pediatric surgical centers in northeast India, one at Guwahati and the other at Dibrugarh (both in north Assam), 400 (12 hours by road) and 600 (16 hours by road) kms away from Makunda. Two pediatric surgeons were also practicing in Itanagar (Arunachal Pradesh) and Kohima (Nagaland). There were no other pediatric surgical services in the entire northeastern region, comprising 8 states. General surgeons performed pediatric surgeries, with some procedures such as neonatal colostomy, herniotomy, pyloromyotomy and bowel resections having good results. There were also stories of perineal surgeries for anorectal malformations using gluteal flaps without dividing the urethral fistula, attempts to treat posterior urethral valves by opening the perineal urethra and excising the valve, attempts at managing trachea-esophageal fistula with significant morbidity and mortality. Pediatric surgery was a major need, many babies and children dying of easily treatable conditions simply because it was too difficult to reach the nearest facility.

When the authors joined, one was a general surgeon, and the other was an undergraduate doctor. The first major surgery, an emergency Caesarean section was done at night with linen autoclaved by the departing missionaries and using kerosene lanterns, lignocaine local infiltration and old sutures. Slowly, people started to come for treatment. It was soon realized that there were few sub-specialty doctors in the area.

In 2000, the authors returned after 3-year training at the Christian Medical College in Vellore in pediatric surgery and anesthesia respectively. They were also trained in critical care and cancer chemotherapy. They started the first pediatric surgical facility in the states of Manipur, Mizoram, Tripura, Meghalaya and south Assam at that time. Soon, patients came from all these states. The biggest medical need in the

community was safe and effective obstetric care, with few people opting for institutional deliveries resulting in one of the worst maternal and infant mortality rates in the country. Understanding social, cultural and economic conditions that affect the poor health seeking behavior, initiatives were made so that poor people lost their fear of hospitals. As delivery numbers increased (to 6750 in 2019-2020), many neonatal pediatric surgical patients born at the hospital were treated, adding to the ones from outside.

The richest patients went outside the northeast when they were sick, and the middle-class patients went to the cities 100-200 kms away to private hospitals. The poor had no options, and they became the focus of the hospital. Many innovative initiatives were launched to focus care on the poor while being sustainable and of good quality. These were studied and published as the “Makunda Model”. [1]

Challenges – when medical staff move to low-resource settings, they face both personal and professional challenges which must be overcome for them to stay on and establish the work. These are some of the challenges and their solutions:

1. Electricity – from the government was intermittent and unusable, usually only 60-70 V (instead of 230V). After some time, a small 3.5 kVA genset could be purchased for the operation room and then, a larger 50 kVA genset for the hospital but the hospital quarters were 1 km away and they were connected to gensets only after 14 years. The staff had to live with kerosene lanterns and had to collect rainwater or carry water from nearby ponds. In the hospital, it was not possible to use electrocautery for many years. The staff adapted to these challenges till larger gensets, and electricity lines could be laid to provide electricity to the entire hospital, including its living areas.
2. Oxygen – with the challenges of obtaining oxygen, it was not possible to use a Boyle type anesthesia machine. Oxygen had to be rationed and used only when absolutely necessary. Anesthesia was therefore a challenge, the answer was the Epstein-Mackintosh-Oxford (EMO) machine, a calibrated, temperature-compensated ether vaporizer that used atmospheric air and anesthetic ether. [2] Anesthesia was induced with thiopentone or ketamine and muscle relaxation achieved with succinylcholine and pancuronium. The only difficulty was the relatively long time taken to induce and for anesthesia to wear off. There was also a restriction to use of cautery in the head and neck when oxygen was supplemented, due to its flammability. This machine was used extensively for over 10 years after 2000 and all sorts of surgeries were performed, including pediatric, thoracic and general surgeries.
3. Equipment – during their postgraduate days, the authors did a scenario analysis to create workable plans to manage most pediatric surgical problems within the limitations at the hospital, identifying any critical special equipment that should be acquired. One was a neonatal chest retractor for trachea-esophageal fistulae and this was purchased. Another one was a neonatal cystoscope but there was no funding available and for many years, patients with posterior urethral valves had high loop ureterostomies performed on them till a generous donor provided the hospital with a neonatal cystourethroscope and a Bugbee electrode. Patients with foreign bodies in the bronchus need a bronchoscope and this was not available. Fortunately, the authors did not have to refer many patients before another donor gave the

funds for a neonatal rigid bronchoscope with peanut forceps (without a telescope) – this was a lifesaving piece of equipment for many years.

4. Ventilation – when the first trachea-esophageal fistula was operated, there was no ventilator. The baby was hand-ventilated for 4 days till she was able to breathe on her own. This was repeated for all babies requiring ventilation for many years with excellent results – many of them are over 20 years old today. They did well because they had an excellent ventilator and monitor – the anesthesiologist!
5. Blood – when the hospital was restarted, it was possible to purchase empty blood bottles and bleed donors as required – walking blood banks. Soon, with changes in Indian blood banking laws, this became impossible, blood had to be procured from 50 kms (often 2 hours one way on a bad road). It was not until a blood storage center was permitted by the government that a reliable source of blood was available in the hospital. Blood donation camps were conducted by the hospital, the collected blood taken away to the 'mother blood bank' 50 kms away and given in lots of 10 units when required.
6. Poverty – the hospital became focused on the poor by using several pro-poor strategies:
    a. There were no private rooms or private consultations. All services were only for the poor. This also ensured that there was no competition with other nursing homes, none of whom had general beds.
    b. Cash flow within communities was analyzed to 'price' tariff instead of the usual costing exercises. Internal cross-subsidy was used and the hospital was financially stable inspite of not receiving external financial support.
    c. Poor people were identified by tell-tale behavior and given charity before they sold vital assets and were pushed into destitution.
    d. "Revised gold standard" protocols were designed to treat patients with what they had avoiding referrals. An example was the use of ultrasound and creatinine to follow-up patients with posterior urethral valves instead of radionuclide studies which were not available in northeast India at that time.
    e. When unanticipated complications occurred, necessitating unexpected delay in discharge, the patient's bills were written off – a form of insurance against unexpected costs.
    f. Occasionally, when patients sold vital assets (land, home etc.) at distress amounts below their market value, hospital funds were used to recover and return them – these were few but created an impression of a hospital that cared for its patients.
    g. Multistage pediatric surgeries were a special problem for poor people. They could pay most or all the cost of a lifesaving neonatal colostomy but did not have the funds for a pull through leaving many older children on colostomies. The hospital subsidized the cost of definitive procedures so that patients could complete their treatment. Since these patients had a good quality of life following surgical intervention, it was justified to use internal funds to support them.
7. Fear – poor people in remote areas are afraid of hospitals. This leads them to avoid going to hospitals and to rely on quacks. When they finally did go to hospitals, they were often late and came with neglected disease. They were not willing for further referral. Many private hospitals charged so much money

that vital assets were sold, children were pulled out of school and families went into irrecoverable financial crisis due to loans taken in desperation. When this happened in a village, it created a chilling effect in the community and reinforced the fear of the hospital. They wanted a sick patient to be discharged when he/she was still breathing because the cost of taking home a dead body was too much. Fear is overcome with loving care – nurses were told to talk to each patient during their rounds to listen to their fears and reassure them, to solve the problems that they and the hospital could and to pray for those they could not. This created a homely setting, and patients started telling their families and communities that this hospital was for people like them.

8. Risks – doctors are trained to minimize risk, often referring patients to the nearest large hospital. However, referral often resulted in patients going home instead and dying of a treatable condition. It was therefore necessary to carefully weigh risks and costs against benefits, take informed consent and take the best possible decision in the situation. Most of these resulted in lifesaving outcomes. An example is a case of a girl with massive hemoptysis treated at the hospital with an exploratory thoracotomy in the early years when the hospital was using the EMO anesthesia machine and did not have a reliable supply of oxygen. [3] The patient had a middle-lobectomy for an intrapulmonary teratoma at a second sitting 4 years ago.
9. Non-medical (management) issues – most doctors are confident in their areas of expertise but when administrative responsibilities legal - financial and manpower issues are thrust on them, they are out of their comfort zone. Since recruitment and retention of committed staff is not easy, senior medical professionals must multitask with the administrative responsibilities, often learning on the job, with mistakes causing preventable difficulties. Visits to medical, nursing and paramedical institutes in northeast India were made to identify and recruit professionals willing to work at the hospital.
10. Personal issues – when medical and paramedical staff move from comfortable locations to remote rural locations and must work under stress, they are tempted to give up and leave. A few are resilient and can overcome initial difficulties and stay on, slowly turning the situation around and experiencing a revival of the institution. Some of the personal issues include:
    a. Loneliness – although the presence of phone service and internet has significantly minimized this issue, staff may miss the professional feeling of comfort when working as a part of a large multidisciplinary team in their medical colleges. They may also not have the large supporting community with their families and staff.
    b. Difficulty in upgrading knowledge and skills – many rural hospitals are short-staffed and it is often difficult or impossible for pediatric surgeons to take leave to attend conferences or training sessions. It may be possible to invite experts to teach them onsite.
    c. Sickness – staff can fall sick with conditions that cannot be easily managed in a remote setting. One of the authors had an acute myocardial infarction with streptokinase not available – he had a 100% block of the left anterior descending coronary artery due to an acute thrombosis and was left with an ejection fraction of 35%.
    d. Education of children – this becomes a major concern of staff when schools are not available locally leaving them with the choice of

sending children off to distant hostels are teaching them at home. The authors started a school on the campus which was a blessing to the local communities besides providing high quality education to staff children.

e. Relief – with single consultants managing large workloads, it is difficult to get other consultants to visit for short periods to relieve them to take leave. The authors did not take most of their leave for about 20 years.
f. Support services – the authors were fortunate that one was a pediatric surgeon and the other an anesthesiologist and they were confident in neonatal/pediatric intensive care. Having a good volume of obstetrics and neonatal/pediatric patients was important in ensuring good volumes. However, the authors managed all other departments as well, until more consultants joined them.

Withdrawal: The authors had made a 30-year commitment of service to the institution. At year 25, they started the process of handing over the hospital and all its departments to second and third-line leaders who were trained and handheld till they were confident and comfortable in managing the work. At that time, the 200-bed hospital was seeing over 130,000 outpatients, admitting about 15,000 inpatients, performing 8000 surgeries and delivering nearly 7000 babies in a year. It was self-sufficient without depending on external resources. A nurse training program, an English medium school and a branch hospital in the nearby militant-infested state of Tripura had been started and were doing well. A large farm and a biodiversity documentation/research project were other activities. A junior surgeon and anesthesiologist had been trained to manage most surgical problems including pediatric surgery. Outside the hospital, the MCh course had been started at the Guwahati Medical College and locally trained pediatric surgeons were available in all the states of northeast India. 5 students trained at the school were doing their MBBS in Assam, over 300 nurses trained at the hospital were working all over northeast India and about 40 Dutch doctors trained were working in low-resource settings across the world. The authors consider it a privilege that they were allowed to see so much change happen during a career of 30 years and inspite of many inconveniences faced, thank God for the wonderful experience.

Discussion:

India is a rapidly developing country but with major disparities between and within its states. There are strong rich-poor and urban-rural divides with most medical service accessibility focused on the rich urban population. Some states have excellent government healthcare facilities which result in high quality free or highly subsidized treatment to its people.

If we measure the potential for transformational impact by restarting services or providing funds or manpower to a hospital, the highest potential will be achieved in locations which have a good population but where there are few hospitals or where that service is not available. In such settings, small investments will produce disproportionate positive outcomes. In addition, services targeted to the economically poor and marginalized communities (who commonly fall through gaps in service) will add to the pool of low hanging fruit.

The greatest barrier to starting medical services in the areas of greatest need is the difficulty in recruiting and retaining staff. Exposure to the needs in remote areas should be given to students and faculty of medical colleges. At the Christian Medical College, Vellore, all undergraduate medical students have mandatory postings to selected mission hospitals for 15 days twice during their course and all faculty need to spend two weeks twice in their career (at confirmation of service and before becoming professors). This experience sensitizes students and faculty in a tertiary advanced training facility to the needs of low-resource settings and could motivate some to consider a long-term career in such locations besides promoting the formulation of revised gold standard protocols to prepare trainees for service in such settings. All undergraduate and postgraduate trainees spend 2-3 years of service obligation in one of the hospitals – thus the training at the medical college is for 3 years and the period of service obligation is considered as an extended part of the training in the community.

Pediatric surgeons are few and concentrated in the urban parts where they feel that their personal and professional lives would be more satisfying. Some doctors (like the authors) are moved to relocate to needy areas through an altruistic motivation or through a call to service from their religious belief. Others may be motivated by a spirit of adventure. Governments and hospitals must invest in the lives of staff to ensure that they are happy, content and comfortable in remote rural work. They should have all the necessities for living (electricity, transportation, communication etc.) and work (adequate equipment and support staff etc.). Additional arrangements to take care of their other concerns such as schooling for children and administrative support should be provided.

Training should be provided to make consultants comfortable in a resource-limited setting. A ‘scenario analysis’ must be done and protocols developed to achieve good results inspite of local constraints. “Revised Gold Standards” should be developed which consider the paying capacity of patients and the facilities available in-house. Postgraduate students should be posted to resource-constrained settings where pediatric surgeons are working confidently so that they see good working models and are taught resource-constrained protocols. The authors were involved in training residents of the MD (Global Health and Tropical Medicine) course from the Netherlands at their hospital. [4] This is an example of the exposure and opportunity that can be given to doctors who are willing to go to the neediest parts of the world – Africa, south/central America, some of the island nations etc.

Poverty is a major hurdle – if actual costed tariffs are charged, most poor people will be unable to access services or may have to sell vital assets. Good business models that involve cross-subsidy, philanthropic donations or state support should be evolved to support the work in the neediest areas. When these have reached a stable state, support could be redirected to other areas.

Objective tools should be used to identify the locations where the ‘bang for the buck’ of financial support or the sending of trained staff will be the greatest. One of the authors had the privilege of visiting Uganda where he realized that some of the most impactful hospitals did not receive any external support. Working with a team from the Wharton School of Business, a tool called the “Transformational Impact Rating system” was created to measure the potential for transformational impact from

external assistance. [5] Most hospitals in the neediest parts of the world are relatively invisible to donors or staff/volunteers, especially in their early vulnerable years when the stress of developing the work is the greatest. If hospitals could create their profiles in such tools and they are used judiciously, donors could identify/shortlist those locations where their aid would create the greatest impact. There are specific donor agencies that work with pediatric populations, including neonatal and pediatric surgery, such as KidsOR internationally and the Sachin Tendulkar Foundation in India. There should be a means to connect these supporters to high-impact institutions.

Conclusion:

Living and working conditions are far from ideal in many low-resource settings, in India as well as across the world. However, these are the locations where the greatest transformation can occur if reliable and accessible services can be provided. Service in such settings should be promoted to young professionals during their student days.

Recruitment and retention of trained surgeons and support staff, judicious support to provide required infrastructure and equipment as well as the creation of well-planned business, HR and medical protocols can provide excellent results, leading to the best outcomes in medical service, including pediatric and neonatal surgery. [6]

References:


1. Flint C., Ismavel VA, Miriam A. *The Makunda Model: an observational study of high quality, accessible healthcare in low-resource settings*: Chris J of Global Health 2020; 7(2):37-51
2. Lo R. *Epstein-Macintosh-Oxford inhaler (EMO anesthetic apparatus):* Hong Kong Med J 2020; 26:358-9
3. Ismavel VA, Miriam A. *Intrapulmonary mature cystic teratoma presenting with haemoptysis treated with right middle lobectomy in a low-resource setting:* BMJ Case Reports 2022; 15(7):248221
4. Ismavel VA. *Closing the Gap – using Global Health doctors*: Chapter in “Into the World” First Edition 2017 Pub: Uitgerverij Boekschap Ed: Mathijs Botman
5. Mayner S., Ismavel VA, Shroff V. *Transformational Impact Rating System: a method to assess the impact potential of hospitals in low-resource settings*: Chris J of Global Health 2024; 11(2):2-22

Naomi Wright et.al. – *Mortality from gastrointestinal congenital anomalies at 264 hospitals in 74 low-income, middle-income, and high-income countries: a multicentre, international, prospective cohort study* - Lancet 2021; doi:



| | |
|---|---|
| Address for correspondence | Vijay Anand Ismavel *, Ann Miriam**<br>Email: ivijayanand@yahoo.in<br>Phone: +91 9365727334 |



| | |
|---|---|
| Received on 23rd May 2025 | Published on 1st Jan 2026 |

| | |
|---|---|
| Acknowledgment none | Conflicts of interest none |
| Source of funds none | Ethical clearance obtained |
| Citation V3 I1 | https://doi.org 10.70947/PST2026.21 |
| Orcid | |
| | |