Implementing Pediatric Spine-Surgery Programs

PICA Interventions in LMICs

By Alaaeldin Azmi Ahmad

Pediatric spine deformity (scoliosis) includes all scoliotic deformities among children. When such deformities progress untreated, the situation can be life-threatening, which makes early intervention crucial. Most patients in this category have complex spine problems with associated comorbidities. They require a multidisciplinary approach in a resource-abundant facility that is run by management that is sub-specialized in spine deformity. Ironically, the incidences of pediatric spine deformity are higher and more widespread in countries with limited resources (CLRs). Thus – except for a very sporadic provision of exemplary management of such patients in Asia, Africa, and Latin America – these patients tend to have no access to the solutions that developed nations possess.

In general, when local governments or NGOs deal with spine deformity, the assumption is that all the required resources are within reach, while the only missing link is the surgical technique. Clearly, this is not the case. Several reasons explain why CLRs lack sustainable programs that deliver pediatric spine-deformity services. First, it is a long-standing myth that very few children suffer from this problem. We now know that 2–3 percent of the population have scoliosis. If we apply this percentage to the United States, for example, there are 6–9 million cases of scoliosis, with at least 20 percent that need management, e.g., 1.2 million to 1.8 million individuals. One would think that such a magnitude of occurrence would attract more attention, especially when management is a life-saving measure.

Second, surgery has been relegated to low-priority status in global health care, believed to be an expensive measure that would compromise other large-scale global health initiatives. Third, many short-term missions were considered as a solution to implement these services, which eliminated the management of pediatric spine deformity from the aegis of global health initiatives. And fourth, prevailing misconceptions led to claims such as the false assertion that the high per-unit cost of pedicle screws makes surgery infeasible, or that local surgeons are unable to learn and implement the treatment, and that a wait-and-watch approach can be adopted. This has reduced the relative priority of spine-treatment training programs among surgeons or organizations that deal with global spine surgery.

Cover of a local newspaper in Mozambique highlighting the Palestinian contributions in managing successful pediatric spine operations in the country, April 2018.

At the Palestinian International Cooperation Agency (PICA), we are convinced that such services should be a priority in our health programs for low- and middle-income countries (LMICs). Thus, we are offering a roadmap on how to implement this service in the limited-resource regions. We refute the claim that LMICs have all the resources at their disposal and only need to learn and implement the technical surgical steps.

Many factors played a role when we decided to prioritize this program as part of a holistic vision for health service provision in LMICs. Not only has the epidemiological shift that was caused by global industrialization given importance to surgery as a health-promoting factor, but people living in LMICs are also now less likely to die from communicable diseases and therefore live to an age when cancer and cardiovascular problems become more prevalent.[i] Moreover, a recent shift in the attention of international societies has made surgical care a fundamental component of global health.[ii] Global activity has moved from short-term missions with a focus on service to capacity building through long-term, sustainable programs with a special focus on education. The perception that used to consider highly specialized surgery a cost-inefficient global activity has changed; it is now considered a necessary activity that augments other health services (such as laboratory services,

The spinal surgery program at Mozambique's Maputo Central Hospital is a model for implementing a highly advanced service on a regional level. It continuously strives for society-centered appropriate care, providing high-quality services in an appropriate setting that will improve the health of patients in the most cost-effective manner for society.

radiology development, blood banking services, anesthesia services, etc.). Furthermore, awareness of the benefits of globalization has risen – especially as the novel coronavirus is affecting the entire world – and with it the fear among developed countries that vulnerable health systems in the developing world could increase the chance of reemergence of infectious diseases. This realization necessitates that health systems be improved uniformly, also in developing countries, promoting a similar approach toward subspecialized surgeries. Finally, there has been increased awareness of the importance of spine problems, as they occur at a higher rate than previously thought, and as the benefits of their early management reduce the complexities and complications associated with late interventions.

Our experience in Mozambique

The idea of implementing this service came in 2017 through collaboration between PICA and the ministry of health (MoH) in Mozambique. Spine-deformity services were not available in Mozambique because both the necessary implants and experienced people in this field were lacking. Previously, the country had a number of scattered missions that treated cases, but they lacked follow-up. The head of the orthopedic department at Maputo Central Hospital (MCH) was interested in implementing a pediatric spine-deformity service through regular missions, aiming to build the necessary local manpower that could continue to provide this service in the future.

During the 2017 meeting of the College of Surgeons of East, Central and Southern Africa (COSECSA), we spoke with the health minister about establishing pediatric spine services at MCH with the full support of the head of the orthopedic department in Mozambique and the executive hospital manager. Thus, collaboration began in 2018 through a memorandum of agreement signed by PICA and the MoH in Mozambique.

Why begin in Mozambique?

Among a population of around 30 million Mozambicans, 100,000 assumed scoliosis cases need clinical attention (extrapolated prevalence). The health care providers that would implement this service are the MoH hospitals, university hospitals, and NGO hospitals.

We decided to focus on pediatric spinal-deformity surgery because, unfortunately, there is a severe lack of personnel in this field in southeastern Africa, with no local facility in the entire region that provides such treatment. This is a highly demanding specialization that needs a sustainable program to promote local doctors and qualify them to carry out this service. Mozambique was a good starting point because an orthopedic training program had already been established by COSECSA. It is the second-largest surgical training institution in Sub-Saharan Africa, but it lacked spinal-deformity-treatment training. Thus, this service can be spread to many countries in the region through this established program.

Our long-term strategy is to enable local health care workers to help themselves, using locally available resources. Moreover, we wish to expand capacity building by developing country-specific training programs in the COSECSA region.

Dr. Alaa Azmi Ahmad during a successful program in Pakistan, 2017.

Whereas many projects are being carried out in Africa by various organizations, they mainly depend on volunteerism via short-term missions that are resource-intensive but offer limited follow-up and provide minimal teaching. We can establish a new model, focusing mainly on sustainable partnerships that give a significant role to academic institutions and include research, training, and capacity building. This program will also be a good base to collaborate with many other global institutions that work in LMICs, enabling organizations to avoid duplications.

Our program is guided by the short- and medium-term goals of adding pediatric spine services as part of the pediatric orthopedic services at MCH with the support of the head of orthopedic services in Mozambique, Dr. Antonio Costa, a fellow of the orthopedic college of Mozambique, and FCS COSECSA. Moreover, we are establishing scientific cooperation with highly experienced pediatric spine surgeons who visit on a regular basis, aiming to improve surgical services, screening, tracking, and follow-up protocols. In addition, we are planning to generate funding for a three-year program that aims primarily at local capacity building through teaching combined with direct clinical services in the field of pediatric orthopedics, including pediatric spine surgery.

Methods and results

From our previous experiences in pediatric spine programs, we know that the first mission is crucial, especially if you begin from scratch. It may be eyed with skepticism by local health professionals who are wondering, “Can this be done here?” particularly if they have adapted to a pathway that was considered satisfactory, e.g., sending patients to India or South Africa for such surgeries. Moreover, considering the complications that might arise in the course of such complex spine

surgeries, any mistake might cause catastrophic results that would lead to the closure of the program and make it extremely difficult to convince the health authorities to continue with it. From the beginning, and with crucial help from Dr. Antonio Costa, I embarked on setting up a multidisciplinary team. I held meetings with the heads of the pediatric, ICU, radiology, and anesthesia departments in which we discussed the needs and postoperative contributions of these departments to pediatric spine surgeries. We talked about the deficiencies we face, mainly the inability to do MRIs in the hospital because the machine was not working. So we arranged for MRIs outside the hospital, with the financial support of a private radiology center, in select cases, mainly with early-onset scoliosis (EOS).

The anesthesia department personnel asked to have an experienced anesthetist because they do not have any experience in this field. Due to a lack of tranexamic acid, a medication used to stop bleeding, we needed to work without it. Our first mission included a pediatric spine surgeon, an anesthetist experienced in dealing with scoliosis surgeries, a neuromonitor technician highly experienced in intraoperative neuromonitoring, and a competent OR (operating-room) staff nurse.

Our aim was to help establish a team in which each member would train a local health worker while performing surgeries under conditions of optimal safety.

We then treated five scoliosis cases with the active participation of two local orthopedic surgeons who had been nominated by the head of the orthopedic department to be the future pediatric spine surgeons. Utilizing internet and smart phone technologies, we followed up from abroad on the patients' pictures, x-rays, and lab investigations, monitoring general conditions through the local doctors who participated in the surgery. With the success of the first mission, everybody was enthusiastic in implementing this technique, including the health authorities in Mozambique, the sponsoring company, and of course our team.

The second mission was carried out in 2019, treating four cases of scoliosis, two of which were EOSs, done with the same technique as in the previous mission. The difference during the second mission was clear, as the mood of the local OR workers was more relaxed and confident. The surgeons contributed more to the placing of screws, local OR nurses participated more, and the ICU was better at managing the cases.

The success of our experience in implementing spine-deformity correction services in an LMIC was made possible through a number of factors. First and foremost, we had the clear support of the MoH and the head of the orthopedic department who helped implement this program through a memorandum of agreement with a clear timetable. This is of great importance since in most LMICs, the MoH has most of the health resources, and the only way to treat complicated cases is by doing them in a central government or university hospital. Ideally, such surgeries should be done in a hospital that is accessible to all people without charge because they are too expensive for most who live in LMICs.

The sustainability of our program was ensured by the local multidisciplinary team that engaged in the program's implementation. As success in such cases depends not only on surgery, it is crucial to give local health professionals the space to engage, allowing them to feel that by the end of the program, they would be able to comfortably do most of the cases on their own. Importantly, using regular implants makes it easier for governments to buy cost-effective implants that can do the work. Circumstances might also require that the surgeries be done in accordance with the appropriate basis, yet with adjustments that work within a given context, as applicable, for example, regarding techniques to avoid bleeding or carrying out the surgery with accepted universal techniques.

Overall, it is important to know that implementing such programs in LMICs must begin with the clear vision that most health services come through the MoH. In such complex surgeries, a memorandum of agreement with the MoH is mandatory, as well as critical support from the head of the orthopedic and/or neurosurgery departments, which in our case we were very lucky to have.

It is also important to try to make these programs regional to decrease the financial burden, with consistence in multicenter educational and research activities. Motivated health workers can serve to be a professional lobbying power on the MOH officials to improve the service in the future.

Surgery, which plays big role in management, can be done in these areas within the health and financial context by applying techniques that can overcome excessive intraoperative bleeding, expensive implants usage, and a malfunctioning follow-up system, as well as avoid the risk of doing complicated procedures.

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[i] Colin D. Mathers and Dejan Loncar, "Projections of global mortality and burden of disease from 2002 to 2030," PLoS Medicine, November 28, 2006.

[ii] Catherine DeVries and Raymond R. Price, *Global Surgery and Public Health: A New Paradigm,* Jones & Bartlett Publishers, 2012.