

Children's Orthopedics Education for Developing Nations [COEDN]

Program for Mombasa, Kenya 2025-26

Children's Orthopedics Education for Developing Nations is a program developed by Pediatric Orthopedic and Spine surgeon Mark Barry M.D. (*1).

The goal of COEDN is to provide fellowship level training for orthopedic surgeons in-country and thereby help bring sustainable pediatric orthopedic care to LMIC's.

Multiple volunteer surgeon-educators from North America and internationally provide training for 3 fully trained local surgeons interested in becoming pediatric orthopedic surgery sub-specialists. COEDN surgeon-educators visit consecutively for 4-6 weeks for a 2 year Fellowship. Didactic, leadership and hands-on surgical training is provided per an established curriculum.

For true long-term sustainable graduate medical education, these fully trained and accredited Pediatric Orthopedic Surgeons will stay at the hospital of training and establish a regional/ international center for training of future sub-specialists in Pediatric Orthopedic surgery.

A. COEDN Program Objectives and Aims: "Training the Trainers"

Most educational programs targeting surgical interventions in the developing world involve short visits with lectures and visiting surgeons operating on prepared cases often with first world expertise and technology that ends up leaving with the team. Unfortunately this results in little long-term benefit and sustainability. The goal of the COEDN program is to provide a full 2 year fellowship in pediatric orthopedic surgery on-site so that local surgeon trainees gain the knowledge, surgical skills and leadership capabilities to provide high level pediatric orthopedic care for their country. In addition, it is anticipated that the fellowship trainees will be leaders and train others from their own, and surrounding nations, thereby magnifying the benefits of the program.

COEDN evaluates areas in the developing world that lack pediatric orthopedic care and assesses the local clinical capabilities and needs. Target countries are chosen based on the ratio of pediatric sub-specialists to total population, presence of academic training programs and local resources. Strength and stability of the local programs, willingness of program leaders and the cooperation of the government are crucial keys to success. When a strong need and desire is recognized in the host country and full cooperation is assured, a project agreement is signed. COEDN establishes a customized curriculum with the assistance of the local program director and provides a 2 year "hands-on" training program in pediatric orthopedic surgery. A schedule of lectures, access to electronic textbooks and study guides, surgical videos and other internet-based electronic educational materials is facilitated. The surgeon trainee will benefit from being the lead surgeon on all cases. For sustainability, locally available resources such as easily obtainable implants and materials are used. Assistance will be

provided to source such materials at affordable prices, but is subject to official country specific importation tariffs and limitations.

Allied physicians and other healthcare providers will also be trained in the principles and techniques of pediatric orthopedics so they can provide the needed care to their country. After departure of COEDN personnel at the end of the training term, COEDN and other organizations will be able to provide extra training visits to help the graduate surgeons with further complex pathology training. COEDN also provides ongoing support via internet/email, Zoom meetings, etc., and through ongoing visits on an agreed to basis for several years.

Another major benefit of training in-country is that the surgeon trainee will not have to leave the country to train, thus retaining valuable manpower and continuity of care, and, most significantly eliminating the risk of the trainee not returning home... “Brain Drain”- as seen in other country’s programs in the past is thus mitigated.

B. Current Pediatric Orthopedic Surgical Care in Kenya, the Need:

There is a dire need to address overall global health equity. There are only 5 formally fellowship trained Pediatric Orthopedic surgeons in Kenya, a country with an estimated population of 57 million. One half of the population is under 20 years old. There is currently an approximate ratio of one generalist orthopedic surgeon to 300,000 population. In high income/resourced countries the ratio is approx. 1:15,000. For pediatric orthopedics this ratio is at minimum 1:400,000, therefore by developed world standards Kenya could benefit from 145 Pediatric Orthopedic sub-specialists for all citizens to get care. Similar dire circumstances exist in all surrounding countries in sub-Saharan Africa. Currently in Kenya there are over 100,000 children in need of orthopedic surgery extrapolating from epidemiological studies done in neighboring countries. (*2,3)

The family burden of caring for a disabled child is significant, and often drives a family into poverty. In the poorest regions, children born with disabilities are 4 times more likely to die than those without. Only 1 in 10 children with disability attends school, 1 in 20 completes their primary education.

In Kenya, six orthopedic residency programs currently graduate 20 surgeons per year. The vast majority of orthopedic surgeons are generalists/ traumatologists. There is only one pediatric orthopedic fellowship training program in Kenya (Kijabe). More specialty programs are desired, such as trauma, arthroplasty, spine, sports and hand. There is a clearly recognized need and a strong desire by the Coast General Teaching and Referral Hospital (CGTRH) administration and Orthopedic Faculty to set up a Pediatric Orthopedic fellowship training program in Mombasa. CGTRH has an established Orthopedic Residency training program. We will train pediatric sub-specialists who will be tomorrow’s leaders and educators of future fellows at CGTRH and also to provide specialized care at regional hospitals throughout Kenya.

CGTRH is well regarded as the top center for orthopedic surgery in eastern Kenya. The estimated population drawing area is 5 million.

The Level 5 hospital sees over 100,000 patients per year and has 723 beds- the 2nd largest in Kenya. Over 7000 surgeries are done per year. CGTRH has multiple other specialty training programs. The hospital is well staffed and well equipped. Laboratory and Diagnostic Imaging are available and proficient. There is MRI, CT and ultrasound available. Anesthesia is very proficient. The O.R.'s have modern technology and are equipped with fluoroscopy. Complex procedures such as joint arthroplasty, arthroscopy, spine surgery and cardiac catheterization are done.

C. Description of Project for Mombasa, Kenya:

A total of 10-12 experienced volunteer pediatric orthopedic surgeons from the Pediatric Orthopedic Society of North America and equivalent international societies around the world will travel to CGTRH in Mombasa over a 2 year period beginning in January 2025. All surgeons are, or have been highly qualified and experienced teachers at their respective institutions and will teach the full spectrum of pediatric orthopedics in conjunction with other visiting trainers.

COEDN will provide guidance to each instructor and help develop the curriculum in conjunction with the local orthopedic faculty, the administration at CGTRH and the multinational (14 countries) accreditation organization- the College Of Surgeons of East, Central and Southern Africa (COSECSA). Included are the educational and research goals and core surgical techniques. The curriculum is customized to the needs of the practice of pediatric orthopedics in central Africa and focuses on endemic conditions and the use of regionally available materials and implants.

Each COEDN surgeon-educator will spend 4-6 weeks at CGTRH, training 3 fully trained and well qualified orthopedic surgeons, and also help train select allied health care providers, such as orthopedic residents, nurses, interns and technicians.

Rotations will be sequenced in order to provide a continuous on-site 11 month period of training presence in year 1, followed by four- 4 week quarterly visits in year 2. The exiting COEDN surgeon will convey all needed transfer information with the incoming surgeon and prepare a trip report to ensure uniform continuity of instruction. An ongoing COSECSA internet based log of patients, interventions, and outcomes will be maintained during the training period for review of trainees, to conduct a formal program evaluation, for accreditation and for research purposes.

Fellows will enter the program with a strong basic knowledge of pediatric orthopedics attained from their current practices, residency and through self-directed learning. They will be given all needed educational material and guidance 3 months in advance of the program. The principal format of fellowship training will be case-based experiential education. Patients will be sourced from clinics and direct referral. Patients will be evaluated as a team. After establishing a differential diagnosis necessary diagnostics will be ordered and a treatment plan will be formulated. Pre and post-surgical conference schedules will be instituted. Regular rounds will be conducted on in-patients. Vigilance for, and early treatment of complications will be stressed. All rounds and teaching will be conducted in English.

In coordination with the academic faculty at CGTRH the visiting surgeons will also teach the fellows how to train future pediatric orthopedic surgeons, residents and additional non-MD healthcare personnel for sustainability of the program.

At the start of the program the fellowship trainees will be provided a schedule by the program director to conduct formal rounds and teach residents, students, etc “down the line”, as this is the best methodology of becoming experts themselves.

It is expected that by the end of the training program, the local surgeons will be proficient in the evaluation and treatment of most endemic pediatric orthopedic problems. They will understand skeletal growth, musculoskeletal anatomy and pathology. They will become experts in physical examination. They will be able to prepare a differential diagnosis for all pediatric orthopedic problems. They will be able to propose a treatment plan with all options considered beginning with the most conservative care. They will be proficient in the diagnosis and treatment of the full scope of pediatric fractures and dislocations. They will be able to identify those conditions that require intervention and perform closed and open reductions of all common fractures and dislocations. They will be able to diagnose and treat the full complexity of infections of bones and joints. They will be able to perform most classic osteotomies, Ponseti treatment and surgical repair of clubfeet, tendon transfers. Most importantly, they will be able to recognize complications early and evaluate and intervene accordingly.

A formal accreditation- FCS(paed-ortho) sub-specialty has been created with COSECSA. Fellows will sit written and oral exams at the end of the program to qualify for their FCS(paed-ortho) ECSA.

Following completion of the program, a COEDN surgeon will be available to make 2-4 week visits to CGTRH over subsequent years in order to assist in further surgical education including the potential for the development of a comprehensive pediatric spine program.

Educational Materials: A syllabus, lecture schedule, and additional on-line educational materials will be produced and provided in concert with the RMH program director prior to the implementation of the actual 2 year program. The materials will be specific to the local needs; they will be in English, the language of training. Internet access to current on-line educational resources through the Orthobullets PASS Annual Study Curriculum, American Academy of Orthopedic Surgeons (AAOS), POSNA Academy, SRS, COSECSA, Global Help. Access to JPO and JPOSNA journals and other sites will be provided. The Orthobullets PASS program will be used to provide a testing platform including (expanded) ACGME milestones covering medical knowledge, procedural skill and professionalism. All of the above will ensure that the trainees will receive a world class training experience.

Education Abroad: The Pediatric Orthopedic Society of North America [POSNA] has a visiting scholar program. It is organized through "POGO"- Pediatric Orthopedics Global Outreach. Deserving fellows will be offered scholarship opportunities. Surgeon-volunteer POSNA members will sponsor deserving fellows after their training to come to their hospital in the USA to observe for a few weeks and also present their research at one of our meetings- POSNA or IPOS [International Pediatric Orthopedic

Symposium]. This would not be official "training", but more of an educational/observational 3 week visit.

D. Evaluation Plan

Testing: Trainee competency will be evaluated with testing at entry, mid-year and exit utilizing a number of parameters and milestones derived from the Accreditation Council of Graduate Medical Education (ACGME). Formal trainee accreditation will be applied for with the College of Surgeons of East, Central and Southern Africa (COSECSA). COEDN personnel will assist the local program director with this and in evaluating progress of the trainees.

Clinical Proficiency in Pediatric Orthopedic Care: The local trainees will be directly observed over the training period for improvement in cognitive and procedural capabilities as well as professionalism. Each trainee's progress and clinical case outcomes will be documented and reviewed by periodic activity reports and at the end of the training program to determine retention of information and surgical outcomes. All complications will be reviewed, discussed and documented.

Academic standing: The program is designed such that the surgeon trainees will go on to complete their COSECSA exams and obtain certification as "Fellows of the College of Surgeons (FCS)" in Pediatric Orthopedic Surgery and be able to function at a level equivalent to a sub-specialist from a North American or European fellowship program by completion of the course.

Research: Fellows will be expected to engage in and complete clinical research as defined and coordinated by the CGTRH program director in conjunction with COEDN instructors, who will assist in guidance. The training program itself will be evaluated and outcomes and experiences will be shared in professional meetings and publications.

Case Type/ Volume: A COSECSA electronic data collection program (E-Logbook) will be used. The number of pediatric orthopedic patients and their diagnoses will be tabulated and reviewed and which responsible surgeon trainee will be recorded. The diagnoses will be classified into one of seven categories:

1. Trauma (fractures, dislocations and soft tissue injuries)
2. Infection (septic joints, osteomyelitis)
3. Congenital (clubfeet, hip dysplasia, limb deficiency, etc.)
4. Developmental (non-traumatic growth abnormalities, scoliosis)
5. Neurological (cerebral palsy, neuropathies, etc.)
6. Neoplasia (bone and soft tissue tumors)
7. Syndromic and metabolic conditions (Marfan, Down, etc.)

The types of procedures and their outcomes will be recorded and evaluated during and after training for the full conventional follow-up period. Complexity of cases will be reviewed as well, with the expectation that more complex care can be undertaken as the trainees gain experience.

The trainee will also be encouraged to establish and utilize their own personal electronic case database for professional development, quality assurance, research, etc.

E. Continuation of Care:

Further Training of Specialists (sustainability): At the completion of the program, the accredited trainees will be expected to possess the knowledge and skill to train future pediatric orthopedic surgery sub-specialists. The recognized, agreed-to goal is the establishment of a permanent regional “Center of Training Excellence” in pediatric orthopedic surgery. This center will train others from Rwanda and surrounding nations and have COSECSA accreditation and support.

Community screening instruction: Screening for orthopedic conditions in the community (including schools) can be taught to non-MD medical personnel such as orthopedic nurses and other physician extenders in an effort to raise awareness of pediatric musculoskeletal conditions and refer cases that may need treatment. It is anticipated that the Ministry of Health and various humanitarian aid NGO’s will aid in this initiative.

Ponseti instruction: Formal Ponseti clubfoot treatment instruction will be provided to orthopedic fellows, residents and non-MD caregivers in training at CGTRH. Training will also be made available for any other visiting medical personnel in order to help provide quality care and instruction at regional clubfoot treatment clinics throughout the country.

KEYS TO SUCCESS OF THE PROGRAM:

1. Kenya is ready to establish a permanent, accredited Pediatric Orthopedic Surgery fellowship training program at CGTRH.
2. Provision of all needed certification and indemnification of COEDN volunteer surgeon-educators for all training facilities involved for the full duration of the program.
3. Full cooperation with the CGTRH administration and staff in setting up and running the fellowship training program and supporting a program director.
4. Full cooperation of the Ministry of Health in support of the program.

5. Recruitment of the brightest and best fellowship level surgeon-trainees who will be retained at CGTRH as the leaders and educators of future pediatric orthopedic fellows and residents.
6. Provision of a high volume of patients with a full spectrum of surgical orthopedic conditions available for treatment and teaching.
7. Assured adequate scheduled access to the operating theatre to perform a high volume of cases for the benefit of teaching of the fellows.
8. Assured adequate supply and quality of technology, instruments and basic orthopedic implants to perform safe and efficient surgical treatment.

The ultimate beneficiaries of the joint CGTRH and COEDN educational program will be the children of Kenya and surrounding countries who will have greater access to expert pediatric orthopedic care to maximize their chances to live normal, productive, pain and impairment-free lives.

The COEDN volunteer surgeon-trainers look forward to the opportunity to participate in, and contribute to the success of this truly sustainable endeavor for Kenya.

Mark A. Barry M.D.
Founder & Director- COEDN

* REFERENCES:

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