# Orthopaedic Surgery in a Global Context

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Orthopaedic surgery is a "contextual" field, and the most appropriate treatment is crafted at the site of service delivery. Whether the solution involves an individual patient, or organizing service delivery within a health system, a number of variables are important and differ considerably when comparing high income countries (resource unconstrained, over-resourced) with low and middle-income countries (LMIC, resource constrained or challenged, under-resourced). Deficiencies in access to surgical care result from economic or political fragility/instability, armed conflict, geospatial constraints (terrain, road infrastructure, transportation), lack of availability of services, inability to finance services, and cultural acceptability. Timely access to "essential" procedures, for example drainage of an abscess or irrigation and debridement of an open fracture, which are often performed by non-surgeons or general surgeons (task shifting or sharing), are cost effective and can prevent the need for more complex treatment strategies. Health systems aspire to provide universal access to these essential orthopaedic services at primary referral level facilities, while at the opposite end of the spectrum tertiary services are usually available in the major cities at large public hospitals or teaching hospitals. These centers often have more advanced imaging technologies (image intensifier, CT/MRI), availability of advanced anesthesia services and also access to a variety of surgical implants. They typically have training programs as well.

How can surgeons trained and practicing in a high-income country contribute in a meaningful way to orthopaedic service delivery in these resource challenged environments? We must be sensitive to contextual differences in the pathology, resources available, health system, and sociocultural milieux. The visiting surgeon will be exposed to the common presentation of conditions which they rarely see at home, for example tuberculosis or the sequalae of polio or untreated hip sepsis. They are also exposed to the uncommon presentation of familiar conditions for example a displaced supracondylar humerus fracture presenting three weeks after injury, tibial osteomyelitis with a sequestrum protruding through the skin, or an adult with an untreated clubfoot. These late presenting cases require more complex interventions for which the outcomes are predictably inferior versus the same condition presenting acutely. Modifications of the treatment plan are commonly required when resources are limited, and always have one or more back-up plans. Newer techniques for minimally invasive fracture fixation, especially in the pediatric age group, cannot be considered without reliable access to an image intensifier and/or implants. Imaging for a bone lesion may be limited to plain radiographs. Surgical care becomes essential for source control in cases of hematogenous osteomyelitis when antibiotics are unavailable, as disease-free survival requires wide resection of all contaminated tissue. Don't forget honey when addressing challenging wounds. Sociocultural variables often impact the choice of treatment. Don't assume that an adolescent female with an untreated clubfoot is having pain or seeking treatment for gait disturbance, the problem may be the social stigma; she may be unable to have a marriage arranged unless her club feet are corrected. While an amputation maybe the best treatment option to salvage a mangled extremity or provide palliation for a large and painful malignancy, some patients may still refuse to have their limb removed. These decisions must be respected.

There are multiple avenues for surgeons to become involved, at an international venue and/or the virtual world. Some choose to participate in service-oriented experiences, for example mission trips, in which they provide direct patient care, often bringing a team with implants and the appropriate resources to perform procedures such as total joint arthroplasty or correction of spinal deformities. Others prefer to be involved in capacity building through teaching/training, research, advocacy/policy related initiatives, with or without a component of direct patient care, or more than one of these. Virtual platforms for didactic learning and interactive experiences offer an opportunity for those who are unable to travel. Some elect to become involved as an individual, while others work with non-governmental organizations, academic institutions, or others. Some service opportunities require us to step back from our typical practice patterns, for example the principles of trauma management in disaster relief or war surgery have been informed by extensive experience in the field, are focused on provisional stabilization and reducing complications, and are reflected in protocols by organizations such as the International Committee of the Red Cross (ICRC). Surgeons can become involved in disaster relief and/or war surgery must understand these concepts, for example open reduction and plating of a closed pediatric femur fracture has a very high risk of being complicated by infection when performed in an environment with limited sterility, for example in mobile surgical unit following an earthquake. These patients should all be placed in traction or have external fixation applied during the early phases of their care.

A few general principles should be considered prior to engaging in any of these activities. Think of yourself as a guest in someone's home. It's useful to listen before we speak, to gain an understanding of the local context. Emphasize your "software", thought process and approach to solving problems, and in general avoid the temptation to bring "hardware" unless these items can be maintained or

restocked locally. Solve problems with what is available locally. Research efforts should emphasize building local capacity by teaching local surgeons and their trainees to ask appropriate questions, answer them, and then publish their findings. Local students and providers should always be authors on projects completed in their center. Surgeons involved in service missions need to consider who will manage the patient when they have left, especially any complications. They should also be aware of what resources are available for rehabilitation, and whether orthotics and/or assistive devices are available. It is important to realize that there can be untoward effects on the local health ecosystem. For example, visiting surgical teams caring for well to do members of a community and therefore undercutting the income of the local surgeons who often need to supplement the meagre income they receive from practice in the public sector by having a private practice in the late afternoon or evening, after their government service. We must recognize the importance of interactions between colleagues practicing in resource challenged environments, through local or regional conferences, exchanges, journals, and training activities. Perhaps the greatest impact can occur with establishing networks involving individuals and institutions in both high and low-income environments.

Orthopaedic surgeons who have had the opportunity to explore their field in another context will likely agree that there is enormous educational value, and that the experiences enhance their perception of disease, awareness of deficiencies in access to health services, and the importance of context when developing treatment strategies. A sensitivity to the local context is essential if we are able to contribute in a meaningful way to enhancing the delivery of orthopaedic surgical care in resource challenged environments. The greatest opportunities may lie in forging relationships between individuals and institutions, and this model of cross fertilization should enhance both training and patient care, a win-win situation for all involved. The pandemic has made most of us familiar with technologies which make it easy to engage colleagues around the world, and innovative educational platforms can add value to these relationships. There are innumerable ways in which individuals and institutions can work together, it's a matter of figuring out how we can incorporate these global activities within the many commitments we have at home. Building global activities into the culture of an academic orthopaedic department can enhance the educational program and open the eyes of our faculty and trainees to the vast world of orthopaedic surgery.