The Burden of Musculoskeletal Injury in Low and Middle-Income Countries: Challenges and Opportunities

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The global burden of injury is substantial, and injuries are predicted to be a leading cause of death and disability over the next few decades. The majority of this burden will be borne by low and middle-income countries, where preventive strategies are often nonexistent and barriers to the timely and appropriate care of the injured include absent or inefficient systems for the delivery of trauma care, inadequacies in the number and the distribution of health-care facilities and workers, a lack of infrastructure and/or physical resources, and a lack of education and training. Addressing the burden of injury in low and middle-income countries has become a public health priority. So-called essential services, which are low-cost, high-yield, and target major health problems, should be made available to every person in the world. While surgery has been traditionally viewed as a high-cost treatment lying outside the realm of the traditional public health model, evidence is emerging that the burden of surgical diseases such as trauma is substantial, and that essential surgery may be a cost-effective addition to the health system in low and middle-income countries.

The Global Burden of Injury

Background

The World Bank classifies countries in July of each year on the basis of per capita gross national income. As of 2005, countries have been classified (in U.S. dollars) as low income (<$875 per year), lower-middle income ($876 to $3465), upper-middle income ($3466 to $10,725), and high income (~$10,726). The most comprehensive assessment of global mortality and morbidity has been provided by the Global Burden of Disease project (www.who.int/healthinfo/bodproject/en/index.html). The initial Global Burden of Disease Study was published in 1996, and was based on data collected in 1990. That study introduced the disability-adjusted life year (DALY), drawing attention to the importance of nonfatal outcomes, and suggested that disability plays a major role in determining the overall health status of a population. Specific diseases and injuries have been disaggregated into three major groups: Group I (communicable diseases, maternal and perinatal conditions, and nutritional deficiencies), Group II (noncommunicable diseases), and Group III (injuries) (Table II). Injuries are further divided into intentional (self-inflicted violence, interpersonal violence, war, and other) and unintentional (those resulting from road traffic crashes, poisoning, falls, fires, drowning, and other). The overall rank for each category of unintentional injury, in terms of both deaths and DALYs (1990 and 2001), is
shown in Table III. Subsequent to this landmark publication, burden-of-disease calculations have been revised and updated\textsuperscript{3,6}.

Injuries accounted for 16\% of the world’s disease burden in 1998 and for 11\% in 2001\textsuperscript{1-2}. Unintentional injuries were estimated to be responsible for 66\% of injury-related deaths and 70\% of injury-related DALYs (8\% of all DALYs) in 2001, and most occurred in males who were fifteen to twenty-nine years of age\textsuperscript{4,5}. Road traffic crashes are the most common cause of death from injury worldwide, and \textsuperscript{>90\%} of the deaths from injury worldwide occur in low and middle-income countries\textsuperscript{1}. Injuries are twice as common in males, and 50\% of deaths occur in individuals between fifteen and forty-four years of age\textsuperscript{6,15}. Patterns of injury differ between urban and rural environments\textsuperscript{11,30}.

Although there is a paucity of published material quantifying the burden of musculoskeletal injuries in low and middle-income countries, extremity injuries are thought to be an important cause of permanent disability\textsuperscript{11,20}. As such, the impact of traumatic conditions treated by orthopaedic surgeons has yet to be quantified on a global basis.

Quantifying the Burden of Disease: The Disability-Adjusted Life Year

Traditional measures of population health have focused on mortality, which by definition neglects the majority of conditions treated by orthopaedic surgeons. With a growing awareness of the contribution of nonfatal outcomes to the world’s disease burden, there was a need for a summary measure of population health that would reflect this component of disease burden. In response, the DALY was developed as a component of the Global Burden of Disease Study, initiated in 1988 by the World Health Organization, the World Bank, and the Harvard School of Public Health\textsuperscript{1}. The DALY was designed to measure the combined impact of morbidity and mortality, in order to quantify the burden of disease and disability in a population, and to inform resource allocation\textsuperscript{1-6}.

The DALY represents the gap between the health of a population and an ideal reference state, and it combines the years of life lost because of premature mortality (YLL) with the healthy years of life lost because of disability (YLD) (DALY = YLL + YLD). One DALY is equal to the loss of one healthy year of life. The years of life lost because of YLL are calculated by multiplying the number of deaths by the standard life expectancy in years at the age of death (eighty years for men and 82.5 years for women). The years lived with disability (YLD) are calculated by multiplying the number of incident cases by the average duration of the disease and by a weight factor (disability weight = severity of disease from 0 [perfect health] to 1 [death]).

While a critique of the methods and assumptions used in calculating DALYs\textsuperscript{23-25,27} is beyond the scope of this review, and the methodology continues to evolve on the basis of critical reviews, several issues surrounding the calculation of the disability component (YLD) are worthy of discussion. As with other summary measures of population health, social value choices are incorporated. Age-weighting assumes that there is a social or societal preference to value a year of life for a young adult more than for a child or an elderly person\textsuperscript{1}. Age-weighting has been eliminated in the most recent updates from the Global Burden of Disease Study. Disability weights for each condition reflect societal preferences for time lived in nonfatal health states. The values for a selected group of conditions were determined by a panel of experts using a person trade-off method, and they lie along a continuum from 0 (complete health) to 1 (death). Examples of disability weights for traumatic musculoskeletal conditions include dislocations (0.074), fractures (femur [0.372]), pelvis [0.247], ankle [0.196], tibia [0.271], and amputations (leg [0.300] and finger or arm [0.102])\textsuperscript{11,30}. For comparison, weights associated with other conditions include spinal cord injury (0.725), cataracts (0.600), acute myocardial infarction (0.491), unipolar major depression (0.600), developmental disability (0.024), birth asphyxia or trauma (0.381), leprosy (0.153), tuberculosis (0.294), poliomyelitis (0.369), spina bifida (0.593), and osteoarthritis of the hip or knee (0.156). Disability weights are frequently listed for both the treated and the untreated condition, and, in a subset of cases, these weights are the same. It should be recognized that disability weights do not take into account the context in which the condition occurs. As stated by Allotey et al., the “experience of a health condition is an interaction between a person and the social, cultural, and environmental context”\textsuperscript{4,43}. Weights for the same condition might vary substantially on the basis of the local infrastructure and the availability of support from family members and the society. For example, paraplegics in Cameroon rated their health as considerably worse than those in Australia\textsuperscript{44}.

While acknowledging that it has flaws and limitations, it is also important to emphasize the advantages of the DALY: a composite summary measure that allows comparisons across different conditions or interventions (for example, the costs per DALY averted by poliomyelitis immunization compared with the costs per DALY averted by liver transplantation). Evidence that certain surgical treatments can avert DALYs is beginning to emerge\textsuperscript{45}. In advocating for the orthopaedic treatments in low and middle-income countries, research studies focusing on the ability of specific treatments to avert DALYs should be supported.

Road Traffic Crashes

Much of the literature concerning the global burden of injury has appropriately focused on road traffic crashes, which are predicted to be the third leading cause of DALYs worldwide by 2020, and the second leading cause in low-income countries\textsuperscript{1}. The term crash has replaced the term accident, as crashes are nonrandom and are therefore amenable to prevention\textsuperscript{46}. An
An increase in the number of motorized vehicles has accompanied economic development within low-income countries, yet the infrastructure to support this volume has been lacking. The number of motorized vehicles in China increased from 60,000 to more than fifty million over the past fifty years \(^{31}\), while in Thailand the number has increased from 4.9 million in 1987 to 17.7 million in 1997 \(^{32}\). The resultant "epidemic" of road crashes has led to several resolutions on road safety and control of road traffic crashes from the General Assembly of the United Nations \(^{33}\).

Road traffic crashes are responsible for approximately 1.2 million deaths worldwide per year, and an additional twenty to fifty million people survive with or without a permanent disability \(^{34-36}\). Road traffic crashes ranked eleventh in both deaths and DALYs in 2001 \(^{2}\) (Table III), and projections from data collected in 2002 suggest that road traffic crashes will be the eighth leading cause of death and the fourth leading cause of DALYs in 2030 \(^{3}\).

An increase in injuries from road traffic crashes has been associated with economic growth in low-income countries \(^{37}\). While only 32% of the world's vehicles are found in low-income countries, they account for 85% of the deaths and 90% of the DALYs attributed to road traffic crashes \(^{38}\). Alarming increases in mortality have been documented (from 1975 to 1998) in Malaysia (44%), India (79%), Colombia (237%)}
China (243%), and Botswana (384%). More than 50% of those killed are males between fifteen and forty-four years of age, and these injuries are more common in individuals of lower socioeconomic status. The global economic costs are estimated to be $518 billion per year. The estimated costs for low or middle-income countries are equivalent to 1% to 2% of their gross domestic product, which for many countries exceeds yearly developmental aid given to them. The traffic mix is considerably different in low-income countries, and between 41% and 75% of those injured are pedestrians. Others who are commonly injured include bicyclists and motorcyclists and passengers on public transportation.

While closed head injuries and visceral injuries are the predominant cause of death, musculoskeletal injuries are a common source of morbidity. The effect of nonfatal injuries is likely much greater than that of fatal injuries, although the data remain sparse. In an extensive review of the literature, Ameratunga et al. found that the prevalence of disability after a road traffic crash ranged from 2% to 87%; however, none of those studies were conducted in a low-income country. For patients who required hospital admission for the management of their injuries, the rate of self-reported disability was 21% to 57%, whereas physicians reported disability in only 2% to 7% of such patients. Self-reported disability was identified in 5% to 39% of those seen as outpatients. A study from Sweden found that 23% of victims had a reduced health status at nearly four years following injury.

### Delivery of Care

Up to 50% of those injured in low and middle-income countries receive no medical care, and a substantial number receive services at a primary health facility staffed by a nonphysician care provider. In high-income countries, better organization of trauma systems has reduced mortality by 15% to 20% and has decreased medically preventable deaths by >50%. Components of a trauma care system include both prehospital and hospital-based services.

With respect to prehospital care, while formal emergency medical services may be unaffordable for the majority of low-income countries at present, improvements in informal mechanisms have resulted in better outcomes. In such resource-challenged environments, the majority

### TABLE II Burden of Disease Statistics for 1990 and Projected to 2020: Epidemiologic Transition

<table>
<thead>
<tr>
<th>Major Category</th>
<th>Percentage of Total Deaths</th>
<th>Percentage of Total Disability-Adjusted Life Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I (communicable and perinatal diseases)</td>
<td>44 20</td>
<td>34 15</td>
</tr>
<tr>
<td>Group II (noncommunicable diseases)</td>
<td>41 60</td>
<td>56 73</td>
</tr>
<tr>
<td>Group III (injuries)</td>
<td>15 20</td>
<td>10 12</td>
</tr>
</tbody>
</table>


### TABLE III World Ranking of Unintentional Injuries

<table>
<thead>
<tr>
<th>Category*</th>
<th>Rank in Terms of Deaths†</th>
<th>Rank in Terms of Disability-Adjusted Life Years‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road traffic crashes</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Self-inflicted injuries</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Interpersonal violence</td>
<td>16</td>
<td>22</td>
</tr>
<tr>
<td>War</td>
<td>20</td>
<td>46</td>
</tr>
</tbody>
</table>

*Four categories of unintentional injury that ranked among the top twenty causes of global morbidity and mortality in 1990 and in 2001. †Based on data from The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020. ‡Based on data from Global Burden of Disease and Risk Factors.
of deaths occur in the prehospital setting, and transport to a medical facility is often provided by relatives, police, taxi drivers, and others. A community-based strategy empowers selected individuals to work with the health system to improve the quality of care. Although the specific arrangements will differ between communities, lay people may be trained in basic first aid and the use of both private and public transport vehicles may be encouraged (with drivers trained in basic first aid) to transfer the injured to a medical facility in order to improve outcomes.

Guidelines for the development of effective prehospital trauma care systems have been published by the World Health Organization.

Deficiencies in Physical Resources and Human Resources for Health Care

A logical foundation with which to develop a hospital-based trauma care system has been developed through the Essential Trauma Care Project, a partnership between the International Association for the Surgery of Trauma and Surgical Intensive Care (IATSIC) and the Department of Injuries and Violence Prevention of the World Health Organization. This collaboration led to the publication of “Guidelines for Essential Trauma Care,” a document that provides a generic, flexible template for human resources (training and staffing) and physical resources (equipment and supplies) required to provide essential trauma care services. Eleven core services are deemed essential (“rights of the injured”). The information is most useful for health planners, including government officials, representatives from the ministry of health, and hospital administrators. These services are outlined in the estimated trauma-care resource matrix, based on four levels of health-care facility (basic [village health post], GP [a hospital staffed by a general practitioner who has surgical capability], specialty [a hospital staffed by a general surgeon with or without an orthopaedic surgeon], and tertiary [a hospital staffed by an orthopaedic surgeon]) (Table IV).

With respect to the health workforce, current estimates suggest that there is a global shortage of four million health-care workers, and this global human resource crisis is defined not only by deficiencies in the absolute number of workers but also by inadequacies in the distribution of workers both between and within countries.

Access to an orthopaedic surgeon is a luxury in most parts of the developing world. In contrast to the United States, where there are 2.6 physicians per 1000 inhabitants, the ratio in low-income countries has been reported to range from 0.02 to 0.74.

While 24% of the world’s disease burden is found in Africa, this continent has only 3% of the world’s health-care workers and only 1% of the world’s resources for health care. In contrast, while only 10% of the world’s disease burden is found in the Americas (including the United States and Canada), this region accounts for 37% of the world’s health workforce and >50% of the world’s spending on health care. In low-income countries, while the majority of disease burden is found in rural areas, most health-care workers are found in urban areas.

The migration of health-care workers both between and within (rural to urban) countries, referred to as the “brain drain,” has been an enormous problem. The reasons cited include insufficient remuneration, poor working conditions and/or inadequate resources, the political climate, discrimination, and even persecution.

More than 23,000 health-care workers migrate from Africa each year, and it is estimated that each departure costs the society approximately $184,000. In Ghana, between 1985 and 1997, 50% of each graduating class ultimately migrated to the United States or Great Britain. Individual countries have devised strategies to decrease the impact of brain drain. For example, measures to counter the exodus of 33% to 50% of the medical graduates from South Africa include increasing the time between the completion of training and formal certification, compulsory community service, and banning the recruitment of health professionals from other Organization of African Unity countries. In Thailand, graduates are required to spend three years in rural community service, and the medical curriculum was modified to increase the emphasis on training for service in rural environments. Strategies to decrease the impact of brain drain are being developed in other countries as well.

Education

While training programs in North America and Europe have evolved toward greater subspecialization, this approach is impractical for most low and middle-income countries, especially with regard to the provision of care for the majority of the population who reside in rural communities. Most injured patients worldwide have no access to an orthopaedic surgeon, and it is unlikely that this will change in the foreseeable future. As such, the majority of treatment is provided by traditional practitioners (such as bonesetters), general medical doctors, general surgeons, or other health-care workers. Many patients receive no medical care at all. Orthopaedic surgeons may have the greatest impact through the teaching and/or training of a range of health-care workers, provided that the information is appropriate to the local environment (infrastructure, resources, and educational level of caregivers).

Training programs in orthopaedic surgery should be encouraged and supported, but a global strategy to improve care for musculoskeletal injuries must focus on training other health-care professionals to provide basic orthopaedic services. The potential orthopaedic caregivers, including general surgeons, general medical doctors, nurses, and other health professionals, should be considered for such training. Cultivating a positive relationship with traditional practitioners may also help to improve the quality of
Although the rate of complications following treatment by traditional bonesetters remains unknown, catastrophic consequences, such as gangrene and Volkmann ischemic contracture, have been the focus of numerous articles. Traditional practitioners are well established in many communities throughout the world, and working with them, rather than against them, must be viewed as a “win-win” situation. Onuminya demonstrated that when traditional bonesetters attended a one-day instructional course on the treatment of fractures, there was a substantial decrease in the rate of gangrene, infection, malunion, and nonunion.

Although training in the basic sciences is appropriate in any setting, clinical training must be specific to local or regional needs and must focus on the resources available locally. The needs should ideally be documented by epidemiologic study or local audit. Surgical training programs in high-income countries are unlikely to meet the needs of students in low-income countries, especially those who will work in a rural setting. In a review from Pakistan, only 37% of the general surgical procedures performed were taught in training programs from high-income countries.

The training of orthopaedic surgeons is to be encouraged, but alternate approaches must be explored in order to deliver orthopaedic services to resource-challenged environments. One approach has been to introduce the field of “rural” surgery, which has been defined as “need-based multidisciplinary surgery under resource constraints to make surgical care affordable and accessible to the community.”

In sub-Saharan Africa, nonmedical health-care professionals (for example, assistant medical officers in Mozambique and orthopaedic clinical officers in Malawi) have been trained to treat surgical conditions. Short-term educational courses have also been used with success by the Canadian Network for International Surgery (in Ethiopia, Uganda, Mozambique, and Malawi) and by others. The IATSIC, in partnership with the Academy of Traumatology, has pioneered a National Trauma Management Course in India that has trained 4000 doctors in the last six years. In Ghana, a trauma course based on the advanced trauma life-support protocols of the American College of Surgeons has been developed with modifications to suit the needs of general practitioners in rural hospitals.

### TABLE IV The Essential Trauma Care Matrix

<table>
<thead>
<tr>
<th>Service</th>
<th>Basic</th>
<th>GP</th>
<th>Specialty</th>
<th>Tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic immobilization</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Closed reduction</td>
<td>PR</td>
<td>PR</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Skeletal traction</td>
<td>I</td>
<td>PR</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Operative wound management</td>
<td>I</td>
<td>PR</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>External fixation (or pins and plaster)</td>
<td>I</td>
<td>PR</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Internal fixation</td>
<td>I</td>
<td>I</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Fasciotomy for compartment syndrome</td>
<td>I</td>
<td>PR</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Radiography</td>
<td>D</td>
<td>D</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Image intensifier</td>
<td>I</td>
<td>I</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Hand injury: assessment and basic splinting</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Recognition of spinal cord injury</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Immobilization (cervical collar or backboard)</td>
<td>D</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Monitoring of neurologic function</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Nonsurgical management of spinal injury</td>
<td>I</td>
<td>PR</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>Surgical treatment of spinal injury</td>
<td>I</td>
<td>I</td>
<td>PR</td>
<td>E</td>
</tr>
<tr>
<td>Computerized tomography scanning</td>
<td>I</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Magnetic resonance imaging</td>
<td>I</td>
<td>I</td>
<td>D</td>
<td>D</td>
</tr>
</tbody>
</table>

*According to the Guidelines for Essential Trauma Care, the matrix outlines recommendations for physical resources at each level of health-care facility, recognizing that there is some overlap. Basic = a village health post or equivalent, GP = a hospital staffed by a general practitioner, specialty = a hospital staffed by a general surgeon with or without an orthopaedic surgeon, tertiary = a hospital with an orthopaedic surgeon. E = essential, D = desirable, PR = possibly required, and I = irrelevant.
recently launched a comprehensive training initiative in emergency and essential surgical and anesthetic services aimed at the “primary referral” level facility (a basic facility or a facility staffed by a general practitioner), under the direction of the Clinical Procedures Unit of the Department of Essential Health Technologies. The Emergency and Essential Surgical Care Project (EESC) focuses on the role of the World Health Organization in fostering collaboration among international organizations, institutions, associations, agencies, nongovernmental organizations, and individuals to “promote appropriate and sustainable standards through an integrated approach to improve the quality and safety of emergency and essential surgical care at resource limited health care facilities” (www.who.int/surgery/en/index.html). Workshops to “train the trainers” are held in collaboration with the Ministry of Health and both local and international partners. Medical and nonmedical health professionals participate, and the three to seven-day workshops are often coordinated with other local or regional training activities² eighteen. A needs assessment is performed in advance, and a follow-up assessment is performed afterward.

A standardized curriculum is provided by the Integrated Management of Essential and Emergency Surgical Care tool kit (www.who.int/surgery/publications/imeesc), and the most recent edition of “Surgical Care at the District Hospital—The WHO Manual” (www.who.int/surgery/publications/sdch_manual) serves as the teaching manual. In addition, a Global Initiative for Emergency and Essential Surgical Care was launched in December 2005 and represents the first coordinated effort to address the lack of adequate capacities for emergency and essential surgical care services at the primary referral level in low and middle-income countries.

Sharing of Information
In addition to formal training, providers need access to reliable health information to maintain and enhance their knowledge base. However, a large “information gap” exists between the high and low-income countries⁷ eighth–thirteenth. In 2002, 56% of low-income countries could not access journals, and 21% had access to an average of two journals⁷. While the Internet has created an excellent resource for the dissemination of healthcare information, barriers to effective utilization include a lack of computer equipment and the inability to access educational materials. If services are available, it may be difficult if not impossible to extract useful data from the voluminous amount of information available. A lack of infrastructure has made access a problem for many low-income countries. As of 1998, Africa had a population of 700 million people, but less than one million (80% of whom lived in South Africa) had access to the Internet⁷.

When the infrastructure is available, health professionals need a mechanism with which to access reliable information relevant to their field. In response to this need, a number of organizations have developed programs to improve electronic access to healthcare information in low and middle-income countries. The World Health Organization, in January 2002, launched the Health InterNetwork Access to Research Initiative (HINARI), providing access to Medline and full-text articles through more than 2400 journals by means of a web portal⁹,10,22. As of 2004, more than 1100 nonprofit institutions from 103 of 113 eligible countries had subscribed to the service, which is free in countries with a gross national product per capita of <$1000. The cost is US$1000 per year in countries with a per capita gross national product of $1000 to $3000⁹. The Ptolemy project involves a partnership between the University of Toronto and the Association of Surgeons of East Africa, and electronic access to the medical literature is provided for East African surgeons through the University of Toronto library⁹. Participating surgeons have found access to full-text articles from journals to be most useful, and 61% used this resource for more than one hour per week. The International Society of Orthopaedic Surgery and Traumatology (SICOT) has developed a web portal, active in eighteen countries, to facilitate the exchange of ideas and educational materials. One component of this program is a telediagnostic web site, through which consultation can be obtained.

Of the 3000 journals covered by Medline, 98% originate in developed countries⁹. The most useful information may come from local journals, which are rarely indexed in Medline or similar databases³. Page et al. performed a cross-sectional questionnaire in various countries (China, Thailand, India, Egypt, and Kenya) and found that research published in local journals had the highest likelihood of changing practice⁹. As such, orthopaedic surgeons from both high and low-income countries may potentially serve as “information brokers” to improve access to reliable information.

Overview
The global burden of injury is enormous and is expected to increase over the next few decades, and musculoskeletal injuries will continue to contribute substantially to the worldwide burden of disability. Further epidemiologic study will be required to increase our knowledge of the impact of musculoskeletal injuries. Such information will help to develop and promote preventive strategies, to inform the decision makers for resource allocation, to address issues relating to the health workforce, and to refine medical curricula. The majority of those injured worldwide have no access to an orthopaedic surgeon, and this is not likely to change in the foreseeable future, so strategies for teaching and training must educate and empower other health professionals to care for musculoskeletal injuries, where appropriate. While individuals, institutions, and societies from high-income countries may play an important role in partnering with colleagues and insti-
tutions in low and middle-income countries to develop and implement strategies to decrease the burden of injury, an exchange of information between and within providers from resource-challenged environments will also be essential. The time is ripe for the orthopaedic fraternity, as well as our colleges, academies, associations, and societies, to take the lead in this process.

References


