

## SURGERY AND REFUGEE POPULATIONS

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### ABSTRACT

Although infectious diseases, malnutrition and diarrhea account for the vast majority of deaths in many crisis situations, many individuals also suffer from traumatic injuries and other surgically treatable conditions. Understanding the determinants involved in surgical interventions is facilitated by defining baseline, emergent and chronic phases for refugees and internally displaced populations. International aid organizations often expend vast resources on surgical interventions. More detailed assessments and further study may help provide insight into optimizing the success and minimizing the cost of such interventions. This article is a review of the surgical and disaster literature and defines issues for further study.

Key words: Refugees; surgery; developing countries; medical missions; humanitarianism; tropical medicine

### INTRODUCTION

The health status of refugee and internally displaced populations varies greatly depending upon geographic location, underlying medical and nutritional status, and the events causing the initial relocation. Although infectious diseases, malnutrition, and diarrhea are the major causes of death and illness in these populations, injuries and surgically treatable conditions also significantly impact these communities (1). Many international organizations including the International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF), and the United Nations High Commissioner for Refugees (UNHCR) spend considerable resources in caring for the health of the estimated 67 million refugees and internally displaced persons worldwide (Table 1) (2). This paper will attempt to review the surgical needs of these populations and provide an assessment of areas needed for further research.

TABLE 1

*Global totals of refugees and internally displaced persons, 2007.*

IDPs: Internally Displaced Persons	Total (millions)
Category of forced displacement	
Total number of refugees	16.0
Conflict-generated IDPs	26.0
Natural disaster IDPs	25.0
Total number of IDPs	51.0
Total number of refugees and IDPs	67.0

2007 Global Trends (UNHCR) [www.unhcr.org/statistics/STATISTICS/4852366f2.pdf](http://www.unhcr.org/statistics/STATISTICS/4852366f2.pdf)

Crisis situations resulting in forced migration caused by natural disasters or conflict occur in numerous countries around the world (3). No two situations are equivalent; however, the underlying conditions are of inadequate food, shelter, and medical care and can be viewed in terms of a baseline, an emergent, and a chronic phase. These three phases each have distinctive characteristics and requirements with respect to surgical therapy. Based upon the underlying medical conditions, resources, and input from the international community and local populations, surgical therapy can be a necessity or an inefficient use of resources.

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## BASELINE PHASE

The majority of forced migratory crisis situations occur in developing countries located in tropical or subtropical climates. Poor economic conditions and minimal health care infrastructure and resources characterize these nations. Numerous studies have documented the limited surgical resources, training, and access to care of these countries as compared to Western standards (4–15). Nordberg characterized the rates of major surgical procedures in Western Kenya and found them to be at least 20 times lower, on average, than in the West (4). Blanchard et al. estimated an overall rate of surgical operations of 124 per 100,000 in Pakistan (15) compared to 8,253 per 100,000 in the United States (16). Weiser et al. described the unequal distribution of surgery performed around the world. Of an estimated 234 million operations per year, only 8.1 million (3.5%) occurred in countries with per capita health expenditures less than US\$ 100 per year (17).

Relative stability and access to some level of resources characterize the baseline phase before a crisis situation. Though these levels may be inadequate when compared to standards set in the west; mechanisms for medical and surgical care are often in place through traditional healers, local governments, or frequently missionary and non-governmental organization (NGO) hospitals. Factors such as baseline nutritional status, economic and agricultural resources, belief systems, and education are important components of the local response to crisis events. Healthier populations with better access to services can more easily withstand a crisis. However, all populations are at risk if sufficient planning and preparation for disasters is neglected (18, 19).

One important aspect of the baseline situation is gauging the local resources, including trained surgeons, operating room facilities, and rates of elective and emergent surgery. Once the baseline resources and needs of a community are understood, then proper planning can be initiated to improve facilities and training, and prepare for potential problems in the future. Unfortunately, most areas where these crises occur do not have accurate epidemiological data that can be utilized to plan for future disasters.

The work by Burkitt and others has been important in establishing the specialty of geographic medicine. Burkitt's descriptions of the medical diseases along the Nile valley are an example of informative and useful data that can be used to establish a proper baseline evaluation for a local population (20). Many of the diseases treated in tropical countries are specific to those regions and foreign physicians without proper training may be at a loss to provide adequate care (20–26). Although Canadian military surgeons working as part of the international forces in Bosnia reported on the successful treatment of hydatid disease as part of a humanitarian surgical mission (27); Fanny reported a misdiagnosis rate of 82% for cases of pyomyositis treated by volunteer physicians in a Cambodian refugee camp in Thailand (28). Through better cooperation with local health care providers and a more in depth understanding of baseline condi-

tions, medical relief efforts can use advanced planning and prepare for varying situations.

The lack of centralized information gathering is difficult for relief teams that may approach a new crisis situation. A better understanding of local resources, health care workers, hospitals, and training will facilitate care if a disaster or crisis occurs. An effort to establish trauma systems in developing countries is one way to increase disaster preparedness. Mock described trauma mortality patterns between nations of different economic levels (29). He concluded that efforts focusing on pre-hospital and emergency room care may help to decrease mortality. First aid and injury prevention skills are helpful in complex emergencies and crisis situations where resources are limited. Implementing such efforts will help to limit the impact of injuries and violence, which according to the World Health Organization, "...is fast overtaking infectious diseases as the principal cause of morbidity and premature mortality" (30).

The principles of proper airway management, adequate resuscitation, and wound management are important tenets in the care of injured trauma patients worldwide (19, 31–33). Reliance upon sound training and adherence to accepted surgical principles are a cornerstone for trauma care in developing countries (33). With proper training in these areas and advanced planning, local facilities are useful.

De Wind outlined the successful experience of a Ugandan missionary hospital in caring for war wounds with only basic facilities and sound surgical principles (34). Multiple reports from Croatia describe how civilian hospitals were transformed to care for war injured patients (35–37), and Behbehani et al. reported on the experience of a teaching hospital in Kuwait during the Gulf War (38).

Thus, the baseline phase includes key elements that can guide surgical interventions during the next two phases. Although missionary and teaching hospitals and local health centers can care for injured patients as the need arises, much of the effectiveness of these facilities depends upon the initial event and the length and severity of the emergent phase.

## EMERGENT PHASE

The emergent phase of a crisis situation begins with an initial event. Such events are either natural disasters: earthquakes, floods, or famines; or armed conflicts such as wars or terrorist attacks. Large numbers of injuries, the breakdown of communication systems and infrastructure, and the need for external assistance characterize the emergent phase. Much of the surgical literature relating to refugee care has concentrated on this time period and utilizes many of the principles developed in conflicts such as World War II, Korea, and Vietnam (32). Key elements of this phase include triage and care of acute and chronic surgical conditions.

In recent crises, a mix of civilian and military organizations has been called into action. Mehran et al. described the Canadian military's surgical experience

TABLE 2

*International Committee of the Red Cross Triage Categories. Coupland R, Parker P, Gray C. Triage of war wounded: the experience of the International Committee of the Red Cross, Injury 1992; 23: 507–510.*

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Triage categories used in ICRC hospitals

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*Category I:*

Those patients for whom urgent surgery is required and for whom there is a good chance of reasonable survival.

*Category II:*

Those patients who do not require surgery. (This includes both patients with wounds so slight that they do not need surgery and those who are severely injured and for whom reasonable survival is unlikely.)

*Category III:*

Those who require surgery but not on an urgent basis.

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in Bosnia while providing medical backup for Canadian and UN forces. A quarter of consultations were for musculoskeletal problems, half of which were due to trauma. In total they performed fifty operations in six months and only five percent were for civilians (39, 40). Nasir et al. reported the characteristics of war injuries to civilians in an extensive review, noting that no information could be found about non-war related surgical entities in refugee populations (41). Australian Defense Forces in Rwanda, enlisted to provide assistance to UN troops, reported 84.8% of the patients cared for on this mission were civilians (42). Unlike the civilian wounded, however, injured UN personnel underwent definitive treatment in Nairobi, Kenya after initial stabilization. This factor highlights one of the main differences between military war surgery and civilian conflict situations. The echelon system developed for military forces which provides for immediate first aid and rapid transport to rear areas for treatment is unavailable for most civilian war injured (43). Surgical facilities provided for military personnel along with the logistical support of wealthy Western governments are unavailable in most refugee and conflict situations, which is why local triage is so important.

The most experienced organization providing surgical care in areas of conflict is the International Committee of the Red Cross (ICRC). Since 1979 ICRC surgical missions have at times been located in Cambodia, Afghanistan, Sudan, Angola, Somalia, Ethiopia, Rwanda, Lebanon, Gaza, Iraq, and Yemen. These facilities, unlike army hospitals, are relatively small, often with two to four surgical teams functioning with basic operating equipment and limited laboratory and radiology capabilities. For the years 1985 through 1993, there were more than 115,000 patients admitted to ICRC hospitals and more than 225,000 operations performed (44).

ICRC hospitals have provided much insight into the difficulties in undertaking surgery in less than optimal conditions, even with well-trained surgical teams and adequate supplies. Unlike the reports from hospitals in Croatia converted to wartime use, ICRC hospitals are created to function efficiently under mass casualty situations with limited resources

(44–46). Specific reports from Afghanistan (47–49), Thailand (45, 50), Gaza (51), and Lebanon (52), have helped to illustrate many of the needs and conditions associated with surgery in these situations. Triage needs to be done according to the appropriateness and ability of the situation and the resources. In most situations nurses were taught how to perform debridements and first aid to improve the capacity.

ICRC experiences have provided insight into the management of war wounds involving bone (56), the technical aspect of war wound excision (57), musculoskeletal injuries, and the management of landmine injuries (58, 59). The experience of ICRC surgeons has helped to develop a method of triage for war wounded that reflects a system refined and tested in multiple locations (Table 2) (53) and differs from systems developed for the military (54). Coupland also reported a method for classifying war wounds based upon features of the wound and not the weaponry. This system facilitates wound assessment and provides for standardized data from the field (55).

Subsequently, in situations where resources are limited, Coupland proposed an epidemiological approach toward managing patients in need of surgery. He pointed out that most injuries in war remain untreated. The lack of qualified surgeons or even doctors to perform procedures is likely to do more harm than good. Early first aid and non-operative management may save more lives or at least conserve limited resources for those who would benefit the most (60).

Conflict and war are not the only events that injure large numbers of individuals. Earthquakes have been determined to be the most devastating of natural disasters (18). Armenian and Noji's study of injuries arising from the earthquake in Armenia in 1989 estimated that 130,000 people suffered injuries and 14,000 were hospitalized (61).

During a crisis situation, resources are limited and the utilization of expensive material for patients who will not survive is unwarranted and wasteful. The workload in a war time hospital to treat acute and chronic conditions is enormous. Fosse et al. reported how the use of experienced nurses for minor debridements and other non-operative procedures was able to expand the capacity of the facility during the siege of Tripoli (52). A study by Gertsch undertaken in Pakistan found that there was no correlation between operative time and patient outcome or increased postoperative workload (61). Cutting and Agha reported an operative mortality of only 3.2% in the Bourj al-Barajneh Refugee Camp in Lebanon. The camp was isolated and under siege for six months but was able to care for patients with severe and complicated wounds because of a rapid transport time, adequate amounts of blood for transfusions and reliance upon sound surgical principles (44). They also brought up the point that while military victims are young healthy males, surgical patients in refugee camps vary in age and may have underlying medical conditions and poor nutritional status. Reports from Lebanon demonstrated a trimodal distribution of war injuries in both civilian and military populations (52, 64). Deaths occurred in three peaks, within the first

hour (93.7%), 1 to 4 hours after injury (2%), or 1 to 75 days after injury (4.3%) (64).

Experience from Afghanistan has been important in understanding the complexity of treating wounds presenting long after the time of injury. This factor contributed to high pre-hospital but low in-hospital mortality (63). Coupland and Howell reported on the management of wounds greater than three days old. They highlighted the necessity of proper resuscitation and adequate debridement. Other observations included the cultural obstacle of obtaining permission for amputations and the evidence of inadequate first aid in the field. "The team saw results of suturing war wounds and field laparatomies along with catheter tubing in penetrating chest wounds, chicken skin dressings, and the parenteral administration of steroid, vitamin and antibiotic cocktails " (48). ICRC first aid courses teach only to clean and dress wounds and never to attempt primary suturing in the field.

A good example of successful use of local resources to reestablish surgical services occurred during the Kurdish refugee relief effort in Northern Iraq (65). The hospital in Zakho had been abandoned and there was no fresh water, electricity or sewage disposal. Before the medical team arrived, a temporary electrical supply, waste disposal and a water supply were established. Utilizing abandoned equipment and some additional supplies, 19 major and 15 minor procedures were undertaken during an 8-day stay by a surgical team from Edinburgh hospitals. Of these procedures, 11 major and 8 minor were for 15 children under 16 years old. A unique problem highlighted in Zakho was that due to the mobile refugee community, contrary to conventional surgical teaching, all wounds were thoroughly debrided and closed primarily. Three cases were also turned away: an 18-month-old child with a fungating retinoblastoma, a 1-year-old with a large soft tissue tumor, and a 16-year-old paraplegic boy with an infected, eroding sacral pressure sore. For these cases, the lack of specialized equipment and postoperative care was an absolute contraindication for surgical treatment; they were sent to the main referral hospital for care.

Traumatic injuries are prevalent during all phases of a refugee situation; however, mass casualty situations require more intensive planning. In a refugee camp, the director of medical care must take into account the volume of patients, the severity of illness or injury, the skills of the medical staff, the number of doctors available, and the facilities and supportive services. A triage system must be established. Resources are limited and therefore, prolonged treatments for unsalvageable patients may not be appropriate.

Refugee camps offer additional challenges during the emergent phase, because in addition to trauma, other surgical emergencies such as intussusception, obstruction from ascariasis or incarcerated hernias, appendicitis, typhoid fever perforation, and amebiasis can occur. In addition to these general surgery conditions, obstetric and gynecologic conditions are frequently encountered in these populations. Woman, vulnerable to sexual violence, may also suffer from numerous life threatening conditions, ranging from

septic abortions, extra uterine pregnancies and complicated deliveries (66, 67). All of these entities are amenable to surgical treatment, yet without the proper resources or personnel a more prudent plan may be to stabilize the patient with fluids and antibiotics and then transfer them if possible.

As the emergent phase depends upon the international community to provide supplies and resources, decisions to forgo costly surgical therapy and instead prevent infectious diseases or improve water and sanitation facilities may be more effective. The discussion on surgery during the Khmer assistance operation in 1979 and 1980 provides one viewpoint on the issue. "Surgery in refugee camps is considered to be 'heroic' and receives a great deal of attention from journalists and visitors. This can bias their view of an entire program of health-related activities. It was sometimes difficult to convince visitors of this fact and to demonstrate the importance of other less spectacular public health programs of equal or greater benefit " (45). Recent studies, however, have shown that surgical care in low income countries is more cost effective than originally believed (68, 69).

## CHRONIC PHASE

Natural disasters such as earthquakes, tsunamis and floods have a limited initial event causing a crisis. Armed conflict and natural disasters such as famines and droughts can progress over longer periods of time. As the emergent phase progresses towards the chronic or third phase, malnutrition and disease prevalence increases making a population more susceptible to illness with compromised immune systems and poorer wound healing mechanisms.

During the chronic stage of a crisis it is imperative to rebuild the community, reestablish health care resources and treat the recurring diseases. The refugees may sometimes receive adequate access to medical resources, as seen in Khao I-Dang for Cambodian refugees in Thailand (45). However, high prevalence of diseases found only in refugee conditions may abound and not be recognized by local or visiting physicians (28).

Experiences at Khao I-Dang showed that non-war-related surgery outnumbered war-related surgery almost 3 to 1. This facility was well equipped with supplies and had an adequate compliment of trained surgeons on hand to provide assistance. Subsequently, in 1989 through 1991, the hospital had 300 beds and a staff of 25 expatriate doctors and nurses and 200 locals. The ICRC provided surgical care, while MSF delivered medical therapy. Given the amount of manpower and supplies, quality medical care, and when necessary surgical intervention, could be delivered to refugee populations for the management of empyema and other conditions found in a refugee population such as appendicitis, inguinal hernia, abscesses and gynecologic/obstetric conditions (45, 50).

The long-term public health implications of surgery and the treatment of injuries have been examined (64-67) and Aboutanos and Baker proposed an

TABLE 3

*Strategies to reduce civilian war injuries. Aboutanos M, Baker S. Wartime civilian injuries: Epidemiology and intervention strategies, J Trauma 1997; 43: 719–726.*

Injury mechanism	Guideline (non-exclusive)
Glass shards	Keep glass windows open Apply adhesive tape to glass windows Remove glass windows
Shrapnel injuries	Apply sand bags to doors and windows Block open windows with furniture Apply cinderblocks or tree logs to exposed areas
Sniper/bullet injuries	Bullet proof helmets for civilians Flack jackets Sniper shields at hospital entrances, community water sources, food collection sites and other frequently targeted areas
Shelling injuries	Use bomb shelters Use the center of cement-built buildings Avoid houses/buildings with wood or clay based roofs
Chemical weapons injuries	Provide gas masks for every civilian Provide gas masks, special model for children Provide incubator for infants Provide anti-liquid burn powders



Fig. 1. Landmine victim in South Sudan.  
Photograph: Adam L. Kushner.

minimal reduction in injuries and the increase mortality (75).

Long term effects from refugee related injuries are understudied. In a study of well-being and social integration in a sample of war-wounded refugees in Sweden, the results documented injuries and medical complications representative of small-scale operations of war with poor access to early medical care. The degree of disability was not a factor for well-being and social integration after two years in Sweden, though most refugees expressed desires for repatriation (76). More detailed research is needed of these very complex and emotional issues.

Another aspect of the chronic phase and when populations are repatriated is landmine and unexploded ordinance (UXO) injuries (Fig. 1). Awareness and the need for proper first aid training, education, and research into the magnitude of the problem are essential. These weapons not only effect those injured in an explosion, but also kill livestock and add to malnutrition and infectious diseases because of blocked access to arable land, roads, and health facilities (77).

The chronic phase of any refugee situation is quite variable and this is also the phase with the least research. Studies are needed to evaluate the effectiveness and needs for surgical treatment in many of these situations.

## CONCLUSION

This review documents some of the interventions used in crisis situations and highlights the importance of teaching basic first aid, providing relief workers with accurate baseline data, and conducting relief missions with community involvement whereby skills are transfer to the community for use after a crisis has resolved. The need to prepare for possible

intervention strategy to help limit the effects of war that includes protection methods for civilians (Table 3) (71). One retrospective analysis between periods of conflict and post conflict in two ICRC hospitals treating injuries from Afghanistan showed that while the mean monthly admission rate for injuries decreased by 23% in the post-conflict period, in-hospital mortality significantly rose from 2.5% to 6.1% ( $p < .001$ ). The availability of weapons after a conflict and increasing social destabilization were thought to contribute to a

future crises must be inherent in any intervention. Of the billions of euros spent every year on humanitarian assistance, if we are to make a real difference, then efforts into understanding baseline conditions, teaching injury prevention, and providing a rational epidemiological approach to surgery for effected populations are imperative.

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