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Surgical burn care by Médecins Sans Frontières Operations Center Brussels: 2008 – 2014

Barclay Stewart, MD[1], **Miguel Trelles, MD**[2], **Lynette Dominguez, MD**[2], **Evan Wong, MD**[3,4], **Hervé Tribunal Fiozounam, MD**[2,5], **Ghulam Hiadar Hassani, CRNA**[2,6], **Clemence Akemani, CRNA**[2,7], **Aemer Naseer, MD**[2,8], **Innocent Bagura Ntawukiruwabo, CRNA**[2,9], and **Adam Kushner, MD**[4,10]

[1]University of Washington; Seattle, WA, USA

[2]Médecins sans Frontières - Operational Centre Brussels. Surgical Unit; Brussels, Belgium

[3]Centre for Global Surgery, McGill University Health Centre; Montreal, QC, Canada

[4]Surgeons Over Seas (SOS); New York, NY, USA

[5]General Referral Hospital, Médecins sans Frontières; Batangafo, Central African Republic

[6]Boost General Hospital, Médecins sans Frontières; Lashkar-Gah, Afghanistan

[7]General Referral Hospital, Médecins sans Frontières; Lubutu, Democratic Republic of the Congo

[8]District Headquarters Hospital, Médecins sans Frontières; Dargai, Pakistan

[9]General Referral Hospital, Médecins sans Frontières ; Masisi, Democratic Republic of the Congo

[10]Department of International Health, Johns Hopkins Bloomberg School of Public Health; Baltimore, MD, USA

Abstract

Objective—Humanitarian organisations care for burns during crisis and while supporting healthcare facilities in low- and middle-income countries. This study aimed to define the epidemiology of burn-related procedures to aid humanitarian response. In addition, operational data collected from humanitarian organisations are useful for describing surgical need otherwise unmet by national health systems.

Methods—Procedures performed in operating theatres run by MSF Operations Centre Brussels (MSF-OCB) from July 2008 through June 2014 were reviewed. Surgical specialist missions were excluded. Burn procedures were quantified, related to demographics and reason for humanitarian response and described.

Results—A total of 96,239 operations were performed at 27 MSF-OCB projects in 15 countries between 2008 – 2014. Of the 33,947 general surgical operations, 4,280 (11%) were for burns. This proportion steadily increased from 3% in 2008 to 24% in 2014. People receiving surgical care

Corresponding author: Barclay T Stewart, MD, MscPH, University of Washington, Department of Surgery, 1959 NE Pacific St., Suite BB-487, PO Box 356410, Seattle, WA 98195-6410, Phone: 206-543-3680.

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from conflict relief missions had nearly twice the odds of having a burn operation compared to people requiring surgery in communities affected by natural disaster (aOR 1.94, 95%CI 1.46 – 2.58). Nearly 70% of burn procedures were planned serial visits to the theatre. A diverse skill-set was required.

Conclusion—Unmet humanitarian assistance needs increased US$ 400 million dollars in 2013 in the face of an increasing number of individuals affected by crisis and a growing surgical burden. Given the high volume of burn procedures performed at MSF-OCB projects and the resource intensive nature of burn management, requisite planning and reliable funding are necessary to ensure quality for burn care in humanitarian settings.

Keywords

Burns; Humanitarian; Operational research; Developing countries; Conflict; Disasters

Introduction

Humanitarian organisations provide care to ill, injured and vulnerable populations affected by conflict, disaster and disease around the world.(1) When local health systems are disrupted by complex humanitarian emergencies, humanitarian assistance requires treatment of the resultant unmet surgical needs in addition to the injuries and burns attributable to a given crisis.(2) For more than 40 years, Médecins Sans Frontières (MSF; Doctors Without Borders) has been delivering humanitarian assistance in more than 70 countries through over 400 programs.(3) MSF is divided into five operational centres, each capable of providing surgical care One of these operational centres is based in Brusssels, Belgium (MSF-OCB).

Surgical care is vital in early response to crisis and an essential component of fragile health systems.(4) Safe and effective surgery in low- and middle-income countries (LMICs) is made possible by well-trained staff, surgeons and anaesthetistis with a diverse array of skills to meet the need of the populations they serve.(2, 5) Among necessary skills are those needed for the care of burns.

Burns are a major cause of morbidity and mortality worldwide, particularly in LMICs and during crisis.(6) Burn care presents particular challenges for humanitarian organisations given the frequent need for critical care, serial operations, long hospitalizations and rehabilitation (Table 1).(7) Moreover, burn survivors are often left with devastating physical and psychological sequelae that make reintegration to their community difficult.(8) Though the mission of MSF is to deliver quality emergency aid during acute crisis, knowledge of total burn care is important for patients' ultimate wellbeing.

With funding not increasing in proportion with the marked increase in humanitarian need, anticipating the cost of providing assistance has never been more important.(9) This study aimed to characterize the volume and types of procedures for burn care provided at MSF-OCB facilities over six years. Understanding this operative epidemiology will aid effective resource allocation and preparation of humanitarian staff likely to care for burned victims.

Methods

Data collection

All procedures performed in an operating theatre managed by MSF-OCB worldwide are recorded using a standardized Patient Surgical Record (PSR). The Record was developed by MSF for operational research needs, not clinical research. Therefore, patient-specific clinical data or burn particulars are not recorded in detail. PSR variables include: age, gender, American Society of Anesthesia physical status score, condition requiring surgery, type of procedure(s) performed, operating theatre time, perioperative death (death from induction of anesthesia to recovery room discharge) and program site. In addition, brief descriptive operative notes were occasionally written and are described where available. The Record is transcribed monthly into a database (Excel; Microsoft, Redmond, WA) and transmitted to MSF-OCB headquarters in Brussels, Belgium. At headquarters, the Surgical, Anesthesia, Gynecology and Emergency Medicine (SAGE) Unit review all data for completeness and accuracy. Discrepancies, missing data and questions are immediately corrected after reconciliation with program personnel.

Data analysis

Orthopedic, obstetric, gynecologic and sub-specialty projects (including plastic and reconstructive projects) were excluded to demonstrate the incidence of burn procedures among general surgical operations. Operations from July 2008 through June 2014 were combined and analyzed with descriptive statistics (Stata; College Station, TX). Logistic regression, adjusted for covariates age, gender and project, was performed to examine the relationship between each covariate and having undergone an operation for burn injury.

The reason for MSF-OCB assistance at each was characterized as natural disaster, hospital support or conflict. Programs not caring for those immediately injured or burned as a result of widespread conflict or natural disaster were considered to be hospital support. There is some overlap between the reasons for assistance. For instance, conflict in fragile states often lead to prolonged complex humanitarian emergencies that require hospital support despite no ongoing conflict.

Ethics

This retrospective description of de-identified, routinely collected data satisfied criteria for exemption from MSF Ethical Review Board. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board provided ethical approval for analysis of the anonymous database.

Results

A total of 96,239 operations were performed at 27 MSF-OCB sites in 16 countries between 2008 and 2014 (Table 2). Specialists in obstetrics and gynaecology, orthopaedics, urology and sub-specialties performed 62,292 operations. Of the 33,947 general surgical operations, 4,280 (11%) were for burns. The proportion of general surgical procedures to care for burns increased annually from 2008 to 2014. In 2008, burn surgeries accounted for 3% of MSF-

OCB general surgical operative volume. In 2013 the proportion was 17% and from January to June 2014 24% of general surgical operations were for burns (Figure 1).

Children requiring surgical care ages 6 months to 3 years had the greatest odds of needing a burn operation (aOR 7.82, 95%CI 4.23 – 14.51) compared to infants less than 6 months of age. Having a burn operation was less common with increasing age. Of those undergoing an operation, females were more likely to require a burn procedure than males (aOR 1.58, 95%CI 1.40 – 1.77). People receiving surgical care from missions acutely affected by conflict had nearly twice the odds of having a burn operation compared to people in communities affected by natural disaster (aOR 1.94, 95%CI 1.46 – 2.58). (Table 3)

Of the 4,280 burn procedures, 1,261 (29%) were initial operations, 3,043 (69%) were planned serial procedures and 6 (<1%) were unplanned returns to the operating theatre. Consistent with the age distribution, most burn procedures were performed on otherwise healthy patients (62%) or those with only mild systemic disease (34%). Ninety percent of burn procedures were done safely under general anesthesia without a definitive airway. The median operating theatre time was 30 minutes (IQR 10 – 210 min). There were only two perioperative deaths (0.05%) (Table 4).

There were only 1,941 burn procedures with brief operative notes (45%). Burns ranged from 1 to 95% total burn surface area. There were 1,060 skin grafting procedures (1% of general surgical operations), 22 major amputations, 16 sub-specialist reconstructive procedures and 9 escharotomies. On January 31st 2009 a fuel-tanker exploded in Nakuru, Kenya. MSF-OCB responded and cared for 89 patients. In addition to the above procedures, MSF-OCB performed 80 operations on 31 people, including 39 split-thickness skin grafts, 21 debridements, 7 escharotomies, 4 contracture releases and 3 amputations. This experience has been described.(10)

Discussion

Burns procedures are among the most common reasons for theatre usage in humanitarian settings. Given the burden of burns and frequent need for serial operations, burn injuries require significant infrastructure, human and material resources. In addition, burns demand multidisciplinary care and surgical knowledge of an array of procedures, which is challenging in austere environments.

Consistent with usual burn epidemiology in LMICs, children and women remain the groups most likely to require burn procedures in the humanitarian context.(11) Though burn procedures were more common in conflict-related missions, they are also common among MSF-OCB-supported hospitals and during natural disasters reflecting the high background incidence of burns in LMICs.(12–18) Operational decisions of national and humanitarian organisations undertaking surgical programs should consider the burden and distribution of burns within their community. This is particularly important for programs operating in conflict settings, where burn procedures account for up to a quarter of the operative volume. In addition, areas with extraordinary burn burden and frequent burn disasters, like sub-Saharan Africa and South Asia, require special attention.(10, 12, 19, 20) Given the high

incidence and prevalence of burn injury and complications in LMICs, allocating resources essential for burn care is important for effective humanitarian assistance.

In LMICs, nearly 40% of burned don't present for medical treatment.(18) Of those that seek and have access to care, a high-proportion requires surgical management.(15, 17, 18) Though the majority of LMIC hospitals have capacity to provide basic burn resuscitation, only a third of hospitals are able to provide excision and grafting and care for burn complications.(16) Given that severe injury, delayed presentation and burn sequelae are prevalent in LMICs, particularly those affected by conflict, providing humanitarian assistance to hospitals may significantly reduce burn death and disability.

Unlike other conditions that are treated by a single operation, burns often require serial procedures. In addition, even small burns across joints or on the hands, face or genitals can require specialized and resource-intensive care.(21) Therefore, humanitarian surgical programs should be prepared for the disproportionate operative volume burn injuries require. Moreover, clinicians preparing for humanitarian missions should ensure they are equipped with the basic knowledge and skills necessary for burn management. Lastly, national and humanitarian organisations expert in healthcare capacity development should have burn prevention and rehabilitation services incorporated into their surgical programs. Under-resourcing burn injury risks an unacceptably high rate of morbidity and mortality and compounds the challenges of functional recovery in LMICs.(22)

This study analysed routinely collected operational data making description of clinical specifics, burn details and outcomes not possible. However, the data are useful for those assessing surgical capacity needs in LMICs and humanitarian settings. Burn care requires a comprehensive program, ideally including prevention, critical care, rehabilitation and mental health services. This study was unable to describe MSF-OCB's other burn-related activities given the procedural data. However, multidisciplinary strategy is an integral part of programs caring for burns in any context. Although the lack of granularity and significant number of missing operative notes precluded detailed assessment of specific burn procedures, this is the largest examination of humanitarian surgical burn treatment published and contributes to the operationalization of burn care in equivalent settings.

Conclusion

Unmet humanitarian assistance needs increased US$ 400 million dollars in 2013 in the face of an increasing number of individuals affected by crisis and a growing surgical burden.(4, 9, 23) Characterizing the volume and nature of procedures performed by humanitarian programs in LMICs using operational data can estimate requirements for providing care. Given the high volume of burn procedures performed at MSF-OCB projects and the resource intensive nature of burn management, requisite planning and reliable funding are necessary to ensure quality for burn care in humanitarian settings.

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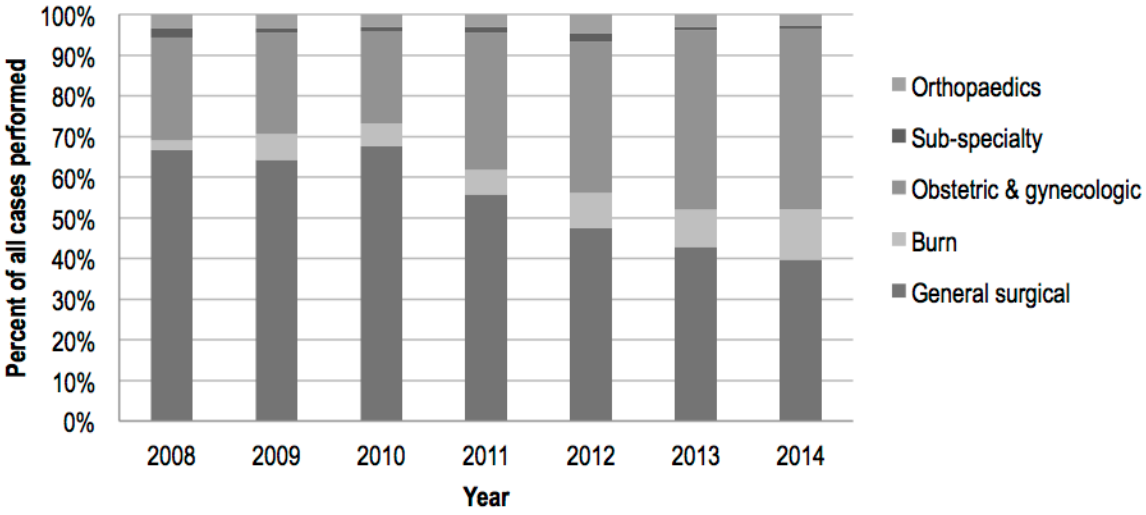

Figure 1.

Percent of total operations performed by MSF-Operations Centre Brussels from 2008 to 2014.

Table 1

Procedures and services often required for serious burn injury and challenges faced when developing humanitarian assistance programs in under-resourced settings.

Phase of Burn Care	Procedures	Services	Under-resourced settings' challenges
Resuscitation			
	Airway management Venous access Escharotomy Wound care Amputation	Clinician Nursing Nutrition Blood bank Dialysis Critical care	Prolonged pre-hospital times results in significant physiologic derangements commonly.(20) Lack of anesthetists and specialist clinicians, as well as blood banking, dialysis and critical care capacity.(16, 24–26)
Excision and grafting			
	Debridement Grafting Surgical immobilisation Tissue flap coverage	Anesthesia Surgery	Serial operations require significant theatre usage, often one theatre in district hospitals.(24) Clinician performing surgeries are often not trained in burn debridement and skin grafting or lack the necessary equipment.(16)
Rehabilitation			
	Dressing changes Splinting	Physiotherapy Occupational therapy Mental health	Specialist therapies (i.e. occupational, hand, speech/language) and mental health are largely absent.(27–29)
Reconstruction			
	Contracture release Scar revision	Plastic surgery	Specialist surgeons are few, particularly during times of humanitarian emergency.(16, 20)
Reintegration			
		Social work	Social work often absent, difficult to dedicate resources to reintegration during humanitarian crisis.

Table 2

Countries in which Médecins Sans Frontières Operations Centre Brussels provided surgical assistance from 2008 – 2014.

Country
Afghanistan
Central African Republic
Chad
Côte d'Ivoire
Democratic Rep. of the Congo
Haiti
India
Kenya
Mali
Mauritania
Pakistan
Philippines
Somalia
South Sudan
Sudan
Syria

Table 3

Characteristics of general surgical and burn operations performed by MSF-Operations Centre Brussels from 2008 to 2014.

	General operations		Burns		Adj. odds ratios	
	n	(%)	n	(%)	OR	95% CI
Age						
<6 months	367	(92)	30	(8)		Referent
6 mos – 3 yrs	1,384	(61)	876	(39)	7.82	(4.23 – 14.51)
3 – 12 yrs	5,475	(76)	1,735	(24)	3.25	(1.76 – 6.00)
13 – 18 yrs	2,761	(91)	261	(9)	1.21	(0.64 – 2.31)
18 – 50 yrs	18,433	(94)	1,252	(6)	0.70	(0.38 – 1.29)
≥50 yrs	5,514	(98)	138	(2)	0.28	(0.15 – 0.56)
Gender						
Male	22,127	(90)	2,343	(10)		Referent
Female	11,807	(86)	1,950	(14)	1.58	(1.40 – 1.77)
Mission type						
Natural disaster	2,718	(94)	168	(6)		Referent
Hospital support	18,897	(91)	1,923	(9)	1.17	(0.88 – 1.55)
Conflict	12,041	(84)	2,201	(16)	1.94	(1.46 – 2.58)
Total	33,934	(89)	4,293	(11)		

Adj – adjusted for age, gender, cause for humanitarian response and site; OR – odds ration; CI – confidence interval

Table 4

Operative details of burn operations performed by MSF-Operations Centre Brussels from 2008 to 2014.

	Burns	
	n	**(%)**
Operation		
Initial	1,261	(29)
Planned return	3,043	(71)
Unplanned return	6	(<1)
ASA class		
I	2,569	(11)
II	1,407	(13)
III	174	(8)
IV	15	(4)
V	1	(2)
Anesthetic		
GA without airway	3,893	(90)
GA with airway	134	(3)
Spinal or regional	83	(2)
Other	200	(5)
OT time; median (IQR)	30	(10 – 210)
Perioperative deaths	2	(<1)

ASA – American Society for Anesthesia; GA – general anaesthesia; OT – operating theatre; Perioperative deaths are those that occurred in the operating theatre or in the post-anaesthetic recovery area; IQR – interquartile range