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Editorial*

Surgery in low-income countries during crisis: experience at Médecins Sans Frontières facilities in 20 countries between 2008 and 2014

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The global burden of trauma and surgical conditions fall disproportionately on low- and middle-income countries (LMICs).[1, 2] Inopportunely, developing countries are least equipped to provide essential surgical care.[3] Consequently, LMICs have a significant burden of unmet surgical needs.[4] When these fragile health systems are disrupted by conflict, a natural disaster or an epidemic the volume and quality of surgical care decreases even further.[5] In response, Médecins Sans Frontières (MSF) provides surgical humanitarian assistance in countries affected by crisis through one of five operations centres; one of these is Operations Centre Brussels (OCB).

Describing the epidemiology of surgical care at MSF-OCB projects improves planning for humanitarian assistance and provides a unique opportunity to examine surgical needs that are otherwise unmet by national healthcare systems.[6] From 2008 through 2014, MSF-OCB performed 119,524 operations at 45 projects in 20 countries. The majority of operations were obstetric (range 28 – 42% of operations by year), general surgical (e.g. hernias, appendicitis; range 15 – 49%) and unintentional trauma-related (e.g. road traffic crash, burn; range 10 – 42%). Violence was also a common cause of surgical need (e.g. land mine or bomb injury, gun shot wound; range 7 – 15%) (Table 1). MSF-OCB teams provided safe anesthesia, often by task-sharing, in the face of complex care needs evidenced by low perioperative death rates (i.e. death from time of anesthesia care to discharge from the recovery ward; 0.2 – 0.3% of operations). From 2008 through

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2014 the orthopedic capacity was deliberately improved to meet the needs of conflict-related projects (Figure 1). This was done by developing fracture care guidelines for non-orthopaedists, as well as recruiting expatriate orthopaedic surgeons. More detailed operative epidemiology of these sites has been previously.[6-8]

Commitment to quality surgical care

MSF-OCB uses data from operational and clinical research at each project to identify opportunities to better care provided by both national and international staff.[9] Some examples of published quality improvement programs and lessons learned from the process are:

- Establishing minimal standards of skill and training required for humanitarian surgery necessary before field missions;[6]
- Creating management pathways for complex genital fistulas;[10]
- Strengthening local ambulance services to reduce maternal and neonatal mortality;[11]
- Monitoring post-operative surgical infection rates in austere contexts;[8]
- Providing and maintaining minimum resource inputs for humanitarian surgical activities during conflict or disaster;[12]
- Ensuring safety while relying on surgical and anesthetic task-sharing in Africa;[13]

These studies further MSF's mission to improve surgical care despite crisis and build capacity useful long after a conflict or disaster subsides.[14, 15] Lessons learned in these reports might be instructive for other humanitarian assistance programs or surgical teams operating in similar contexts.

Meeting challenges with solutions

Beyond operating in resource-poor and insecure settings, MSF-OCB faces several major challenges that have required innovative strategies to avoid compromising surgical quality. Among the greatest challenges are those stemming from human resource deficiencies. The number and scope of projects that MSF-OCB supports require many well-trained surgeons and anesthetists to function successfully. Further, providing surgical care for patients with complex pathologies in the absence of advanced resources requires a highly skilled team to achieve satisfactory outcomes. Given that these projects operate in settings without a well-trained cadre of healthcare providers, the demand-supply gap is difficult to overcome. In response, models for surgical and anesthesia task-sharing in areas well-trained personnel are not available have been developed.[13] These teams have similar perioperative death and complication rates as projects with qualified national or expatriate surgeons and anesthetists.[13] MSF associations created a shared human resource pool by keeping a register of specialized staffs 'on call' when emergently needed for new or evolving crises. The register allows quick creation of qualified and skill-complementary teams when rapid deployment of a large

number of specialized humanitarian staff is needed. Such models might be useful for other humanitarian sectors or organizations that rely on immediate availability of a highly trained staff.

In addition to a shortage of specialized staffs, many of the surgeon or anesthetist volunteers only perform one mission. Certain skills are only acquired by having previously performed in high-intensity, low-resource environments or operating with teams practiced in caring for the dramatic pathologies commonly encountered by humanitarian surgical teams.[6] Unfortunately, such skills are not usually available for serial deployments. To avoid conceding quality of care or team efficiency, MSF-OCB developed protocols for managing common conditions for which the care might be different between high-income and LMICs (e.g. tropical infections, genital fistulas, fracture care for non-orthopedic surgeons).[10, 16, 17] By doing so, staff without significant humanitarian surgical experience can immediately operate safely and effectively despite working in foreign contexts. For example, routine analysis of MSF-OCB operative logbooks identified projects where complex pathologies (e.g. complicated wounds, traumatic brain injury, major burns, traumatic or obstetric genital fistulae) were particularly common. To avert excess death and disability that would otherwise be incurred without specialized services, permanent centers were developed to provide needed expert care. For example, a high burden of obstetric and traumatic genital fistulas was found in Burundi.[10] In response, MSF-OCB developed a comprehensive fistula care center. Data from this project were used to develop protocols for complex, multi-stage fistula repairs. The center helps women cope with the trauma of living with a fistula and the psychosocial implications of returning home. These protocols standardized genital fistula care at MSF and might be useful for other teams operating in areas with a similar burden.[10]

Lessons from unanticipated natural disasters, such as the 2010 Haiti earthquake, highlighted the importance of having a quick, coordinated and robust humanitarian surgical response.[18] In efforts to improve agility during the hyperacute phase of a crisis, three escalating 'packages' of surgical care resources were developed: i) rapid intervention surgical kit - all essential resources for life and limb saving surgery designed to be functional within 3 days of the start of a crisis; ii) rapid deployable surgical unit – include inputs to perform more complex operations and can be available within 1 week; inflatable hospital – infrastructure and resources necessary for advanced surgical care and can be functional within 2 weeks. To further improve response times, the packages are stored at strategic locations around the world, preemptive import agreements with national governments and WHO have been made, potential supply chains were outlined, and a surgical mass disaster plan was established. Together, these preparations may lead to a more swift response to sudden crises and further reduce in avertable death and disability.

The way forward

Certain inputs and process improvements are considered to be particularly important for providing quality humanitarian surgical assistance, such as: i) recruiting expatriate staff with a broad skillset (e.g. general, orthopaedic and obstetric surgery) and practiced in operating with severe resource limitations; ii) developing formal training and mentoring programs with local staff to sustainably build surgical and anesthesia capacity; iii) supporting specialized activities (e.g. complex wound reconstruction, thoracic and vascular surgery, and advanced orthopaedic care); iv) creating comprehensive but user-friendly protocols that further efforts to ensure all patients receive a defined standard of care; and v) expanding routine data collection to capture data required for more better monitoring and evaluation (e.g. specific complications, in-hospital deaths) of these interventions. By doing so, MSF will continue to advance surgical care in the most challenging of circumstances, relieve a substantial proportion of the avertable disease burden that results from conflict or disaster, and facilitate lasting improvements to local healthcare systems.

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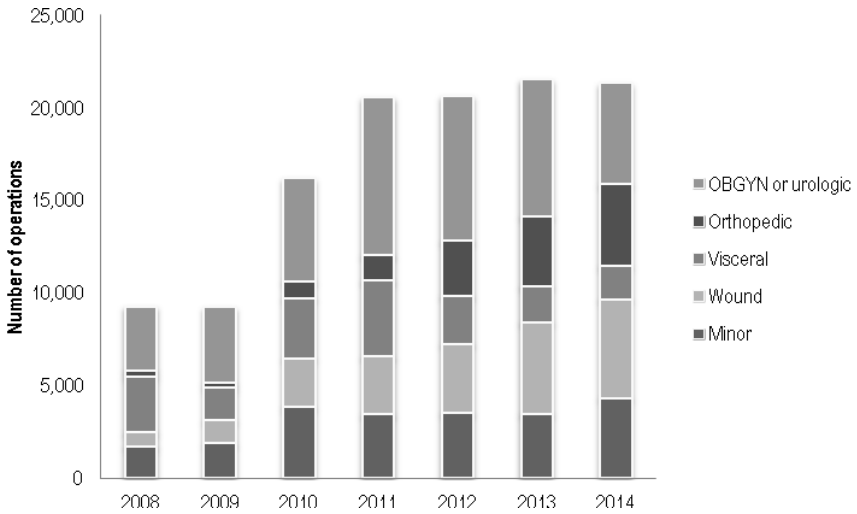
Table 1. Numbers of projects and causes of surgical procedures and anesthesias provided by Médecins Sans Frontières Operational Centre Brussels from 2008 to 2014.

	2008		**2009**		**2010**		**2011**		**2012**		**2013**		**2014**	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Number of sites														
Ongoing	7		9		10		14		11		12		10	
Opened	6		2		8		3		4		2		2	
Handed-over	5		4		1		4		6		3		4	
Brief assistance	0		3		2		3		1		3		1	
Causes of surgery														
Violence	618	(7)	940	(11)	1,904	(12)	1,954	(10)	2,211	(12)	2,465	(13)	2,648	(15)
Unintentional trauma	873	(10)	1,125	(13)	3,264	(21)	3,409	(17)	5,860	(31)	7,093	(37)	7,709	(42)
Obstetric	3,092	(34)	3,716	(42)	5,137	(33)	7,916	(40)	7,113	(37)	6,685	(34)	5,082	(28)
Other	4,498	(49)	4,498	(34)	5,239	(34)	6,365	(33)	3,968	(21)	3,145	(16)	2,796	(15)

Brief assistance refers to projects where assistance was provided for less than one year

Figure 1. Types of operations performed by Médecins Sans Frontières Operations Centre Brussels from 2008 to 2014.



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