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Mosul Trauma Response: A Case Study Quality and Effectiveness

Executive Summary - Part 2: Quality and Effectiveness



JOHNS HOPKINS

CENTER *for*
HUMANITARIAN HEALTH

Introduction

The battle of Mosul was one of the largest urban sieges since World War II. From October 2016 to July 2017, at least 30,000 Iraqi and Kurdish forces, backed by a U.S.-led international anti-Islamic State of Iraq and the Levant (ISIL) coalition, fought to retake Iraq's second-largest city, which fell to ISIL in 2014. Over nine months, more than 940,000 civilians fled.

As the battle unfolded, the need for trauma care for injured civilians became increasingly evident. In previous wars in the region, coalition military had often provided care for war-wounded civilians; indeed, many of the articles in the Geneva Conventions and Additional Protocols place responsibility for the care of war-wounded in interstate and intrastate conflicts on the warring parties themselves.^{1,2} This care largely did not happen in the battle of Mosul. The Iraqi military had few medical units with limited capacity, and U.S.-led coalition forces stated that they were in a supportive role and were unable to supply medical teams to care for civilians. International non-governmental organizations (NGOs), stung by recent attacks on health facilities and workers, initially struggled to find their footing amid the security risks and other programming; moreover, many argued that their role has not and is not to provide frontline care, which should remain the responsibility of warring factions as set out in the Geneva Conventions and Additional Protocols.

The World Health Organization (WHO), as the “*provider of last resort*” for providing health services in the cluster approach,³ stepped in to fill this void. It led and coordinated what the Humanitarian Coordinator for Iraq described as one of the “*most complex operation[s] the UN has done anywhere in the world*”⁴: a trauma pathway, modeled after military trauma systems, involving several levels of care. This included “*trauma stabilization points*” (TSPs) located ideally within 10 minutes from the frontline, and field hospitals positioned within an hour drive (the so-called “*golden hour*”). Despite requests, the UN and WHO were unable to get the Iraqi military or civilian government medical teams to respond to the need to move forward to care for wounded civilians; nor would the U.S.-led coalition forces. WHO then requested Médecins Sans Frontières (MSF) and the

International Committee of the Red Cross (ICRC) to provide these services, but they also declined. Ultimately, WHO contracted other NGOs and a private medical company to manage the TSPs and field hospitals, drawing upon its experience dispatching emergency medical teams (EMTs)⁵ in natural disasters and the Ebola response. Funding came from the U.S. Office of Foreign Disaster Assistance (OFDA), United States Agency for International Development (USAID); the European Civilian Protection and Humanitarian Aid Operations (ECHO); and the United Nations (UN) Central Emergency Response Fund.

The Mosul trauma response was novel for several reasons: It was the first time that WHO played the leading role in coordinating trauma care in conflict; the first time a civilian trauma system was attempted in such a frontline setting; and the first time the UN sent humanitarians within minutes of the frontline to deliver trauma care in close coordination with the military. Given the unprecedented nature of this response, as well as the questions it has raised about humanitarian principles and its applicability to other contexts, there is strong interest to better understand what was done, why it was done, and whether this approach represents a model that can or should be used in future conflicts.

This brief summarizes key findings from a larger report funded by a grant from OFDA/USAID to the Center for Humanitarian Health hosted at the Johns Hopkins Bloomberg School of Public Health and focuses on the quality, clinical appropriateness, and effectiveness of the response. A second executive summary focuses on the application of humanitarian principles during the response and related concerns.

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¹ ICRC. Treaties, States Parties, and Commentaries. <https://ihl-databases.icrc.org/applic/ihl/ihl.nsf/WebART/380-600006?OpenDocument>

² ICRC. Customary IHL. https://ihl-databases.icrc.org/customary-ihl/eng/docs/v2_rul_rule110

³ <https://www.humanitarianresponse.info/en/about-clusters/what-is-the-cluster-approach>

⁴ UN Briefing, July 17, 2017. <http://webtv.un.org/watch/lise-grande-unami-on-the-situation-in-iraq-press-conference-17-july-2017/5510054178001/?term>

⁵ WHO, Emergency Medical Teams. http://www.who.int/hac/techguidance/preparedness/emergency_medical_teams/en/

Key Findings

Key Finding #1: The Mosul trauma referral pathway likely helped to save approximately 1,500-1,800 lives.

- The collective action of various organizations, led by WHO, including TSP providers such as NYC Medics, Cadus and Global Response Management (GRM), as well as field hospital operators such as Samaritan's Purse (SP), Aspen Medical, MSF, and International Organization for Migration (IOM), saved significant civilian and military lives during the Battle of Mosul.
- Some actors were directly supported by WHO and its donors; others participated in the response, but did not receive direct financial support from WHO.
- Many of the lives saved were civilian; however the limited data suggest that a majority of those saved were military soldiers or combatants.

Key Finding #2: TSPs increased access to frontline care for civilians, while challenging humanitarian principles.

- By all accounts, TSPs saved lives of wounded civilians, Iraqi soldiers, and other combatants. Of the roughly 13,000 patient encounters recorded at TSPs, roughly 1,800 (14%) were critically injured, based upon extrapolations from available data.
- Close coordination with the military, though controversial, was critical for effectiveness and security of the TSPs (see *Executive Summary Part I and full report for more detail on humanitarian principles*).
- Some TSP providers reported that they were able to raise the quality of frontline care and undertook on-the-job training of Iraqi medics.
- Referrals to field hospitals appear to have been mostly timely, but other quantitative quality metrics were generally lacking to assess effectiveness.

Key Finding #3: WHO-supported field hospitals filled important gaps in trauma surgical care.

- SP and Aspen Medical's field hospitals addressed important surgical needs, performing at least 1,900 major operations through July 2017.
- Timeliness and siting of field hospitals could possibly have been improved, although such decisions are difficult in a highly kinetic war environment.

- Static field hospitals became less relevant for trauma as frontlines rapidly shifted; SP's hospital quickly became a referral hospital as the battle moved to West Mosul, as well as a site for local medical needs.
- The highly insecure environment around Mosul led some organizations to adopt very heavy security fortifications and precautions, which anecdotally may have affected patient and community access.

Key Finding #4: Post-operative and rehabilitative care warranted greater support.

- Post-operative and rehabilitative care needs were inadequately developed and supported.
- Field hospitals were instructed to discharge patients within 72 hours to ensure they had sufficient space for mass casualties, leading some patients to be discharged too early with limited to no follow-up.
- This issue was eventually recognized, and MSF, Handicap International (HI), and others provided post-operative and rehabilitative care; however, there was insufficient capacity to meet the need.
- The full extent of rehabilitative needs among war victims in the internally displaced persons camps remains unknown, although surveys from HI in some of the camps have shown large needs.

Key Finding #5: Access to obstetric care was strengthened by United Nations Population Fund (UNFPA), but other non-trauma emergency medical needs could have been better incorporated.

- UNFPA significantly enhanced obstetric care at Aspen Medical's field hospitals, providing more than 200 Cesarean sections and 500 vaginal deliveries.
- Although initial plans called for field hospitals to treat non-trauma medical emergencies (e.g. heart attacks), in practice some facilities did not initially consider this care part of their mandate and were slow to provide these services.
- Many humanitarian organizations stressed that trauma care should have been considered as part of, rather than in place of, a global package of care to meet population needs.

Key Finding #6: Patient transport and en-route care were challenging.

- WHO procured dozens of ambulances, in some cases airlifting them, although delays occurred.
- Ambulances were generally not staffed by trained medics or equipped with medications and supplies, according to interviews. In some cases, NYC Medics sent paramedics with critically injured patients.
- The lack of en-route care—a key component of military trauma systems—likely led to disruptions in the continuum of care for critically ill patients. However, data were not available to confirm this beyond our interviews.
- Opportunities for training medics and ambulance drivers in the lead-up to the Battle of Mosul would have been beneficial.

Key Finding #7: Successful coordination among local leaders, partners, and civilian and military officials occurred, but field coordination could have been better resourced.

- Local leadership (Ninewah Department of Health-DoH) played a critical leadership role in operational guidance but did not have capacity to implement.
- OCHA CivMil provided valuable tactical intelligence and coordination among trauma teams, the UN, and Iraqi and coalition forces, and the Trauma Working Group was a novel innovation that improved dialogue and coordination.
- At the field level, coordination was outsourced, under-resourced, and fell to 1-2 individuals at NYC Medics who did heroic work trying to coordinate transport from TSPs to hospitals.

Key Finding #8: Data collection was fragmented, not uniform, and of varying quality, which limits conclusions about effectiveness.

- The lack of a well-organized, consistent and comprehensive data system was a significant weakness.
- Although a standardized data template for TSPs was eventually created and used, it is unclear if data were used in real time to improve the pathway.

- Data that could have been useful to assess trauma outputs and outcomes (e.g. triage status at field hospital, peri-operative mortality) were not uniformly and reliably collected.
- Data were insufficient to make conclusions regarding quality of care at field hospitals.

Key Finding #9: Costs data were not shared, leaving questions about efficiency unanswered.

- Cost data were not provided to the study team, limiting our ability to assess efficiency of resource use; WHO cited contractual obligations as the reason they were unable to share financial data.
- The team independently obtained data indicating the cost of operating a field hospital was ~USD 1 million a month and a TSP ~USD 66,000 a month.

Key Finding #10: The level of training, experience, and education of some implementing organizations was limited.

- WHO was challenged to find organizations willing to contract with it for the trauma response. As a result, its main implementing partners had never worked in conflict settings.
- Interviews raised concerns that some volunteers did not truly understand the risks that they would be taking, nor were they sufficiently informed about international humanitarian law (IHL) and humanitarian principles.
- The hiring of a private medical company, Aspen, also concerned some humanitarians; data viewed by the team are insufficient to analyze the quality or cost-effectiveness of care by Aspen or SP.

Key Finding #11: Sustainability and capacity building may be lost without further support.

- WHO and its partners attempted to address sustainability by training Iraqi medical personnel, transitioning facilities meet post-conflict needs, and developing handover plans with the Ninewah DoH.
- Long-term sustainability remains unclear, as limited DoH staffing and financing may complicate efforts to keep facilities open, and static facilities may now be located away from population centers.

Main Recommendations

Recommendation #1: Clinical standards for civilian trauma care in conflict settings should be developed with input from trauma experts and consistently applied.

- Given that some of the participating partners reportedly did not have standard operating procedures (SOPs), efforts should be undertaken soon to develop trauma care guidelines for civilians in conflict settings based upon best available data and expert advice.
- These discussions should include professional societies, clinical experts, and international organizations with significant experience in battlefield care.
- They should also include a broader discussion about how best to adapt the benefits of trauma systems principles to the realities and constraints of humanitarian responses in war.

Recommendation #2: Non-trauma, post-operative, and rehabilitation needs should be anticipated and adequately supported.

- Planners should incorporate post-operative care and rehabilitation needs more strongly into future responses.
- Appropriate funding should be made available to organizations such as Handicap International that specialize in providing such care.
- Given that maternal and medical needs are a necessity in conflict settings, planners should incorporate emergency non-trauma care, including obstetric services, more strongly into future planning, including explicitly defining these services in provider agreements/contracts.

Recommendation #3: Transport challenges should be anticipated and addressed from the beginning.

- Planners (in concert with ICRC, the International Federation of Red Cross and Red Crescent Societies (IFRC) and NGOs) should support efforts to train ambulance personnel in basic first aid to ensure en-route care.
- Planners should undertake efforts to ensure that ambulances are appropriately stocked with essential supplies and medications.
- Stronger investments should be made in basic communications systems to ensure patients injured at the frontlines reach the intended point of care.

Recommendation #4: Resources for field coordination should be strengthened, and coordination methods that worked well should be codified and used again.

- In future responses involving multiple actors, field coordination should be better staffed and appropriately resourced (e.g. hardware, communication tools).
- The Mosul Trauma Working Group (TWG), consisting of UN, NGOs and civilian leaders, improved coordination, and should be repeated if future conflicts involve many trauma actors.
- District and local leadership should again be prioritized, and efforts should be taken to ensure the TWG as well as a Post-Operative Care Working Group coordinate closely under the aegis of the Health Cluster.
- OCHA CivMil should continue to play a central role in civilian-military coordination for the protection of humanitarians.

Recommendation #5: Data collection and reporting need to be timely, accurate, and relevant.

- Timely, accurate data are critical for tracking quality, measuring outcomes, and making real-time adjustments.
- For future responses, the humanitarian community should develop minimum data sets that are useful and clinically appropriate; indicators should be developed in consultation with trauma experts.
- If such a model is used again, planners should invest in data management systems that can track individual patients along the trauma referral pathway, and collect and organize data in real-time to improve quality and decision-making.
- All humanitarian responders delivering trauma care should agree to share anonymized data publicly to help improve future responses.
- Financial data is addressed below (rec 6).

Recommendation #6: Mechanisms for financial transparency and accountability should be developed and built into contracts.

- Legal and contractual issues should be addressed to allow for a proper financial accounting of humanitarian responses, trauma or otherwise.
- Mechanisms should be established that allow donors, WHO, implementing partners, and external organizations to study the cost and cost-effectiveness of implementing trauma care.
- Key expenditures (e.g. construction, operating costs) should be made publicly available; such requirements should be built into future contracting arrangements by donors.

Recommendation #7: Further study is needed on emerging options for trauma care delivery, such as mobile field hospitals.

- Several organizations experimented with mobile surgical units in the Battle of Mosul, with mixed success.
- Mobile units may hold advantages over fixed facilities, particularly in kinetic environments, but also have limitations in terms of capacity and security.
- Future consideration as to the feasibility, contextual appropriateness, and cost of mobile field hospitals is warranted.

Recommendation #8: Further open and informed discussions around the role of private medical companies in humanitarian settings is needed.

- Although there were various claims about the cost-effectiveness and quality of care provided by Aspen Medical, the study team was unable to substantiate them based upon that data provided.
- Additionally, discussions with participants raised concerns that private medical companies may view their contractual responsibilities in business rather than humanitarian terms, and thus may be less responsive to making appropriate real-time changes (e.g. adding non-trauma care) that require them to go beyond the stipulations of their contract.
- The private sector is often looked upon with suspicion in the humanitarian world; however, with cash-based transfers, this is changing. The development of B-Corporations,

Paul B. Spiegel MD, MPH

Professor, Johns Hopkins Bloomberg School of Public Health
Director, Johns Hopkins Center for Humanitarian Health

Kent Garber MD, MPH

Research Associate, JHSPH

Adam Kushner MD, MPH

Associate, JHSPH

Core faculty, Johns Hopkins Center for Humanitarian Health

Paul Wise MD, MPH

Richard E. Behrman Professor of Child Health and Society
Professor of Pediatrics

Senior Fellow, Freeman Spogli Institute for International Studies
Stanford University

Correspondence: Paul B. Spiegel, pbspiegel@jhu.edu

of which Aspen Medical is one, attempts to use business to address social and environmental challenges.

- In future conflicts, these organizations may play an increasingly important role, particularly if “traditional” humanitarian NGOs are overstretched, unable to respond, or choose not to respond.
- Therefore, an objective analysis of this business model, as well as the corresponding humanitarian ethos, cost effectiveness, and adaptability, needs to occur.

Recommendation #9: Pre-deployment trainings in combat medicine and humanitarian principles should be formalized.

- If TSPs are to be used again in a similar trauma pathway model, significantly more consideration needs to occur regarding the types of organizations and professionals employed, their previous experiences, and their training (both medically and in the humanitarian realm).
- Strong pre-deployment training should include components on IHL and humanitarian principles as well as appropriate medical procedures according to context.
- Such trainings can be developed by international organizations, experts, and academic institutions.
- Post-deployment psychosocial support needs to be made available.

Recommendation #10 Planners and donors should plan for and commit appropriate resources to ensuring sustainability and meeting post-conflict needs.

- Planners and donors who engage in a trauma response should recognize that many victims require prolonged therapy and assistance.
- In future responses, stronger commitments should be made to meeting these long-term obligations.
- In planning for facility handovers, partners should assess whether local capacity can support such facilities, and whether such facilities are appropriate for the population needs; if the needs are real but local capacity cannot maintain such facilities, additional capacity building and support should be strongly considered before handover occurs.

Annex 1: Methodology and Limitations

Methodology

A mixed-methods approach using qualitative semi-structured interviews and a quantitative analysis of data collected by WHO, its implementing partners, and other actors was developed. These efforts were supplemented by an extensive review of relevant meeting notes, presentations, internal reports, needs assessments, press briefings, media articles, and other relevant documents.

For the qualitative component, the team identified key actors and organizations through publicly available and privately shared documents, discussions with WHO and OFDA, and snowball sampling. From July through October 2017, the team conducted semi-structured interviews, either virtually or in person, with more than 50 individuals at the international, regional, and field levels. These included representatives from WHO, OFDA, ECHO, SP, Aspen Medical, NYC Medics, GRM, Cadus, MSF, ICRC, Handicap International, IOM, United Nations High Commissioner for Refugees (UNHCR), UNFPA, OCHA, the U.S. military, Ninewah DoH, and Emergency Hospital in Erbil. A full listing is provided in the main report. Interviews were generally conducted on the agreement that information would be attributable to the organization, but not the individual. Detailed notes were taken for all interviews and saved for reference.

In September 2017, the Hopkins team, with a researcher from Stanford University, undertook missions to Erbil and Geneva. In Iraq, team members visited field hospitals at Hammam Al-Alil (Aspen Medical) and Bartella (SP), as well as Emergency Hospital in Erbil. The team interviewed dozens of participants and stakeholders on the ground including Ninewah DoH, WHO, OFDA, ECHO, SP, Aspen Medical, NYC Medics, CADUS, MSF, ICRC, Handicap International, IOM, UNHCR, UNFPA, OCHA CivMil, the U.S. military, and Emergency Hospital. In Geneva, the team interviewed key officials from WHO, MSF, ICRC, IFRC, and IOM headquarters' offices.

For the quantitative component, data were solicited from WHO and implementing partners, including information on patient demographics, injury severity or acuity, treatment, and outcomes, e.g. mortality and complications. Data on fixed and operational costs, as well as donor support, were also requested.

Limitations

As with all studies, particularly in conflict settings, there were several limitations.

This review was retrospective. At the time of the mission, the Battle of Mosul had ended, and facilities were transitioning to meet post-conflict health needs. As a result, the team was not able to observe the trauma response itself. Efforts were made to interview as many participants as possible, but some viewpoints may be under-represented. Recall bias is always an important issue in such retrospective methods.

Second, this review did not include perspectives of those who received care. Interviews with Iraqi civilian beneficiaries would have added a meaningful perspective, but were not undertaken. Future studies should consider interviewing civilian trauma victims to better characterize their experiences and identify areas for improvement.

Third, there were significant data limitations. Several interviewees raised concerns about data quality and reliability, particularly regarding overcounting of repeat visits as different patient visits. There was no data or only partial data for some relevant indicators. The referral pathway did not have the capacity to track patients through different levels of care, limiting conclusions about effectiveness and impact. Furthermore, although WHO shared substantial data with the team, the Hopkins team was not given full access to all data.

Annex 2: Summary of Key Data

Table 1: TSP Data, Nov 2016-Jul 2017†

Variable	Number or %
Total Patient Encounters	12,910
Sex	
<i>Male</i>	81%
<i>Female</i>	19%
Age	
<18	17% ^{††}
>18	83% ^{††}
Status	
<i>Civilian</i>	40% *
<i>Military</i>	60% *
Injury Location	
<i>Head</i>	14%
<i>Torso</i>	19%
<i>Extremity</i>	53%
<i>Multiple</i>	15%
Triage Status /Severity	
<i>Green</i>	57%
<i>Yellow</i>	27%
<i>Red</i>	14%
<i>Black</i>	2%

Table 2: Hospital-Level Data, Oct 2016-Jul 2017†

Variable	Number or %
Total Patient Encounters	19,784
<i>Inpatient</i>	41%
<i>Outpatient</i>	59%
Sex	
<i>Male</i>	45%
<i>Female</i>	55%
Age	
<15	32%
>15	68%
Status	
<i>Civilian</i>	73%
<i>Military</i>	27%
Injury Site	
<i>Head</i>	12%
<i>Torso</i>	13%
<i>Extremity</i>	32%
<i>Multiple Sites</i>	24%
<i>Minor</i>	17%
<i>Burns</i>	2%
Triage Status/Severity	
<i>Green</i>	NR
<i>Yellow</i>	NR
<i>Red</i>	NR
<i>Black</i>	NR

Source: WHO, *NYC Medics interview.††West Mosul only. Please see full report for more details. WHO data were either shared with the authors as raw data files or obtained from infographics or situation reports. NR: Not reported.

†Note that “patient encounters” does not mean unique patients, or, at the field hospital level, trauma casualties. Given data reporting challenges, percentages may refer to a subset of data, facilities, and/or specific time periods for which the relevant information was available. Hospital-level data generally reflect findings from participating field hospitals and referral hospitals in Erbil or elsewhere. These data are meant to provide an impression of patient demographics but, given the variable data sources and incomplete reporting, may not be truly or fully representative of activities or patient characteristics associated with the trauma pathway response.