

Emergency Trauma Response to the Gaza Mass Demonstrations **2018–2019**

“A One-Year Review of Trauma Data and the Humanitarian Consequences”





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Glossary of abbreviations

AAH – Al Ahli Arab Hospital
ACS – Assalama Charitable Society
DWWT – Doctors Worldwide-Turkey
EGH – European Gaza Hospital
EMT – Emergency medical team
EMT-CC – Emergency medical teams-coordination cell
ENT – Ear, nose and throat
GBV – Gender-based violence
GCMHP – Gaza Community Mental Health Programme
GSW – Gunshot wound
HCEP – Hayat Center for Emergency Preparedness
HCH – Hayfa Charity Hospital
HeRAMS – Health Resources Availability Mapping System
HI – Humanity & Inclusion
ICRC – International Committee of the Red Cross
IRP – Islamic Relief Palestine
MAP-UK – Medical Aid for Palestinians-UK
MDM-F – Médecins du Monde-France
MDM-S – Medicos del Mundo-Spain
MHPSS – Mental Health & Psychosocial Support
MoH – Ministry of Health
MMS – Military Medical Services
MSF – Médecins Sans Frontières
NCCR – National Center for Community Rehabilitation
NGO – Nongovernmental organization
OCHA – United Nations Office for the Coordination of Humanitarian Affairs
oPt – occupied Palestinian territory
PAT – Patient Allocation Tool
PCRF – Palestinian Children’s Relief Fund
PHC – Primary health care
PHR-I – Physicians for Human Rights-Israel
PMRS – Palestinian Medical Relief Society
PRCS – Palestinian Red Crescent Society
QRCS – Qatar Red Crescent Society
TSP – Trauma stabilization point
UHWC – Union of Health Workers Committee
UNFPA – United Nations Population Fund
UNICEF – United Nations International Children’s Emergency Fund
UNRWA – United Nations Relief and Works Agency for Palestine Refugees
WHO – World Health Organization

Key definitions list

The definitions listed below apply only to the context of this report.

Ambulance trauma stabilization point (TSP) bypass rate

The number (expressed as a percentage) that results from the calculation of the total number of patients transported by ambulance directly from the point of injury to the hospitals without stopping at a TSP over the total number of patients that were transported from the field to the hospitals by ambulance.

Canister projectiles

These projectiles are also called gas grenades and are used at longer ranges. They are analogous to rifle grenades, providing increased accuracy and range over hand-thrown gas grenades. Serious injuries and even death can result from a canister projectile impact.

Case fatality ratio

The proportion of death within a designated population of cases.

Casualty

Refers both to someone who was killed and to someone who was injured and survived.

Debridement

Surgical removal of nonviable or infected tissues.

Disability

An umbrella term for impairments, activity limitations and participation restrictions denoting the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors).

Emergency medical teams (EMTs)

According to the WHO EMT initiative, EMTs are groups of health professionals (doctors, nurses, paramedics, etc.) that provide direct clinical care to patients affected by an emergency or disaster. They can be national or international and governmental or nongovernmental organizations (NGOs). They can include civilian or military personnel. An EMT does not need to be verified by WHO to be considered an EMT.

Environmental factors

Refers to the physical, social and attitudinal environment in which people live and conduct their lives, for example products and technology; the natural environment; support and relationships; attitudes; and services, systems and policies.

Explosives

Any conventional explosive, including grenades, mortars, rocket-propelled grenades, bombs, missiles and shells.

Firearm

A weapon small enough to be carried, such as a rifle or pistol, from which a projectile can be discharged by an explosion caused by igniting gunpowder.

Gunshot injuries or gunshot wounds (GSWs)

In the context of this report, these terms relate to injuries sustained as a result of metal projectiles (bullets) fired by firearms. They exclude injuries that result from “rubber bullets”.

Health Cluster

The Health Cluster ensures that international responses to humanitarian emergencies are predictable and accountable and have transparent leadership by making clearer the division of labour between organizations, as well as their roles and responsibilities in different areas. It aims to make the international humanitarian community better organized and more accountable and professional, so that it can be a better partner for affected people, host governments, local authorities, local civil society and resourcing partners. The Health Cluster lead agency is WHO.

Health system

A health system consists of all the organizations, institutions, resources and people whose primary purpose is to improve health. The key components of a well-functioning health system include leadership and governance, service delivery, human resources, essential medical products and technologies, health information systems and health financing.

High-energy gunshot wounds

In the context of this report, these wounds are caused by metal projectiles (bullets) fired from military rifles, where the kinetic energy is above 1000 Joules. They present a high risk of infection secondary to a wide zone of injury and devitalized tissue caused by the cavitation effect.

Personal factors

Factors that relate to the individual, for example age, gender, social status and life experiences.

Preparedness

Pre-disaster activities, including an overall strategy, policies, and institutional and management structures, that are geared to helping at-risk communities safeguard their lives and assets by being alert to hazards and taking appropriate action in the face of an imminent threat or the actual onset of a disaster.

Prevention

Outright avoidance of the negative effects related to the hazard.

Rehabilitation

A set of measures that assists individuals who experience or are likely to experience disability in order to achieve and maintain optimal functioning in interaction with their environment.

Rehabilitation services

A subset of health services, including measures that relate to prevention of loss of function, slowing the rate of loss of function, improving or restoring function, compensating for lost function and maintaining current function.

Resilience

The ability of a system, community or society exposed to a hazard to resist, absorb, accommodate to, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Risk mitigation

Includes all actions to reduce the severity, probability of occurrence, or exposure to a given hazard and therefore lessen its impact.

“Rubber bullets” or impact rounds

Rubber, rubber-coated or plastic-coated projectiles that can be fired from standard firearms or dedicated riot guns. They are intended to be a nonlethal alternative to metal projectiles. Rubber projectiles have largely been replaced by other materials, but for the purpose of this publication, they are aggregated under the same definition. These “kinetic impact munitions” or impact rounds, are meant to cause pain but not serious injury. They are expected to produce contusions, abrasions and haematomas. However, they may cause bone fractures, injuries to internal organs or death.

Vulnerability

Vulnerability is the result of a number of factors that increase the chances of a community to be unable to cope with an emergency. Not all sections of a community are vulnerable to hazards, but most are vulnerable to some degree. Vulnerability consists of two aspects: susceptibility and resilience. Susceptibility concerns the factors of a community that allow a hazard to cause an emergency, for example living in an earthquake-prone area or the level of development of the community.

WHO Emergency Medical Teams (EMT) Initiative

The WHO Emergency Medical Teams (EMT) Initiative assists organizations and member states to build capacity and strengthen health systems by coordinating the deployment of quality assured medical teams in emergencies.

Zero stock

Defined as less than a 1-month supply.

Contributors

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We would like also to highlight the essential roles of the local health providers, in particular the Ministry of Health and the Palestinian Red Crescent Society.



Preface

Gaza's health system is chronically deteriorating and more than a decade of blockade has led to a serious deterioration of the social determinants of health. Water from the aquifer is basically unfit for human consumption, sewage flows largely untreated into the Mediterranean and the economy is stifled, with unemployment rates way over 50%. Of the 1.4 million Palestinians in need of humanitarian interventions in 2019, 1.2 million live in the Gaza Strip.

In this overall context, the "Great March of Return" protests at the barrier to Israel have evolved since March 2018, triggering yet another massive strain for health services in Gaza. More than 28 000 people have been injured, some 60% of them requiring hospital treatment, and over 6800 trauma patients have had gunshot injuries.

While this would overwhelm even well-prepared emergency services in the best-equipped health systems everywhere, it is an almost insurmountable challenge for Gaza's hospitals. Persistent shortages of essential medications and medical supplies are jeopardizing the functionality of critical services, as are the prolonged electricity cuts and the struggle for sufficient fuel supply for emergency generators to ensure life-saving services during the daily blackouts.



Photo credit to WHO

While more humanitarian aid is urgently needed for a predictable health response to meet the immediate life- and limb-saving needs, more sustainable solutions and development perspectives are required to build the capacity of the health system in Gaza to address the critical service gaps that have persisted for years.

All this would be feasible; it requires political commitment and good will from all sides. The right to health – as promoted by the World Health Organization (WHO) – is a basic and universal human right. The people in Gaza, and especially the most vulnerable who require life-saving medical care, should no longer be deprived of it.

Dr Gerald Rockenschaub, Head of WHO Office for West Bank and Gaza

Executive summary

From 30 March 2018 onwards, the Gaza mass demonstrations took place across the perimeter fence with Israel to demand an end to the 12-year blockade and the right to return for Palestinians – they continued to take place in 2019. During the same period, there were a series of outbreak of hostilities between Israel and Gaza.

From 30 March 2018 to 30 March 2019, 28 014 Palestinians were injured as a result of clashes with Israeli security forces and 277 were killed, including 52 children. The World Health Organization's analysis of the trauma caseload reveals that of the total 28 014 casualties, 92% were male (25 720), 8% were female (2294) and 22% were children under the age of 18 (6151). The majority of the injured were between 18 and 39 years old, 19 682 (70%). Although any health system in the world would be overwhelmed if it had to manage a high influx of trauma casualties every week; the most pressing concern was the staggering number of gunshot wounds.

From the total 28 014 injured, there were a total of 6872 gunshot wounds, accounting for 25% of the total casualty caseload and over 40% of the caseload managed by hospitals. 210 people died as a result of gunshot wounds, making it the highest cause of death amongst the casualties; the anatomical distribution of gunshot wounds reveals that the majority of fatalities were caused by gunshots to the chest (38.6%) and head and neck (37.1%). The remaining 50 recorded deaths were caused by explosion injuries (18.8%) and 6 were caused by gas canister projectiles (2.3%).

A breakdown of the 6872 gunshot wounds, reveals that 78.9% were to the lower limbs (5420), 8% to the upper limbs (549) and 4.2% to the abdomen and pelvis (286). The number and proportion of GSWs to the limbs in this cohort (86.9%) is extremely high.

From those who survived these high-energy gunshots, many still face excessive damage to the bone, irreversible damage to neurovascular structures and extensive soft tissue damage. Managing these injuries requires high resources from the health system. WHO calculates that the damage caused by high-energy gunshot wounds has resulted in some 1209 to 1746 patients who will need some form of specialized tertiary treatment with a wide range of multidisciplinary services; this cohort accounts for up to 30% of the total gunshot wounds to the limbs. Without this treatment being made available in Gaza, the number of amputations may drastically increase in 2019. Such a response requires active engagement and resources from the humanitarian and development global community.

The urgency to invest in services that can prevent amputations and restore lives must not be underestimated. From 30 March 2018 to 30 March 2019, 172 people became permanently disabled as a result of their injuries, of which over 20% are children (36). The biggest cause of permanent disability is amputation, with 121 amputations. Amputation is not only emotionally devastating for the victims but also for the family and care givers. It affects every element of life, including home and work. Finally, coming to terms with the psychological impact of an amputation is as important as coping with the physical changes.

Meanwhile, the continuous load of trauma casualties requires an ongoing response led by the Palestinian Ministry of Health (MoH), supported by the Health Cluster. Localised and innovative solutions, such as the Trauma Stabilisation Points led by the Ministry of Health and Palestinian Red Crescent Society have proven to save lives and also removed a burden of 41% of the trauma caseload from the already overwhelmed hospitals. Over 75 international emergency medical teams from various partners were deployed, contributing to the emergency response working side-by-side with local health professional. Overall, it is estimated that between 435 and 1227 lives were saved by the established trauma referral pathway; and the number is growing as the demonstrations continue.

The Gaza trauma response demonstrates that a collective response, with adapted and localised solutions can provide many people with timely, life-saving care. A good example is the field adaptation of the WHO Trauma Care Checklist¹. Lessons learnt from the Gaza trauma response can be applied to the Eastern Mediterranean Region, which continues to suffer from the highest number of conflict-related emergencies globally - of the 133.4 million people requiring humanitarian assistance globally, 76.6 million (57%) are in the region and 80% of the need is driven by conflict.

“

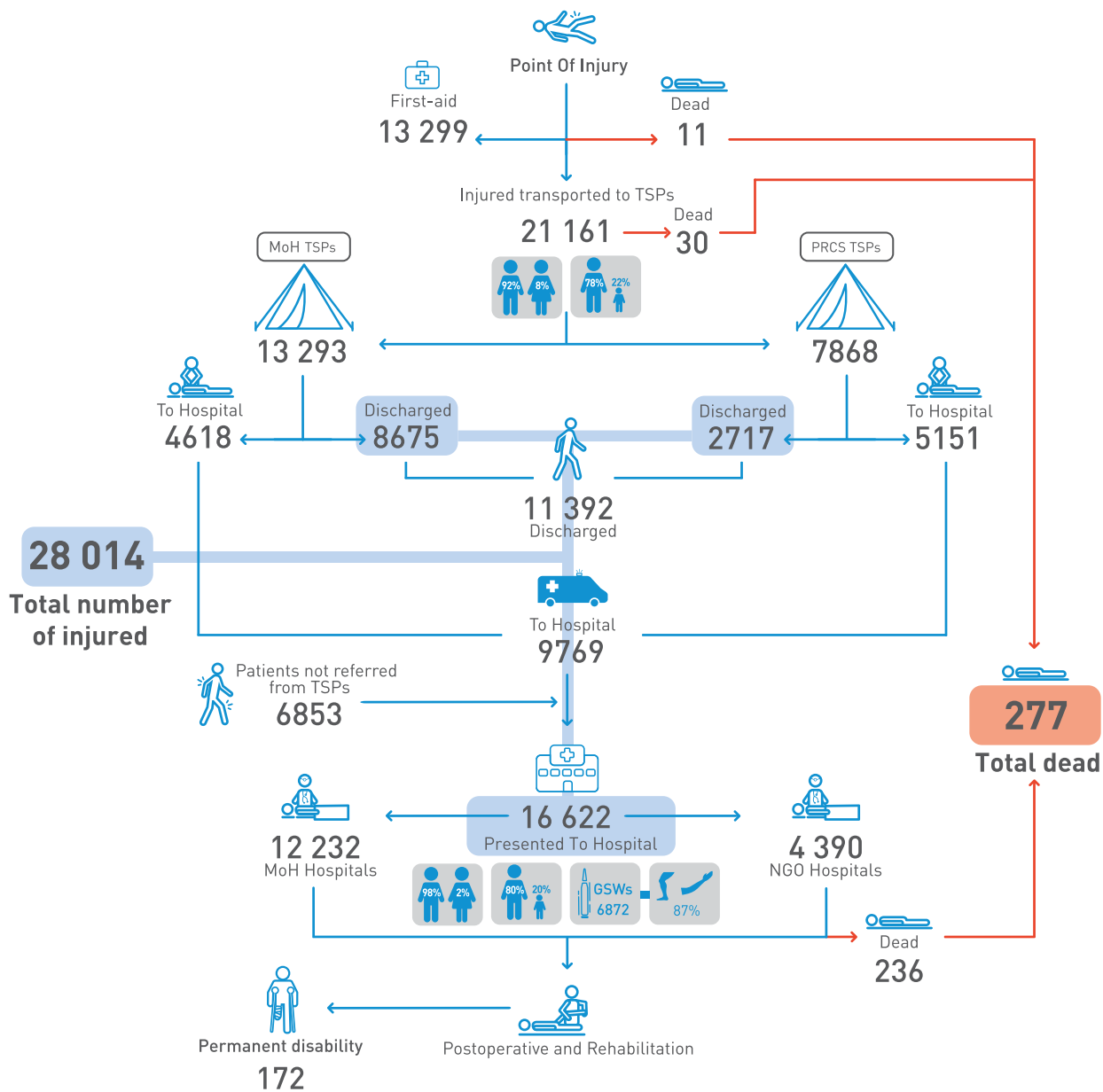
"My future is so blurry now. I am not sure if I can go back to school and graduate. I am not sure how I can go back to school. Life was already hard enough when I had two legs. I can't imagine it now without them. I still want to go to university and study media, so I can document the tragedies and the suffering of people in Gaza",

Abdallah, injured person

”

1- The WHO trauma care checklist. Geneva: World Health Organization; 2016
(<https://www.who.int/emergencycare/publications/trauma-care-checklist.pdf>, accessed 15 April 2019).

Infographic summary²



100 508 postoperative dressing changes
 75 068 physiotherapy sessions
 12 501 occupational therapy sessions
 8 701 assistive devices distributed



1 757 patients were screened for reconstructive surgery
 493 early reconstructive surgeries
 376 late reconstructive surgeries

13 Million USD

6M USD of drugs
 2.7 M USD of medical equipment
 3.3 M USD of medical consumables
 Over 859 000 USD of laboratory reagents



11 712 psychological first aid (PFA) consultations
 14 131 mental health support sessions
 798 group therapy sessions
 21 160 psychosocial support sessions

2- The number of people that reportedly received first-aid at the point of injury, was collected from different partners. These 13 229 people are not included in the total number of injured as no individual identification or demographic data was provided.

Introduction

In Gaza, with a population of just under 2 million – half of whom are children – and one of the highest population densities in the world, conflict-related trauma is a major burden of disease³. In 2018 and 2019, the world witnessed mass demonstrations by Palestinians along the perimeter fence with Israel as part of the Great March of Return. Since the mass demonstrations began, from 30 March 2018 to 30 March 2019, the heightened conflict resulted in a cumulative total of 277 people killed and 28 014 injured as a result of clashes with Israeli security forces⁴.

The impact of trauma is not only a burden on the health sector, and affects not only the victim, but also the family and surrounding community. Trauma is a burden on the larger society and takes an economic toll. In fact, the economic burden of injury is high, in terms of both direct medical costs and indirect costs of premature death and disability. This burden is magnified when those who are injured cannot return to work or when a family member must care for the injured person. Within a place like Gaza, where unemployment reached 54% in the first quarter of 2018, poverty has soared to 53% and food security to 68%, the burden of trauma cannot be overstated.

Within this context, the specific goals of this publication are first, to conduct an analysis of 1 year of conflict-related trauma in Gaza; second, to highlight the role of the Health Cluster partners, including the World Health Organization (WHO) as the cluster lead agency, in supporting the local health system; and third, to document success stories, challenges and lessons learnt.

At the heart of this document is the principle that investment in and strengthening of national and local systems and structures, when properly coordinated and supported by international partners, can provide effective and sustainable trauma care that saves lives in the immediate phase and beyond.



Scope of publication

This document represents the collaborative efforts of more than 20 national and international organizations currently responding to the ongoing emergency in Gaza, particularly focusing on the response to the Great March of Return and its impact on the health system. It covers the period from 30 March 2018 to 30 March 2019.

The target audience for this publication includes health workers, MoH officials, organizations involved in the delivery of emergency care including NGOs, policy-makers, academics, the media and members of the public. The publication is intended for anyone who wishes to advocate for sustainable improvements in trauma care, particularly in emergency and conflict settings.

3- http://www.pcbs.gov.ps/Portals/_Rainbow/Documents/%2097-2017%20المدافعات%20الجزيري%20الانجليزي.html

4- OCHA, 2018. Humanitarian Needs Overview 2019. Available at: <https://www.ochaopt.org/content/humanitarian-needs-overview-2019> (accessed 01.03.19)



Methodology

This document focuses primarily on activities related to the trauma response from Health Cluster partners since 30 March 2018 and WHO as the cluster lead agency. It also includes, where possible, the activities and numbers from Médecins Sans Frontières (MSF). In addition, although the International Committee of the Red Cross (ICRC) provides routine information about their activities to the Health Cluster, further detailed information for this publication was not made available.

A mixed-methods approach was used by collecting data from primary sources, including hospital patient records and prehospital patient records, and conducting a retrospective descriptive analysis. The inclusion criteria for this publication were all patients presenting to the trauma stabilization points (TSPs) and all trauma patients presented to the emergency departments as a result of conflict-related trauma.

In parallel, in-depth focus group discussions among key health service providers and observational efforts were conducted by the WHO Trauma and Emergency Care team at the various health facilities, with support from Ministry of Health (MoH), through the Palestinian Health Information Centre. These efforts were complemented with an extensive survey sent to all Health Cluster partners and observers in order to capture information on treatments provided, financial contribution towards medical resources and capacity-building activities.

Finally, selected success stories were also collected to illustrate the efforts of the various Health Cluster partners in response to the trauma crisis. The selected cases are meant to be representative, but not all-encompassing, and some have been left out because of space limitations.



Limitations

There were three key limitations to the scope of the publication. First, the lack of access granted to prehospital care services due to security concerns meant that WHO's observational analysis was limited to hospital and rehabilitation levels. All efforts were made to overcome this restriction, and one visit was granted towards the end of 2018, but with limited time and with access to only one of the 10 key prehospital facilities.

Second, WHO did not directly include the perspective of those who received care. Interviews with patients would have added a deeper and more meaningful understanding of the quality of response, but this was not possible with the limited resources. In addition, patient-reported outcome measures were not collected. However, stories provided by partners have adequately involved the perspective of the patient.

Finally, there were limitations related to the quality of patient data collection across the different levels of care. This was particularly the case at the secondary level of care in the emergency departments, surgical departments and intensive care units. Some relevant data were collected thanks to the transparency and openness from the MoH and the nongovernmental organization (NGO) hospitals, but key information such as time-bound trauma indicators and clinical indicators were lacking. This made it challenging to track the quality of services given to individual patients.

Applicability

Trauma is an important component of emergency care and humanitarian assistance. The World Bank Disease Control Priorities project estimates that more than half the deaths and around 40% of the total burden of disease in low- and middle-income countries result from conditions that could be treated with prehospital and emergency care⁵.

The Gaza trauma response clearly indicates that investment and support in building the national trauma and emergency structures by deploying medical, logistical and human resources enhances the quality of care. Furthermore, preparing the health response services before a mass casualty event by organizing and dispatching health services and by coordinating follow-up after the event is essential. The immediate effects of the limited postoperative and rehabilitation referral system represented one powerful example of this, in that many patients ended up getting the same services from different providers, which could eventually jeopardize patients' health and exhaust the already limited health resources.

Many of the illustrated problems, solutions, tools and lessons learnt during the Gaza trauma response can be adapted and applied to countries that are experiencing conflict and civil unrest in the region. See Fig.1.



Fig. 1. Countries directly affected by conflict and civil unrest in the Eastern Mediterranean Region.

⁵ -Thind A, Hsia R, Mabweijano J, Romero Hicks E, Zakariah A, Mock CN. Prehospital and emergency care. In: Disease control priorities (third edition): Volume 1, Essential surgery, edited by Debas HT, Donkor P, Gawande A, Jamison DT, Kruk M, and Mock CN. Washington, DC: World Bank; 2015.

Gaza 2018-2019: Understanding the Humanitarian Context



An epidemic of trauma

On 30 March 2018 in the Gaza Strip, hundreds of Palestinians gathered in five main locations across Gaza's five governorates along the perimeter fence with Israel to demonstrate, demanding the lift of the blockade imposed on Gaza and the return of Palestinian refugees as part of the Great March of Return. The protests were largely non-violent, although there were instances of tire burning, throwing of stones and Molotov cocktails at Israeli security forces, as well as use of kites with incendiary devices over the border fence.

The series of protests originally took place every Friday and were expected to continue until the 70th anniversary of Nakba Day, or the day of mourning for Palestinians, on 15 May 2018. However, the intensity of the situation escalated on 14 May and 60 people were killed, including eight children, and a further 2768 injured. Since then, the mass demonstrations have continued, and in August 2018, following clashes between fishermen and the Israeli navy enforcing the blockade, weekly protests began to be held at an additional site at Zikim beach. During the same period, there were a series of outbreak hostilities between Gaza and Israel.

The role of the Humanitarian Coordinator

The proactive and timely leadership from the Humanitarian Coordinator, Mr Jamie McGoldrick, was critical in mobilizing support. An appeal was launched to support the surge of needs caused by the Gaza mass demonstrations. Diplomatic and donor briefings were routinely held, with an opportunity for WHO as the cluster lead agency to present the needs alongside routine visits to Gaza, including meeting with the health coordinators of the TSPs and other health care staff.

In addition, the release of Country-Based Pooled Funds, managed by OCHA under the leadership of the Humanitarian Coordinator, was critical in supporting the humanitarian efforts in a flexible and timely manner, often providing a lifeline of resources, particularly for national NGOs, to respond and provide life-saving care.





Photo credit to WHO

Coordination of the trauma response: The Health Cluster approach

What is the trauma referral pathway?

Within the first 4 weeks of the mass demonstrations, and in order to lead an effective response to the growing number of casualties, the Health Cluster formally established a Trauma Working Group, co-chaired by the MoH. Through the Trauma Working Group, key emergency partners were actively engaged in developing a strategic response for the incident. WHO, as the technical health organization and cluster lead, worked with the partners to recognize the importance of the trauma care pathway, from the point of injury to front-line emergency care, adequate transportation of casualties, injury management at secondary and tertiary hospitals, and postoperative and multidisciplinary rehabilitative care such as physiotherapy, mental health and psychosocial support. The different levels of care have varied temporality: rapid and short for prehospital care, long and slow for post-hospital care. These principles were agreed on and a rapid assessment was conducted to identify the weak links in the chain of care. Fig. 2 illustrates the trauma referral pathway.

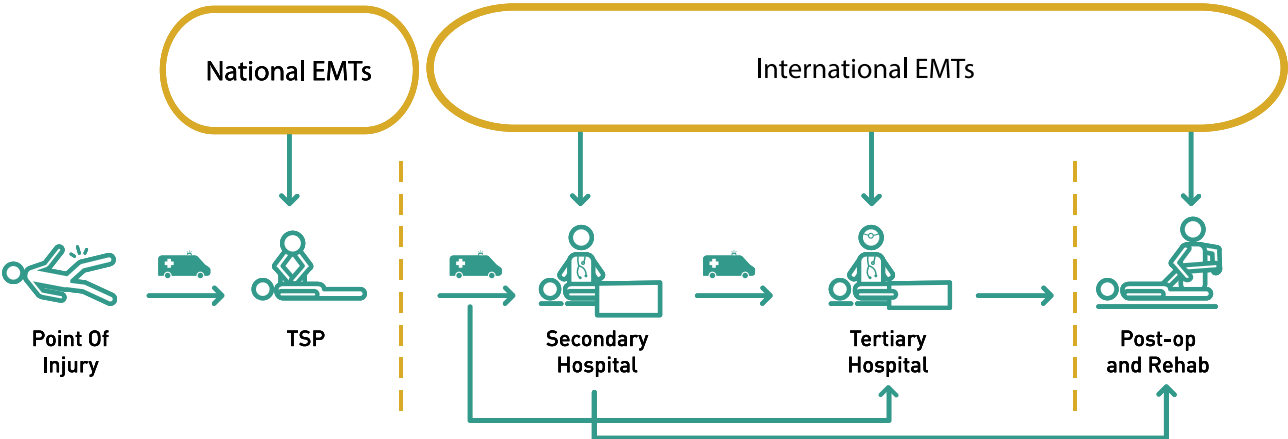


Fig. 2. Gaza trauma pathway

The trauma referral pathway has three levels of care: prehospital, hospital, and postoperative and rehabilitative care.

Prehospital care in Gaza encompasses the first responder, who is often a layperson at the community level and often trained in basic first-aid techniques; the TSPs for the initial triage, life-saving procedures and stabilization; and then, if necessary, transportation to a hospital in an ambulance. **The second level of care**, at the district level hospital, encompasses the emergency departments and the initial acute trauma surgery. Within secondary care, there are also referral hospitals that manage the cases that need further follow-up surgery, such as limb reconstruction orthoplastic surgery; this is often referred to as **tertiary care**. Finally, **the post-hospital and rehabilitation phase encompasses** all care received after hospital care. For more severe cases that require surgical procedures, the rehabilitation phase should be multidisciplinary and effectively include mental health and psychosocial support services, as well as physiotherapy, occupational therapy and social care. Fig. 3. presents a summary of the different levels of trauma care.

All three elements of health care need to be available for the trauma pathway to be effective. It is crucial to understand that trauma care is necessary not only to reduce mortality, but also to lessen the overall burden of injury by reducing long-term disability and restoring lives.

To streamline this approach in the Health Cluster response, WHO as lead agency established technical prehospital, hospital and post-hospital task groups. These proved to be essential tools in the overall coordination mechanism. The regular group meetings provided a forum for partners to share their needs, achievements and plans.

Levels of Care



Prehospital Health Care

First aid, triage, life-saving procedures and stabilization. Provided by:

- First-aid responders
- Ambulance services
- Trauma stabilization points (TSPs)



Hospital Health Care

Includes secondary and tertiary health-care services. Provided by:

- Public and NGO hospitals



Postoperative and Rehabilitative Health Care

Includes care received after surgical procedures, e.g. mental health and psychosocial support, physiotherapy, occupational therapy, wound management, provision of assistive devices, etc. Provided by:

- Public and NGO hospitals
- Postoperative clinics
- Community outreach teams

Fig. 3. Levels of care in the trauma referral pathway



The collective goal

The **overall goal was to reduce preventable death and disability**. This was achieved by upscaling service delivery and quality of care. Through the Trauma Working Group, the Health Cluster promoted internationally accepted best practices, standardization of protocols and definition of minimum standards of care. Ad hoc health interventions were highly discouraged, and ultimately, these working groups allowed for the development of a joint single health emergency strategy that in the end benefits the victims and their families. Finally, key trauma indicators were agreed on at each level of care by standardizing patient forms, data collection, verification and analysis.

Improvements in the system were measured by assessing these key trauma indicators, and ensuring that the total number of patients would decrease at each level of the pathway, from prehospital to hospital to tertiary care, while the relative proportion of severely injured patients would increase. In this publication, we refer to this concept – in which the prehospital structures, during an emergency, efficiently divert patients from the hospital emergency departments – as the Trauma System Pyramid (see Fig. 4).

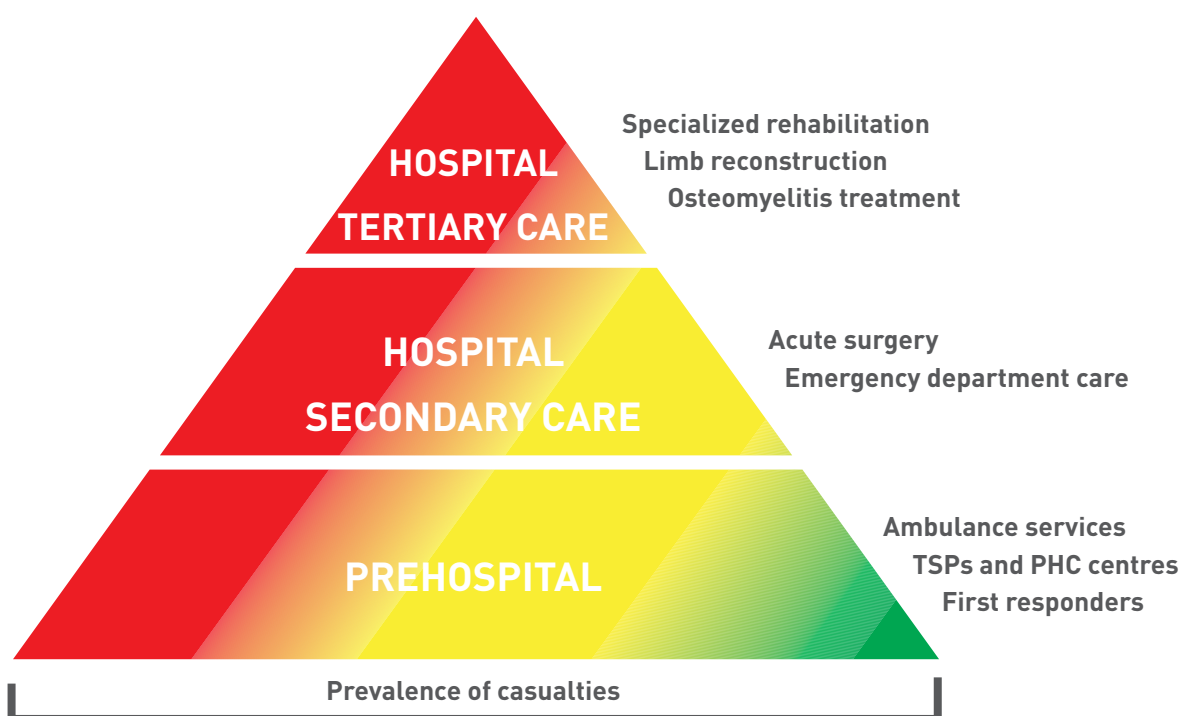


Fig. 4. The Trauma System Pyramid. The number of patients decreases at each level, while the relative percentage of severe patients increases.



Assessing the Humanitarian Response

In the following sections, the results of the humanitarian response are assessed through five components:

Outcomes

The outcomes are the consequences of health care and include the health status of patients. For example, how many lives and limbs were saved, or what was the case fatality rate? Outcomes are elaborated in the Trauma data analysis section.

Coordination

This includes coordination of the overall response and its added value.

Structural improvements

The structure is the environment in which the health care is provided. For example, are the staffing numbers and their skills sufficient? Is the infrastructure appropriate?

Outputs

This includes the method by which health care is provided. How many people received care?

Sustainability

Did this response contribute to resilience building of the health system?



Trauma data analysis



Prehospital level

Trauma stabilization points (TSPs)

A total of 28 014 casualties resulted from incidents related to the clashes which took place from the 30 March 2018 until 30 March 2019⁶. This number encompasses the total sum of patients who were managed and discharged at the TSPs, patients who were managed at the TSPs and referred to the hospitals, and finally, patients who were treated at the emergency departments but had not been accounted for at any point at the prehospital level.

Of these, MoH and PRCS reported that 21 161 casualties were managed at the TSPs - 13 293 presented to MoH TSPs (63%) and 7868 presented to PRCS TSPs (37%). Refer to table 1 below. Most of the patients were transported to the TSPs by ambulance, but there were some ad hoc cases, where they were transported by bystanders or used private vehicles. **Of 21 161 casualties, 11 392 patients (54%) were treated and discharged from the TSPs, and 9769 (46%) were stabilized and transferred to the hospitals for further treatment.**

An additional 13 229 people were reported injured and received immediate first-aid care without subsequent referral to a TSP or hospital, according to partners delivering the initial first response⁷; however, WHO was unable to find any patient records and has not considered this caseload in the sum of injured.

6 -Sources: PMRS, HCH, UHWC, PRCS, and MoH.

7 -PMRS, HCH, UHWC, PRCS.



Photo credit to WHO

The treatment and discharge rate of MoH TSPs was 65%, whereas it was 35% from PRCS TSPs (54% average)⁸. The main explanation for this difference in discharge rates is primarily related to the human resources composition of each structure. The MoH TSPs were staffed with primary health care (PHC) physicians and nurses, later trained on trauma care by WHO, whereas the PRCS TSPs were mainly staffed by paramedics and emergency medical technicians; thus, the diagnostic and treatment capacity of these TSPs was not comparable, and the different capacity of the PRCS TSPs pressed them to transfer more patients to the hospitals for further treatment.

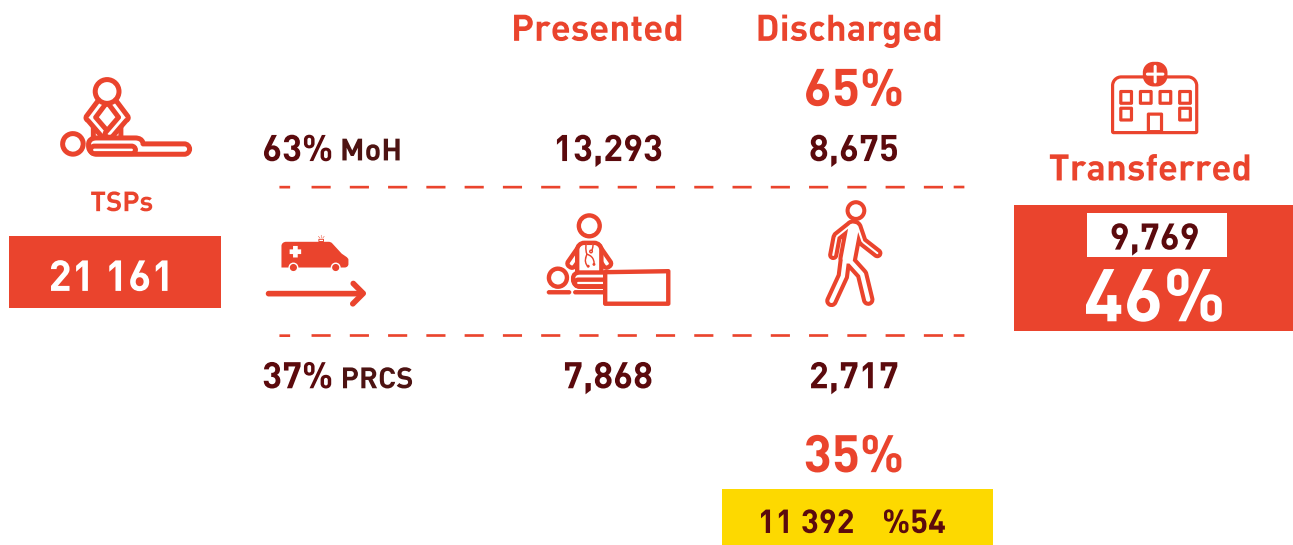


Table 1. Number of patients presented, discharged and transferred from the TSPs

⁸ -In comparison with 48% reported at the Battle of Mosul. Spiegel PB, Garber K, Kushner A, Wise P. The Mosul trauma response: a case study. John Hopkins Centre for Humanitarian Health; 2018 (http://hopkinshumanitarianhealth.org/assets/documents/Mosul_Report_FINAL_Feb_14_2018.pdf, accessed 20 February 2019).

Triage

Patients managed at the TSPs were segregated into three categories according to the severity of their injuries. Severity was subjectively determined by taking into consideration factors such as mechanism of injury, location of injury and general clinical status of the patient. From the available data, 66.4% of patients were triaged as green (minor injuries), 31% as yellow (moderate-to-serious injuries for which care could be delayed) and 2.5% as red (severe injuries requiring immediate care). In addition, 0.1% of the patients had no signs of life and were not triaged. Fig. 5 illustrates the TSP triage distribution.

The data indicates a high level of under-triage (e.g. incorrectly classifying “red” patients as “yellow”) due to the hesitant approach taken by the TSP staff. Although the number of non-limb GSWs was 612, only 523 (85.5% of 612) patients were triaged as red, which represents a minimum of 14.5% under-triage rate. To improve and standardise the triage process, in 2019, the new WHO-ICRC triage system is being incorporated in the TSPs. Annex 2 shows the new TSP triage system.

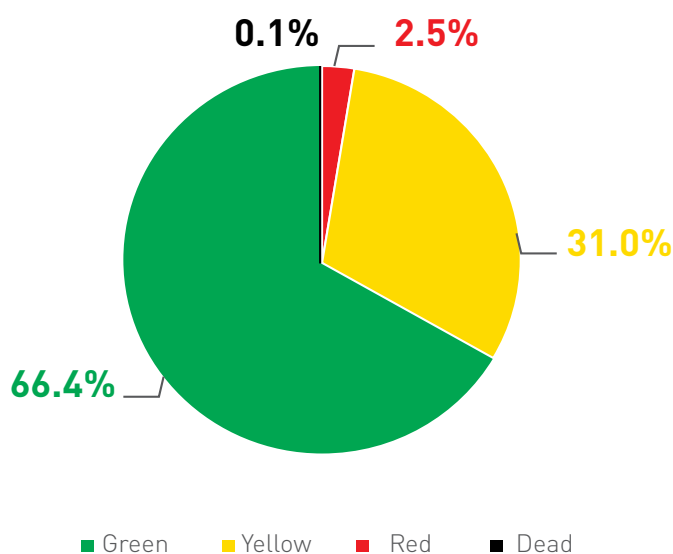
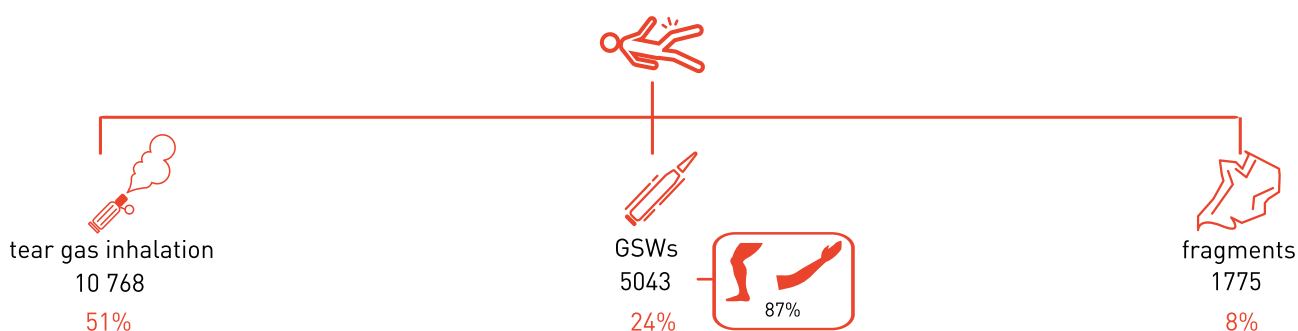


Fig. 5. TSP triage distribution

Mechanism of injury

From the cohort of 21 161 casualties managed at the TSPs, the largest cause of injury was tear gas inhalation, with 10 768 casualties, accounting for 51% of the TSP caseload. The second largest cause of injury was GSWs, with 5043 casualties, accounting for 24% of the caseload, of which the vast majority (87%) were GSWs to the upper and lower limbs. The third largest cause of injury was fragments (commonly referred as shrapnel), with 1775 casualties, accounting for 8% of all cases.



Demographics

In total, 19 489 (92%) of the injured were males and 1672 (8%) were females; 16 488 (78%) casualties were adults and 4673 (22%) were children (under 18 years old). Casualties in the age group 18 to 39 corresponded to 70% of all the injured that were seen at the TSPs. This distribution almost overlaps the subgroup of patients who had GSWs, although in the latter, there were fewer women and children. Refer to Figs. 6 and 7 for the age and gender distribution of casualties at the TSPs.

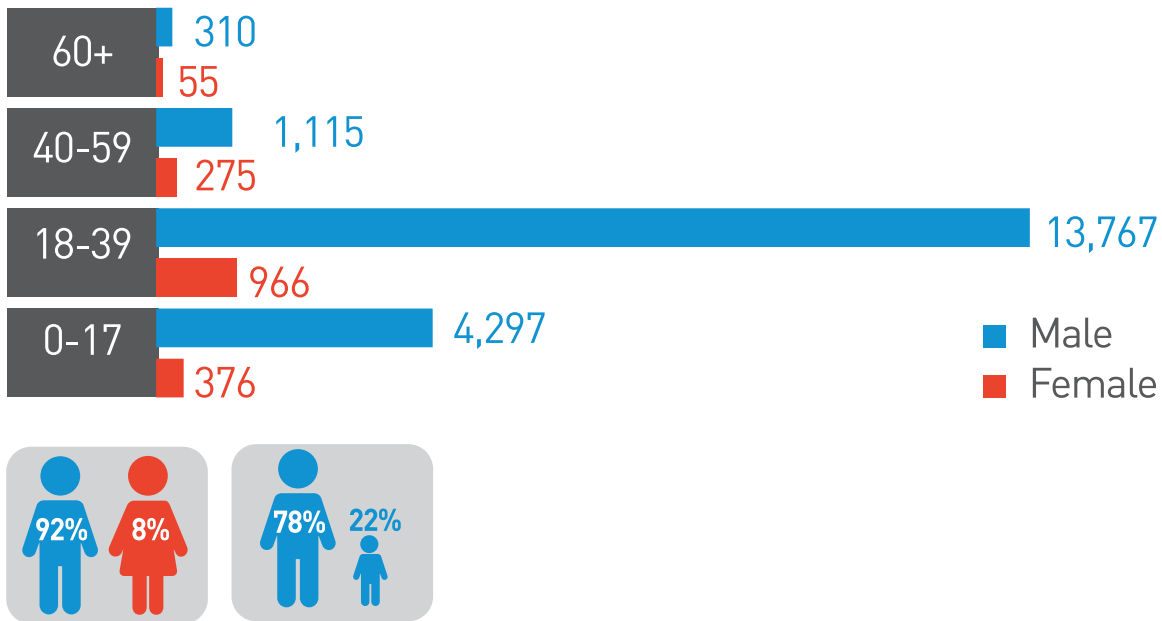


Fig. 6. Age and gender distribution of casualties at the TSPs (n = 21 161)

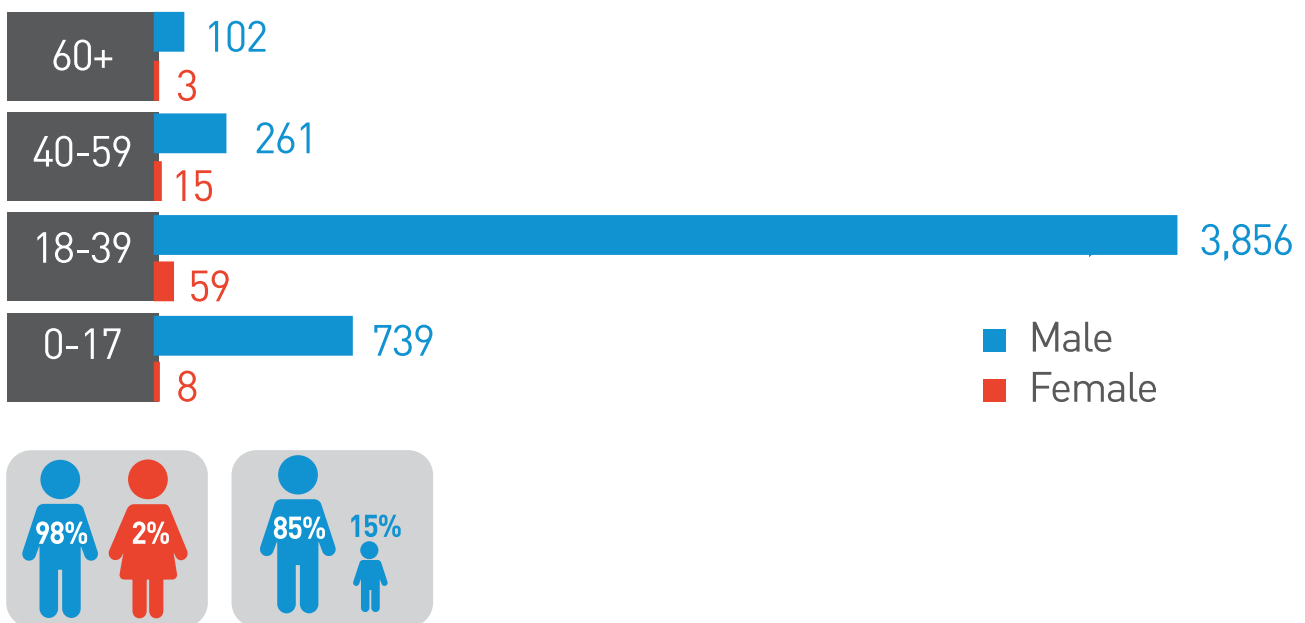


Fig. 7. Age and gender distribution of GSW casualties at the TSPs (n = 5 043)

Death at the point of injury

Although local legislation allows for the official declaration of death to be made only at a public hospital, 30 casualties were taken to the TSPs with no signs of life and were later pronounced dead at the hospitals. An additional eleven bodies were held by the Israeli authorities. All of these fatal injuries at the scene were a result of GSWs to the chest (47%, n = 14), head and neck (27%, n = 8), or abdomen and pelvis (13%, n = 4), in addition to two cases of fatal limb injuries.

Table 2. shows the number and percentage of patients who arrived dead at the TSPs by type of injury and anatomical location.

| Location | Number | Percent |
|---|-----------|-------------|
| GSW Head and neck | 14 | 46.7% |
| GSW Chest | 8 | 26.7% |
| GSW Upper limb | 1 | 3.3% |
| GSW Abdomen and pelvis | 4 | 13.3% |
| GSW Lower limb | 1 | 3.3% |
| GSW unspecified | 1 | 3.3% |
| Dead on-site by other mechanism of injury (non GSW) | 1 | 3.3% |
| TOTAL | 30 | 100% |

Table 2. Patients who arrived dead at the TSPs



Ambulances

Total ambulance movements, from field to TSP and from TSP to hospitals, only started to be recorded and monitored much later in the year. From what is possible to determine so far, the average ambulance TSP bypass rate is around 10% (patients who were transported by ambulance from the point of injury to the hospitals without stopping at the TSP). This figure has been decreasing steadily, probably as a result of the weekly monitoring and feedback effect. Although there are different possible explanations for this bypass rate, most are due to the lack of TSP capacity when casualties arrive at the same time (particularly in PRCS TSPs) and the lack of a centralized dispatch centre to coordinate all ambulance service providers. Refer to Fig. 8 for weekly ambulance TSP bypass rates and total caseload from 7 December 2018 to 30 March 2019.



Photo credit to WHO

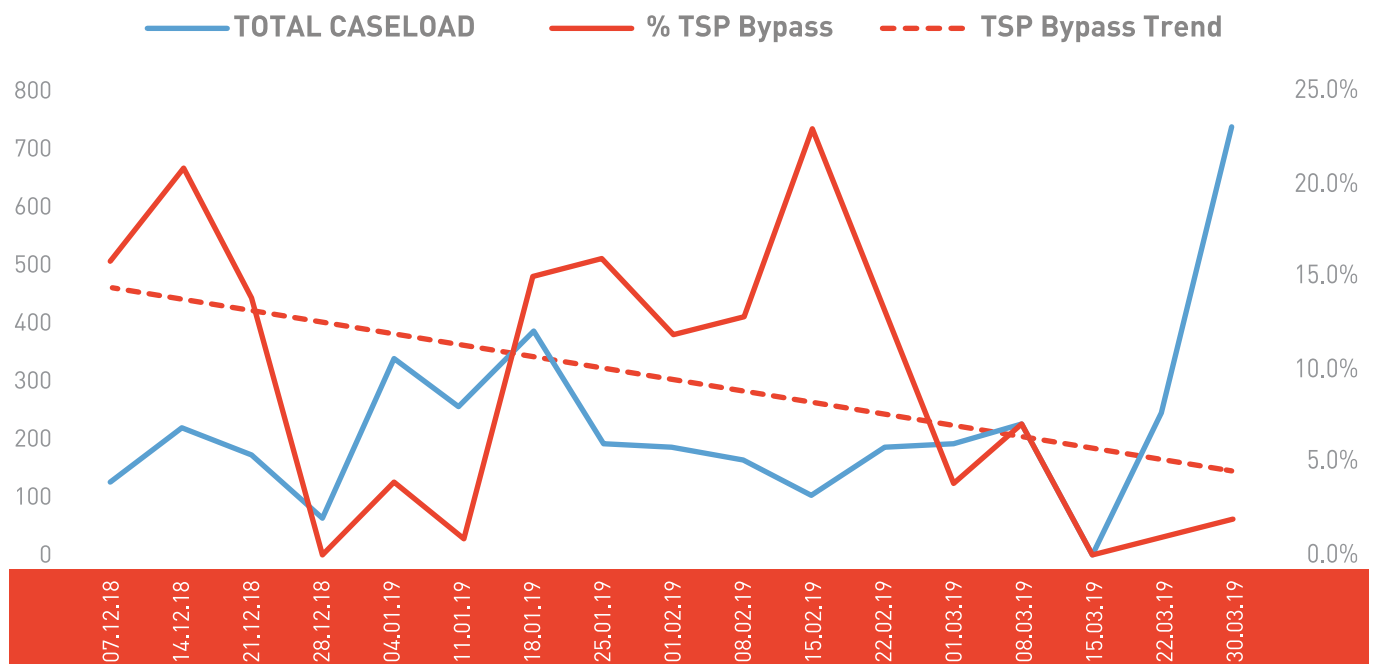


Fig. 8. Ambulance caseload, and TSP bypass rate

Prehospital impact

- ✓ **Increased number of lives saved**
 - Airway and haemorrhage control interventions done within the first few minutes of injury
 - Triage at the TSP level. Severe patients were prioritized for ambulance transportation first
- ✓ **Reduced burden on emergency departments at hospitals**
 - More than 50% of the patients were diverted from the hospitals
 - Most of those who reached the hospitals had been previously stabilized at the TSPs
 - Optimization of hospital resources, who are now allocated to the most severe patients
- ✓ **Rational use of ambulances**
 - Fewer patients transported directly to hospitals (although still a 10% average TSP bypass rate)
 - Clear referral lines from TSPs to hospitals with availability of specific services (as neurosurgery or vascular surgery)
- ✓ **Development of a trauma management culture**
 - The development of the TSP capacity has encouraged a culture of trauma management and reorganisation of systems to ensure more rational use of resources.

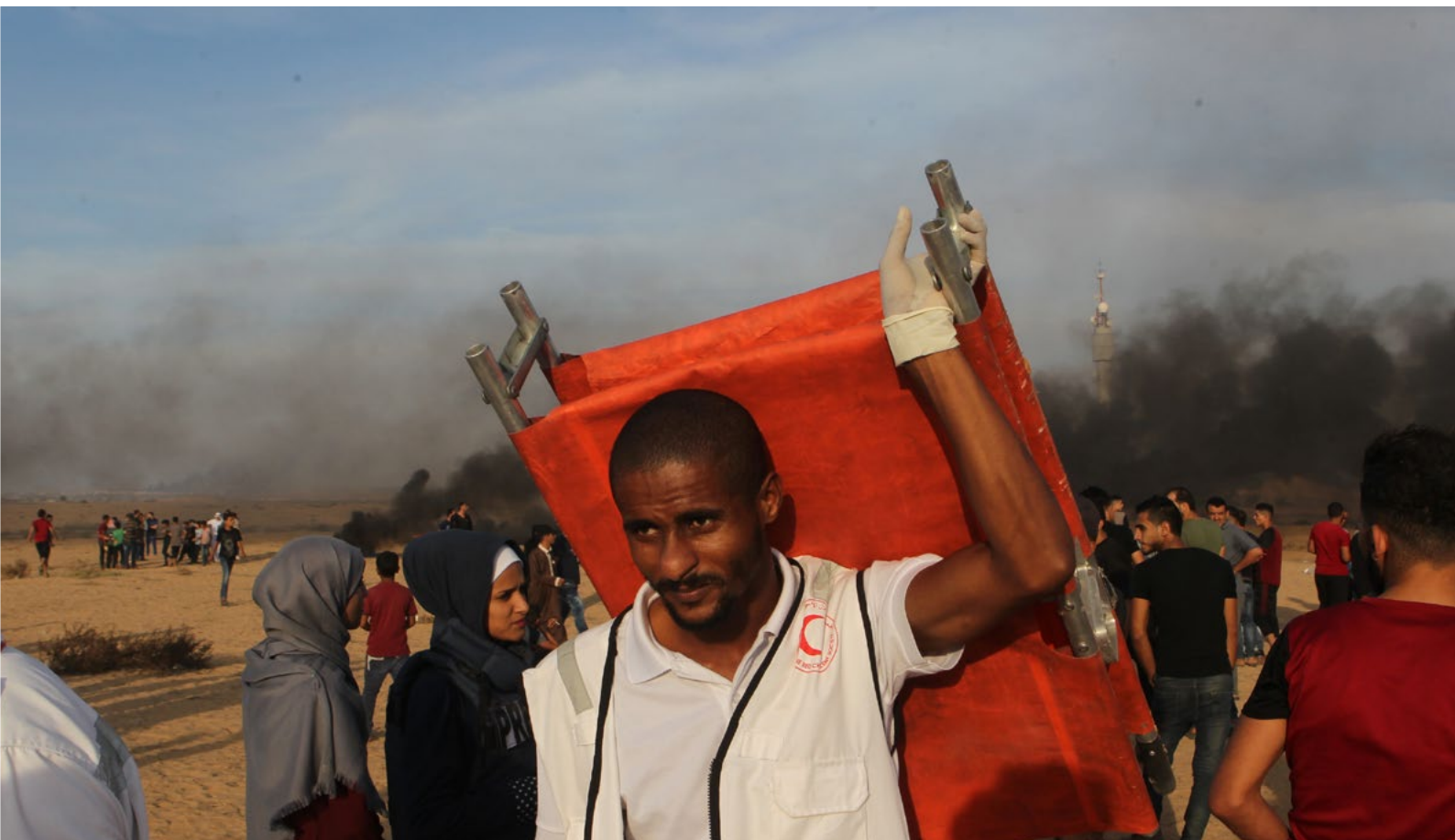


Photo credit to WHO

Hospital Level

Nine hospitals, including Al-Aqsa, Al-Najar, Al-Quds, Al-Awda, Beit Hanoun, European Gaza Hospital, Indonesian, Nasser and Al-Shifa, reported receiving 16 622 casualties in their emergency departments as a result of the mass demonstrations. **MoH hospitals received 74% of the casualties (12 232) and NGO hospitals received 26% of them (4390).** Refer to Fig 9 for the distribution of casualties.

Of the 16 622 casualties, only 59% were referred from the TSPs. This means that there were 6853 casualties that reached the emergency departments without being triaged first at the TSPs. The TSP bypass rate is particularly high for GSWs and is calculated to be 26.6% (1829/6872). This number is probably explained by the first few weeks of the mass demonstrations when the TSP concept was new and there was a high TSP bypass rate and lack of proper registration of casualties. In addition to the pre-existing culture of bystanders transporting patients, another logical reason is perhaps because the TSPs only function on Fridays, whereas there are ad hoc demonstrations throughout the rest of the week. Unfortunately, the available data at the hospital level does not differentiate between those who were triaged at the TSPs and those who went directly to the hospitals.

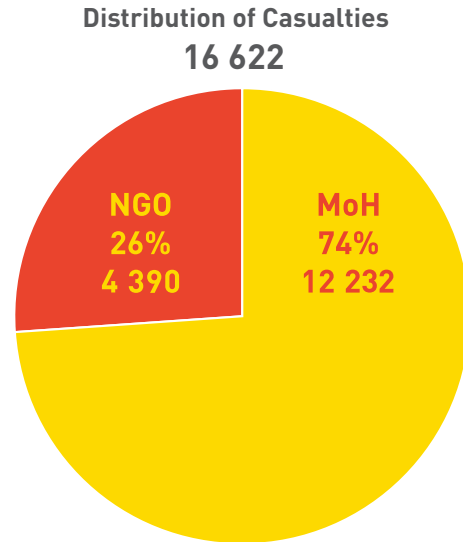


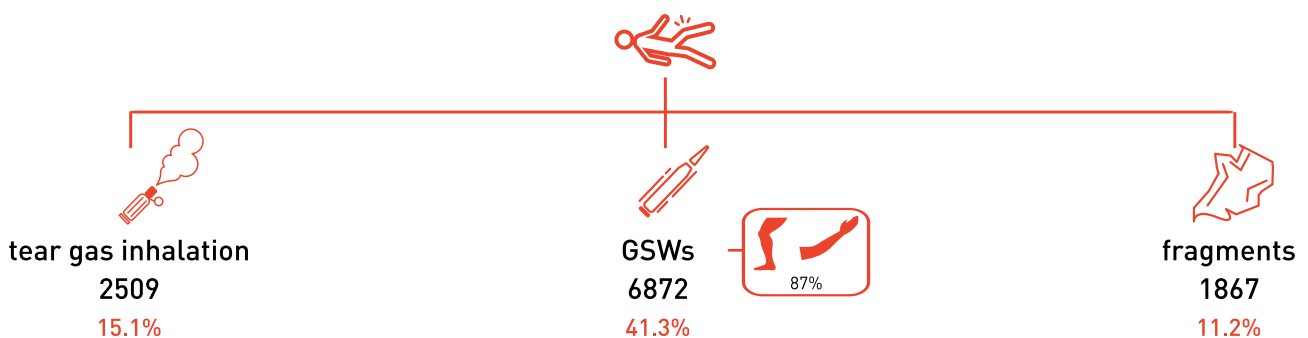
Fig. 9. Distribution of casualties.

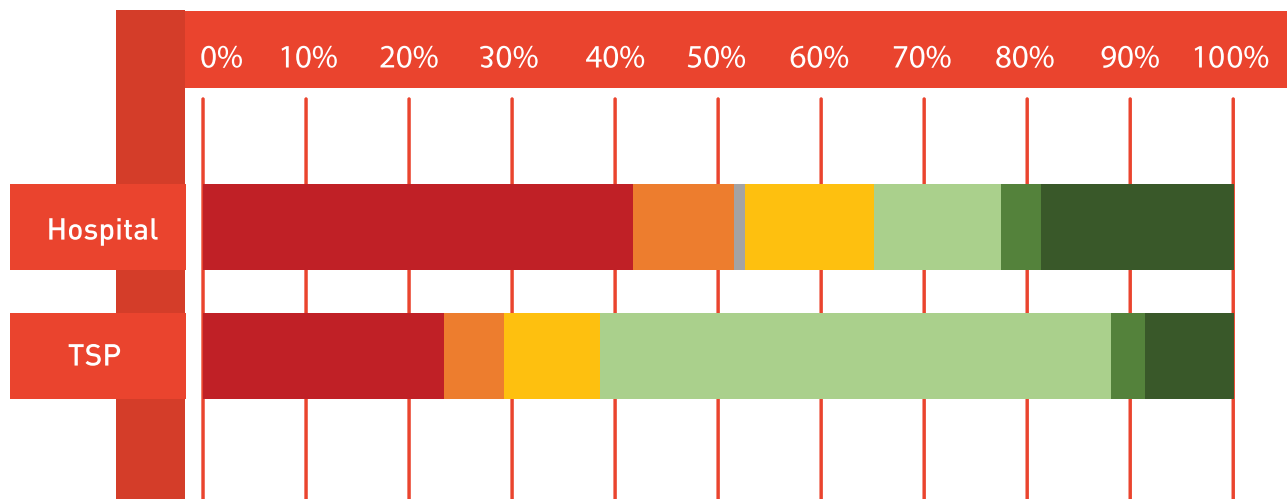
Nonetheless, even considering the average estimated 10% ambulance TSP bypass rate (patients who went to hospitals by ambulance without stopping at the TSP), we realize that a high percentage of patients reached the emergency departments by their own means, either seeking a primary consultation or, after being discharged from the TSPs, wanting to obtain a medical certificate for benefits from the Ministry of Social Affairs. Since March 2019, in order to further reduce the hospital burden, the medical certificates for social benefits started to be provided at the TSP level.

Mechanisms of injury

The top three well-identified mechanisms of injury of patients presented to the emergency departments were GSWs at 41.3% (6872), gas inhalation at 15.1% (2509) and injuries by fragments at 11.2% (1867). Refer to Fig. 10 for a breakdown of the mechanisms of injury and a comparison of this at the TSP level and at the hospital level.

In contrast to the TSPs, where 23.8% of the presenting casualties had GSWs, at the hospital level, they accounted for 41.3% of all emergency department contacts. At the hospital level, only 15.1% of the casualties reported gas inhalation compared with 50.9% at the TSP level.





| | TSP | Hospital |
|----------------|-------|----------|
| GSW | 23.8% | 41.3% |
| Explosion | 5.8% | 10.4% |
| Missile | 0.0% | 0.7% |
| Fragments | 8.4% | 11.2% |
| Gas | 50.9% | 15.1% |
| Rubber Bullets | 3.0% | 3.6% |
| Others | 8.1% | 17.6% |

■ GSW
 ■ Explosion
 ■ Missile
 ■ Fragments
 ■ Gas
 ■ Rubber Bullets
 ■ Others

Fig. 10. Distribution of casualties by mechanism of injury [TSP n = 21 161; hospital n = 16 622]



Photo credit to WHO

Gunshot wound injuries

There was a staggering number of gunshot wounds. From the total 28 014 injured, there were 6872 gunshot wounds, accounting for 25% of the total casualty caseload and 41% of the caseload managed by hospitals.

A breakdown of the 6872 gunshot wounds, reveals that 78.9% were to the lower limbs (5420), 8% to the upper limbs (549) and 4.2% to the abdomen and pelvis (286). The number and proportion of GSWs to the limbs in this cohort (86.9%) is extremely high.

These high energy gunshot wounds have a high probability of causing excessive damage to the bone and irreversible damage to neurovascular structures. Such injuries are often complicated by extensive soft tissue damage and managing these injuries requires high resources from the health system. Any health system in the world would be overwhelmed if it had to manage 6872 high energy gunshot wounds.

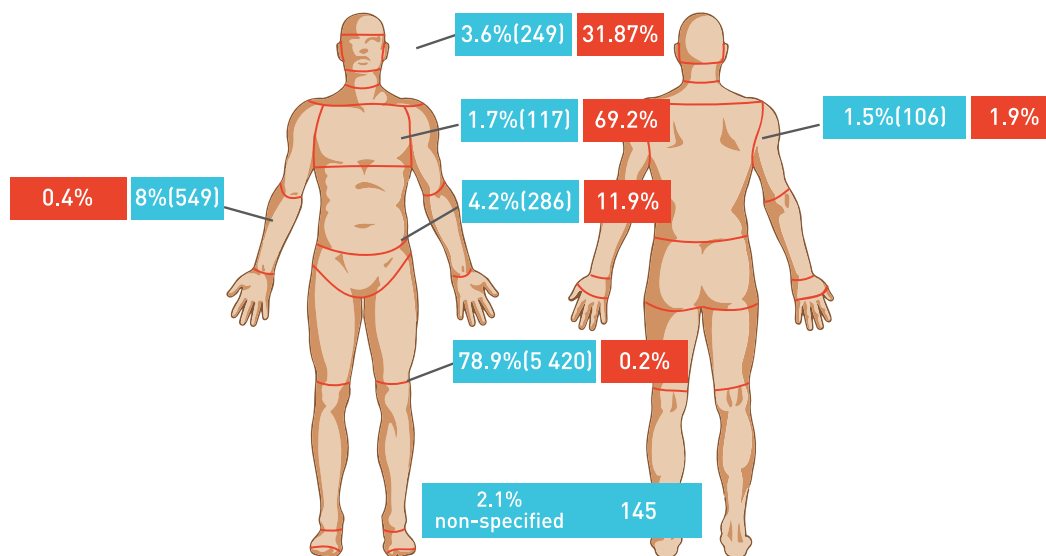


Fig. 11. Anatomical distribution of all GSWs and their mortality rate by body region (red); n = 6 872

How are high-energy gunshot injuries to the limbs managed by the trauma system?

Achieving control of haemorrhage, prevention and control of infection, and late reconstruction in extremity high-energy gunshot injuries requires a three-level stepwise approach: immediate care, early damage control and delayed definitive surgery.

In the Gaza context, immediate care encompasses direct pressure dressings and application of tourniquets by first responders and health staff at the TSPs.

At the hospital level, early damage control is performed. This includes wound extension and exploration, excision of nonviable tissue, vessel ligation or shunting, irrigation, and fracture stabilization. Delayed definitive surgery, which includes repeat exploration and irrigation, interposition grafting, and fracture fixation and soft tissue closure and coverage, is also done at the hospital level.

Physiotherapy, wound dressings, and MHPSS support is provided by different partners at post-operative clinics and at the community level through outreach teams.

Patients who require further reconstructive surgery are later referred to the tertiary care level.

Triage

Triage categories were not consistently collected at the hospital level and for this reason, it is not possible to analyse the distribution of casualties by severity, and compare it with the TSPs.

Demographics

Demographically, the gender and age distribution of the casualties that were admitted to the emergency departments is similar to that of the TSPs: 94% were males and 6% females, and 80% were adults and 20% under the age of 18 years, with the age group 18–39 representing 73% of the patients. Refer to Fig. 12 for the age and gender distribution of emergency department admissions of casualties.

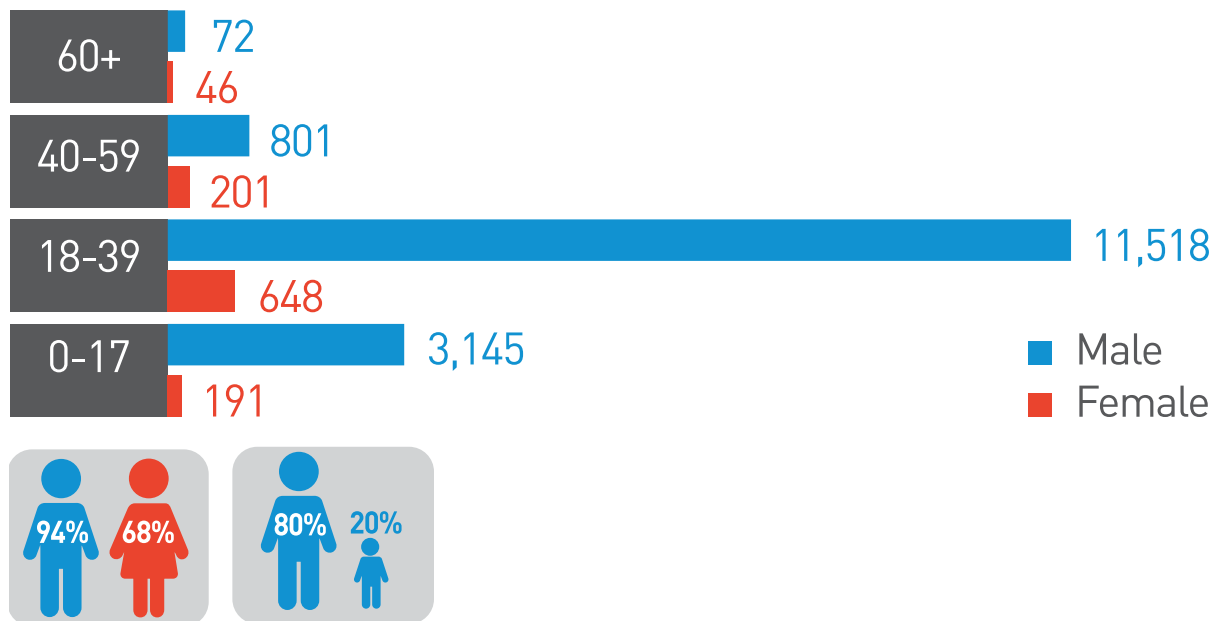


Fig. 12. Age and gender distribution of casualties at hospitals; n = 16 622

The gender and age distribution of gunshot injuries follows a similar pattern, which is expected, since this subset of GSW patients represents more than 40% of all casualties arriving at the emergency departments as a result the mass demonstrations. Refer to Fig. 13 for the age and gender distribution of GSW injuries at hospitals.

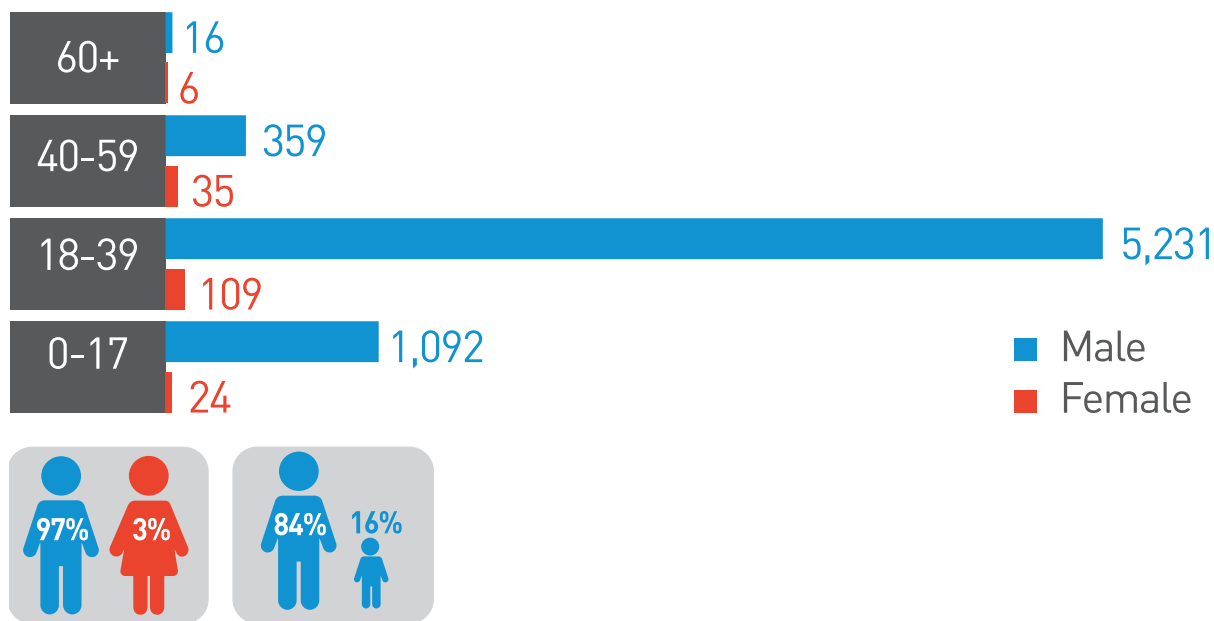


Fig. 13. Age and gender distribution of GSW injuries at hospitals; n = 6 872

If we also consider that the number of encounters at the TSP level was 21 161 and the number of encounters at the hospital level was 16 622, then these figures are very much in line with our proposed theoretical model of the trauma system. **A trauma system optimized for emergencies should aim to decrease the number of patients at each level of the pathway from prehospital to hospital to tertiary care, while the relative proportion of severely injured patients should increase** (see Figs. 10 and 14).

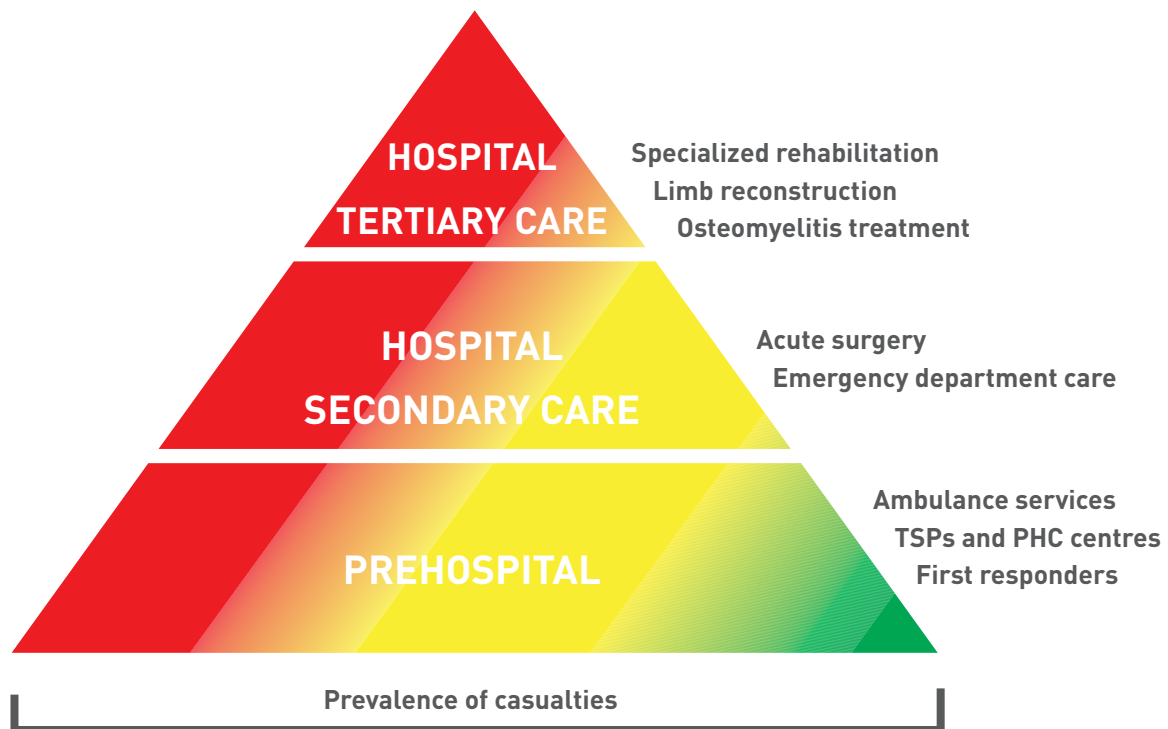


Fig. 14. The Trauma System Pyramid. The number of patients decreases at each level while the relative percentage of severe patients increases.

Unfortunately, the Health Information System currently in use at the hospital level is still not fully implemented and does not provide more information after the patient emergency department admission. For this reason, the analysis of the number of patients who were admitted to the hospital, discharged from emergency or sent for surgery is not currently available.

Mortality analysis

Information regarding the number of fatal injuries opens another window to analyse the performance of the system. MoH hospitals reported 266 deaths as a direct result of conflict-related trauma from 30 March 2018 to 30 March 2019. An additional 11 deaths have been reported by OCHA, the bodies being held by the Israeli authorities.

Demographics

The median and average age of fatalities was 24 years old. The minimum age was represented by a stillbirth from a pregnant woman who was fatally injured, and the maximum age was 75. Females represented 2.3% of deaths and males accounted for 97.7%. Of all deaths, 52 (19.5%) were children under 18 years old and 214 (79.5%) were adults. The age group 18–39 accounts for the largest proportion of cases, 199 (74.8%).

Causes of mortality

Of the 266 recorded fatalities, the three causes of mortality were GSWs at 78.9% (210), of which 88% died in the first 24 hours after the injury; explosion injuries at 18.8% (50); and gas canister projectiles at 2.3% (6). It is worth underlining the high case load of fatal head and face injuries caused by these gas canister projectiles that are traditionally used for riot control. Refer to Fig. 15 for a breakdown of causes of mortality.

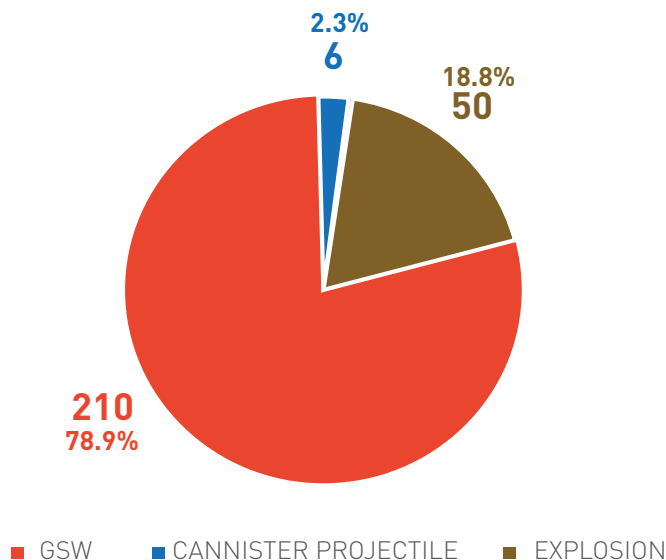


Fig.15. – Causes of mortality; n = 266

Of the 28 014 people who were reported to be injured, 266 of them died; the overall case fatality rate was 0.95%. Among men, 1.01% of the injuries resulted in a death (260 of 25 720), while for women there was a much smaller risk with 0.26% (6 of 2294) resulting in death. The rate amongst men is nearly four times higher than women, which suggests that they suffered far more severe injuries. There was little difference between the death rates among children 0.85% (52 of 6 151) and adults 0.98% (214 of 21 863). It has not been possible to include further information on the additional 11 bodies held by the Israel authorities as no patient records were provided.

Fig. 16 shows the case fatality rate by sex and age group.

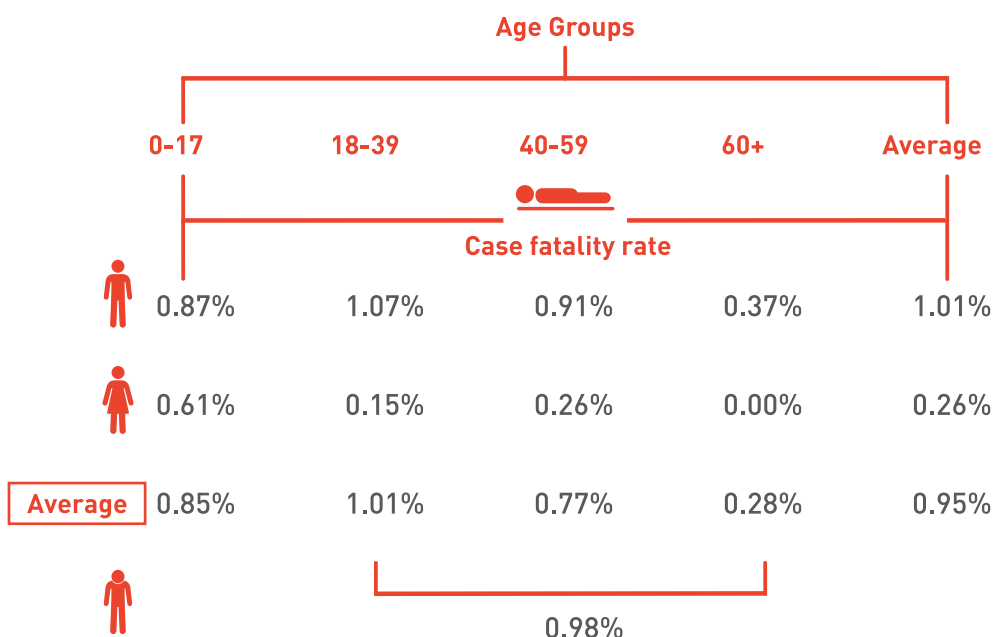


Fig. 16. Case fatality rate by sex and age group (n = 28 014)

Time frame

Of the 266 recorded fatalities, 89.5% [238] occurred in the first 24 hours after injury including 11% [30], which occurred in the first few minutes after injury, before arrival at the first TSP.

GSW case fatality by body region

The GSW fatality rate by anatomical body region reveals that the top three anatomical regions among gunshot fatalities are the chest at 38.6%, the head and neck (including the face) at 37.1% and the abdomen at 16.2%. This is highly consistent with what has been described in an analysis of the burden of GSWs in conflict settings in Iraq and Afghanistan⁹. Refer to Fig. 17 and Fig. 18 for GSW fatalities by anatomical region.

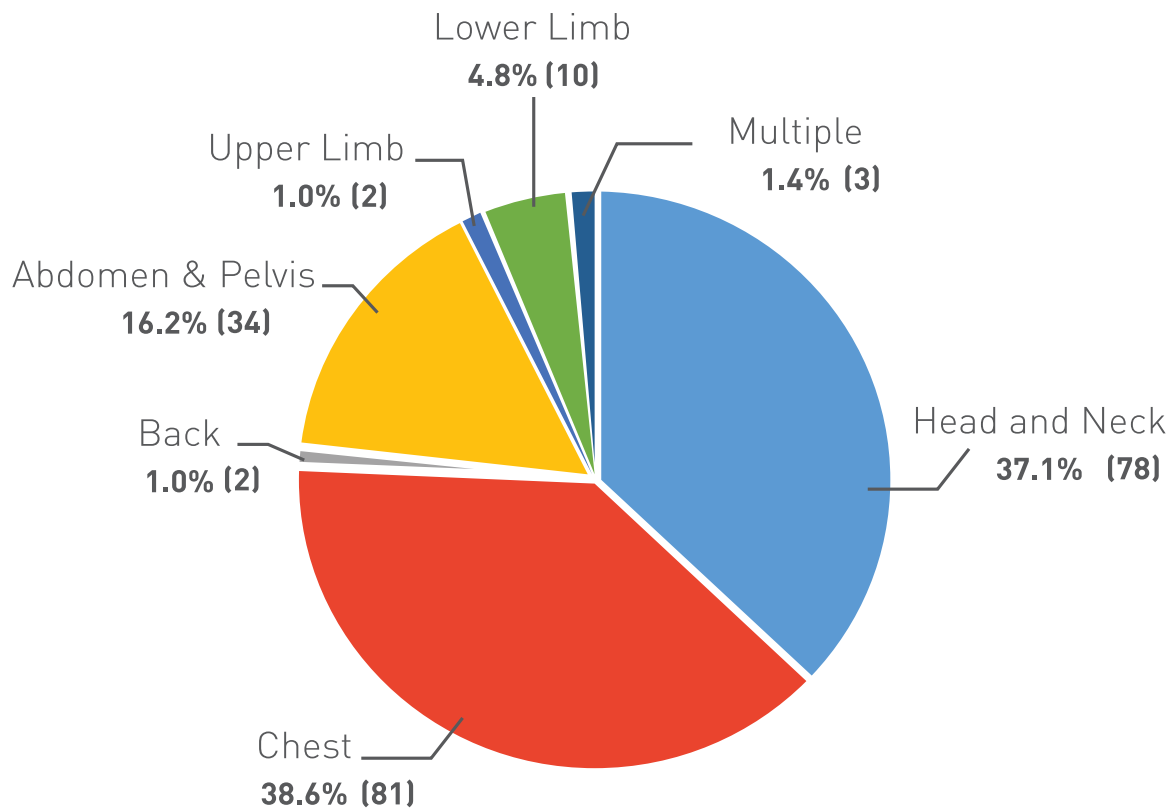


Fig. 17. GSW fatalities by anatomical region; n = 210

The overall case fatality rate among GSWs is 3% [210 of 6872 gunshot injuries]. Anatomical distribution analysis of GSWs and related mortality by body region reveals that almost 69% of all GSWs to the chest were fatal, as well as almost 31% of GSWs to the head and neck and 12% of those to the abdominal–pelvic region. As expected, the case fatality rate related to limb injuries (upper and lower) was very low (0.2%), even though these two regions combined (upper and lower limbs) account for almost 87% of all GSWs. Fig. 18 shows the anatomical distribution of fatal GSWs.

⁹ -Stevenson T, Carr DJ, Penn-Barwell JG, Ringrose TJ, Stapley SA. The burden of gunshot wounding of UK military personnel in Iraq and Afghanistan from 2003-14. *Injury*. 49(6):1064–9. doi:10.1016/j.injury.2018.03.028.

The case fatality rate of chest wounds at almost 69% is much higher than the average reported in the literature, which can be as high as 52% but is also reported to be as low as 11.6% in studies with a similar ballistic background^{10,11}. This extremely high case fatality rate from GSWs to the chest has at least four possible explanations. First, it can be the consequence of a disproportionately high percentage of mediastinal wounds (heart and great vessels), which traditionally have higher mortality rates¹²; second, it can be an issue with skills and training of the hospital staff or fear of patients' next of kin if they perform emergency thoracotomies at the emergency department and the patient dies; third, it is possible that most studies on high-energy penetrating chest injuries are conducted at the hospital level and exclude all patients who died at the scene or before reaching the hospitals, leading to a bias and an underestimated percentage of chest wound case fatality rates in the published literature; and finally, this cohort of high-energy gunshot injuries to the chest is composed of unprotected people rather than military personnel with ballistic protection.

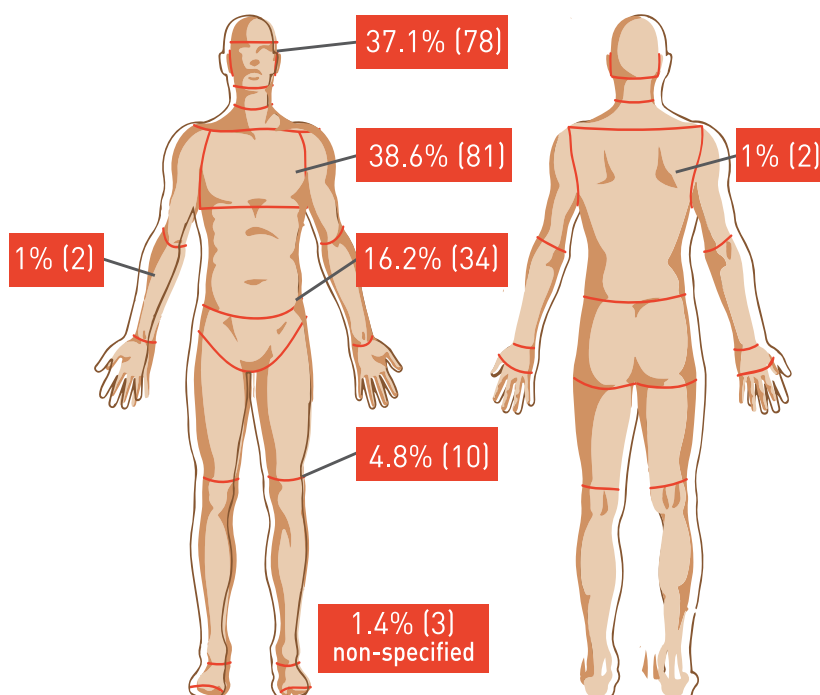


Fig. 18. Anatomical distribution of fatal GSWs; n = 210

Lives saved

There is no standardised method for estimating lives saved in the context of conflict-related trauma. The current health information system is far from optimal in its capacity to provide all the data needed for the “lives saved” analysis, but we can still estimate it by using some basic statistical methods. In this section, we follow the same process that was used to calculate the number of lives saved during the Battle of Mosul in Iraq.¹³

Overall, it is estimated that between 435 and 1227 lives were saved by the trauma referral pathway (see below). Other outcome measures, such as the number of limbs saved, are more difficult to calculate and would need better quality patient data along the trauma pathway over a longer period of time.

Patients triaged as red at the TSP presented life-threatening conditions and would have likely died if not properly stabilized and referred to a hospital facility. A proportion of red cases will die, even if properly stabilized and referred. This value has been calculated as being 16.8% of all red cases.¹⁴

10 -Clarke DL, Quazi MA, Reddy K, Thomson SR. Emergency operation for penetrating thoracic trauma in a metropolitan surgical service in South Africa. *J Thorac Cardiovasc Surg.* 2011;142(3):563-8. doi:10.1016/j.jtcvs.2011.03.034.

11 - Inci I, Ozcelik C, Tacyildiz I, Nizam O, Eren N, Ozgen G. Penetrating chest injuries: unusually high incidence of high-velocity gunshot wounds in civilian practice. *World J Surg.* 1998;22(5):438-42.

12 -Degiannis E, Loogna P, Doll D, Bonanno F, Bowley DM, Smith MD. Penetrating cardiac injuries: recent experience in South Africa. *World J Surg.* 2006;30(7):1258-64.

13 -Spiegel PB, Garber K, Kushner A, Wise P. The Mosul trauma response: a case study. *John Hopkins Centre for Humanitarian Health; 2018* (http://hopkinshumanitarianhealth.org/assets/documents/Mosu_Report_FINAL_Feb_14_2018.pdf, accessed 20 February 2019).

14 -Cross KP, Petry MJ, Cicero MX. A better START for low-acuity victims: data-driven refinement of mass casualty triage. *Prehosp Emerg Care.* 2015;19(2):272-8. doi:10.3109/10903127.2014.942481.

Therefore (total red cases treated) – (total red cases that would die despite treatment) = total red cases saved.

In Gaza, TSPs triaged 2.5% of the cases as red (523 patients). Applying a 16.8% case fatality ratio to those cases, we arrive at 88 patients. Thus, 523 – 88 = 435 red cases saved.

How many of the yellow and green cases would have died without prehospital treatment? Green cases, which are categorized as minor, almost never die of their wounds, even if they do not receive treatment at the prehospital level. However, patients classified as yellow are at higher risk, particularly if they have been mistakenly classified as yellow and should be red; this is referred to as “under-triage”. In fact, although over-triage (e.g. incorrectly classifying “yellow” patients as “red”) is much more common than under-triage (e.g. incorrectly classifying “red” patients as “yellow”), several previous studies in conflict and disaster situations have shown that under-triage rates can be as high as 11%^{15, 16, 17}.

Therefore, we will assume that 11% of the patients triaged as yellow should have been triaged as red. In this case, 11% of 6565 yellow cases yields a total of 722. Applying the same 16.8% factor (the proportion of patients who would die despite treatment), we arrive at 601 lives that would have been saved from the yellow cohort. Summing the total lives saved from the red cohort and the total lives saved from the yellow cohort, we arrive at a total of 1036 lives that have been saved.

The conclusion should be that between 435 and 1036 lives have been saved because of the adopted trauma referral pathway, which includes the TSPs. Refer to Table 3 for the calculations used in the Mosul approach to estimate the number of lives saved by the TSPs.

The Mosul Approach to the Gaza numbers (n= 21 161)

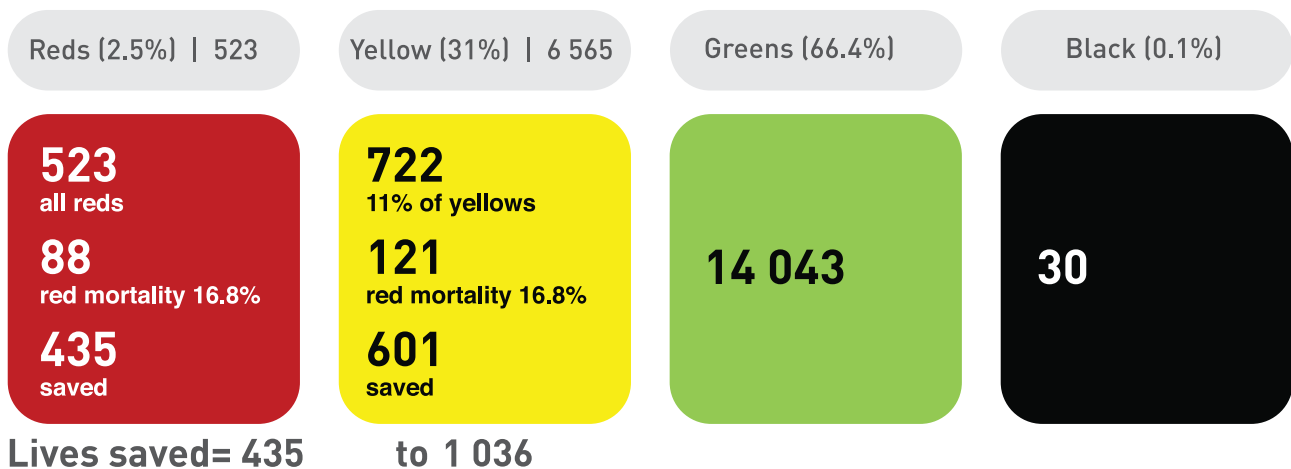


Table 3. Estimation of lives saved by using the Mosul approach

15-Jones N, White ML, Tofil N, Pickens M, Youngblood A, Zinkan L, et al. Randomized trial comparing two mass casualty triage systems (JumpSTART versus SALT) in a pediatric simulated mass casualty event. *Prehosp Emerg Care*. 2014;18(3):417-23. doi:10.3109/10903127.2014.882997.

16-Valles P, Van den Bergh R, van den Boogaard W, Tayler-Smith K, Gayraud O, Mammozai BA, et al. Emergency department care for trauma patients in settings of active conflict versus urban violence: all of the same calibre? *Int Health*. 2016;8(6):390-7.

17-Plackett TP, Nielsen JS, Hahn CD, Rames JM. Accuracy and reliability of triage at the point of injury during Operation Enduring Freedom. *J Spec Oper Med*. 2016;16(1):51-6.

The Gaza hypothesis

It became clear in our analysis that the under-triage rate in Gaza is high and that, for this reason, using the current 11% under-triage figure would lead to an underestimation of the number of lives saved.

If we consider that at least all non-limb gunshot injuries should be triaged as red (612), we have an under-triage rate of at least 14.5% ($1 - (523/612)$). We should then assume that 14.5% of the patients triaged as yellow should have been triaged as red. In this case, 14.5% of 6565 yellow cases yields a total of 952. Applying the same 16.8% factor (the proportion of patients who would die despite treatment), we arrive at 792 lives that would have been saved from the yellow cohort. Summing the total lives saved from the red cohort and the total lives saved from the yellow cohort, we arrive at a total of 1227 lives that have been saved.

Based on these assumptions, **the conclusion is that between 435 and 1227 lives have been saved because of the adopted trauma referral pathways.** Refer to Table 4 for a breakdown of these calculations.

The Gaza Hypothesis (n= 21 161)

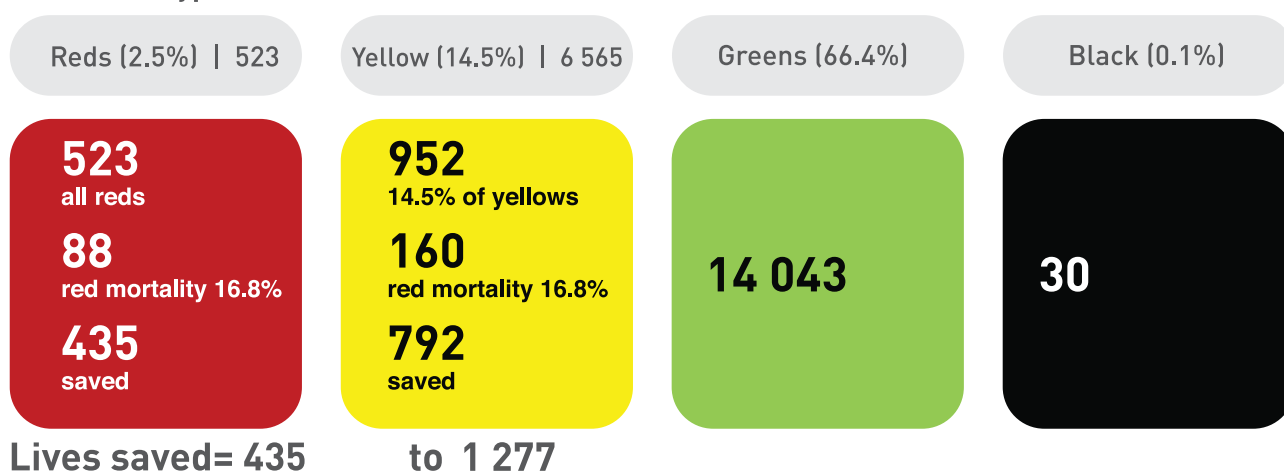


Table 4. Estimation of lives saved by using the Gaza Hypothesis.

Permanent disability and rehabilitation

Permanent disability and the quality of survival is often difficult to measure. For example, most published performance indicators examine prehospital and hospital care, with limited development of indicators for post-hospital care or quality-of-care recovery. Similarly in Gaza, data is lacking on permanent disabilities from the MoH records; however, the total figures are collected on a regular basis by a local NGO, the Assalama Charitable Society (ACS).

From 30 March 2018 to 30 March 2019, 172 people had their lives permanently impacted by some form of disability because of their injuries. Of these, **136 patients were adults (79%) and 36 were under 18 years old (21%).** By gender distribution, 169 were male and three were female. Refer to Table 5 for an updated breakdown of these cases.

From the start of the mass demonstrations to 30 March 2019, of all GSWs (6872), 2.1% (144) resulted in some form of amputation or brain and spinal cord injury. This number is likely to grow, as many patients may still face permanent disability if specialized services, such as osteomyelitis treatment and limb reconstruction are not made available in 2019.

During the period covered by this publication, the following breakdown of disabilities was collected: 121 amputations were performed and of these, 13 (11%) were conducted within 72 hours after the injury and as a direct consequence of the trauma, otherwise known as primary amputations; 108 (89%) were conducted after 72 hours and are related to either infection or ischaemia due to neurovascular damage.

Of the 121 amputations, 107 were major, including 42 above-knee amputations, 55 below-knee amputations, one patient with both legs amputated, 4 ankle amputations and 5 hand amputations. In addition, there were 14 minor amputations of fingers and toes. Amputation, be it arm, hand, leg or foot, is emotionally devastating for the victim but also for family and the care givers. It affects every element of life, including home and work. Even after surgery, long term rehabilitation, and a prosthetic, some will still need home adaptations and assistive devices. Refer to Fig. 19 for the distribution of amputations.

Regarding central nervous system lesions, during the reported period, 3 patients had extensive brain damage and are now in a vegetative state, and 10 patients presented with hemiplegia. Another 10 patients had some form of spinal cord injury (9 paraplegia and 2 quadriplegia). In addition, 16 patients lost sight in one eye, and 9 patients suffer from some form of vision impairment, mainly due to rubber bullet injuries or canister projectiles. Permanent hearing loss was reported in 2 patients as a result of injuries related to the mass demonstrations.

In addition to secondary health care, all of these patients will require specialized tertiary health care, which includes extensive and specialized multidisciplinary postoperative and rehabilitation services, including physiotherapy, occupational therapy, and mental health and psychosocial support.

Table 5. Permanent disability from 30 March 2018 to 30 March 2019

| Type of injury | | Male | | Female | | Total | |
|-----------------------|-----------------------|------------|------------|------------|-----------|------------|------------|
| | | Icon 1 | Icon 2 | Icon 3 | Icon 4 | | |
| Amputations | Hand | 5 | 0 | 4 | 1 | 5 | GSW/EXP |
| | Fingers | 8 | 2 | 10 | 0 | 10 | GSW |
| | Above knee | 31 | 11 | 41 | 1 | 42 | GSW |
| | Below knee | 46 | 9 | 55 | 0 | 55 | GSW |
| | Semi-ankle | 4 | 0 | 4 | 0 | 4 | GSW |
| | Toes | 3 | 1 | 4 | 0 | 4 | GSW |
| | Both lower limbs | 0 | 1 | 1 | 0 | 1 | GSW |
| Brain and Spinal cord | Quadriplegia | 1 | 1 | 2 | 0 | 2 | GSW |
| | Paraplegia | 6 | 3 | 9 | 0 | 9 | GSW |
| | Hemiplegia | 7 | 3 | 10 | 0 | 10 | GSW |
| | Brain death | 3 | 0 | 3 | 0 | 3 | GSW |
| Eyes | Lost sight in one eye | 14 | 2 | 16 | 0 | 16 | RB/GSW/CAN |
| | Vision impairment | 8 | 1 | 8 | 1 | 9 | RB/GSW/CAN |
| Ears | Hearing loss | 0 | 2 | 2 | 0 | 2 | GSW/CAN |
| Total | | 136 | 36 | 169 | 3 | 172 | |
| | | 79% | 21% | 98% | 2% | | |

GSW: gunshot wound; EXP: explosion; CAN: gas canister projectile; RB: rubber bullet.

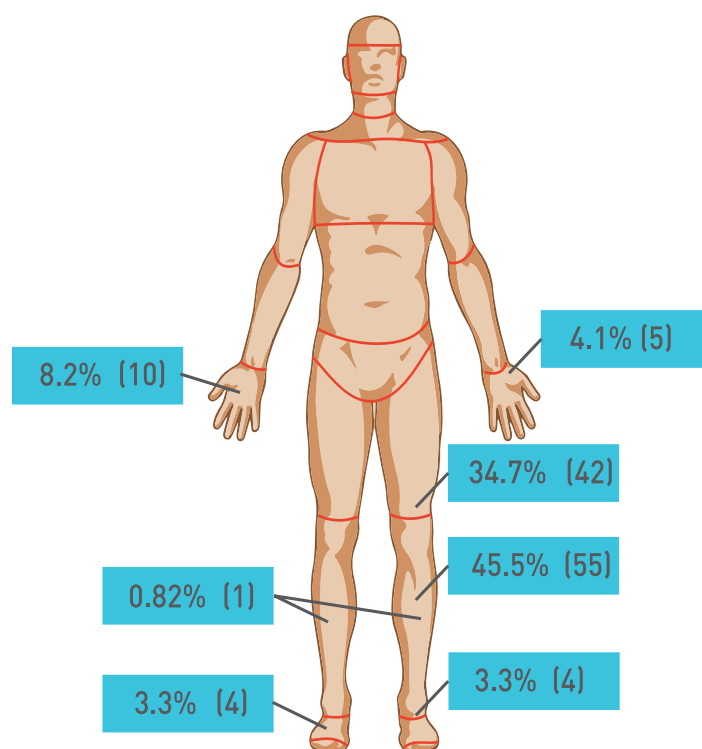


Fig. 19. Anatomical distribution of amputations; n = 121 (from 30 March 2018 to 30 March 2019)

Osteomyelitis treatment and limb reconstruction

In addition to 172 people facing life-long disability, there is also a high number of patients with complex wounds who will require continued health services in order to prevent permanent disability in the future.

From 30 March 2018 to 30 March 2019, a total of 6872 casualties sustained gunshot injuries, of whom 87% (5969) sustained injuries to the limbs. In the current Gaza context, **severe limb injuries from gunshots are common, accounting for almost 44% of all injuries that arrive at the hospitals.** Deployment of advanced weapon technology has resulted in major wounds with more extensive damage of the skin, neurovascular elements and bone. This is often complicated by ongoing bone infection, otherwise known as osteomyelitis. Wound infection per se is associated with poor outcomes and high resource consumption, including an increased number of surgeries and increased length of hospital stay¹⁶. In addition, some studies have suggested that up to 73% of patients with infection in conflict settings present multidrug-resistant bacteria. During emergencies, the limited capacity of the health facilities often led to inadequate debridement or covering of the wounds, which when combined, increases the risk of bone infection.



According to the available data, so far, approximately 45% of all gunshot injuries to the limbs have resulted in open fractures (2686 patients). From the literature, it is estimated that between 25% and 40% of these patients will develop some form of osteomyelitis over a 12-month period^{17, 18, 19}. From these figures, we estimate that **between 672 and 1074 patients will need additional specialized osteomyelitis treatment before undergoing limb reconstructive surgery.** In addition to this cohort, a further 20–25% of the 2686 patients with open fractures, **estimated at 537 to 672 patients, will need specialized orthoplastic reconstructive surgery because of bone gaps or malunion**²⁰.

In total, WHO estimates, on the basis of the caseloads from the reporting period, that between 1209 and 1746 patients will need some form of specialized tertiary treatment. This cohort accounts for 20% to 30 % of all limb GSWs.

The local MoH limb reconstruction team, supported by MAP-UK, has already identified 500 patients from this number; patients with infection have a higher amputation rate than do patients without infection, and so we can expect that some patients with these highly complex injuries face the risk of secondary amputations if not timely treated²¹.

The treatment of osteomyelitis and limb reconstruction involves an extensive array of services, including dedicated ward beds, surgical operating capacity, and multidisciplinary teams of orthopaedic surgeons, vascular surgeons, plastic surgeons, physiotherapists, nurses, and mental and psychosocial support specialists, in addition to clear protocols on the use of antibiotics. Furthermore, the value of educational awareness and communication with patients, along with the development of a trusting relationship between health-care staff and patient, is critical in order to ensure the best possible health outcome.

“

"The success was not only to prevent amputations among injured patients, but also to determine the infection source and to control it,"

”

Dr Fadel Naim, Head of the Orthopaedic Department at AAH.

16-Älgå A, Wong S, Shoaib M, Lundgren K, Giske CG, von Schreeb J, et al. Infection with high proportion of multidrug-resistant bacteria in conflict-related injuries is associated with poor outcomes and excess resource consumption: a cohort study of Syrian patients treated in Jordan. *BMC Infect Dis.* 2018;18(1):233. doi:10.1186/s12879-018-3149-y.

17-Sathiyakumar V, Thakore RV, Stinner DJ, Obremsky WT, Ficke JR, Sethi MK. Gunshot-induced fractures of the extremities: a review of antibiotic and debridement practices. *Curr Rev Musculoskelet Med.* 2015;8(3):276–89. doi:10.1007/s12178-015-9284-9.

18-Murphy RA, Ronat JB, Fakhri RM, Herard P, Blackwell N, Abgrall S, et al. Multidrug-resistant chronic osteomyelitis complicating war injury in Iraqi civilians. *J Trauma.* 2011;71(1):252–4. doi:10.1097/TA.0b013e31821b8622.

19-Jerzy K, Francis H. Chronic osteomyelitis – bacterial flora, antibiotic sensitivity and treatment challenges. *Open Orthop J.* 2018;12:153–63. doi:10.2174/1874325001812010153.

20-Bauhahn G, Veen H, Hoencamp R, Oim N, Tan ECTH. Malunion of long-bone fractures in a conflict zone in the Democratic Republic of Congo. *World J Surg.* 2017;41:2200–6. doi:10.1007/s00268-017-4008-5.

21-Älgå A, Wong S, Shoaib M, Lundgren K, Giske CG, von Schreeb J, et al. Infection with high proportion of multidrug-resistant bacteria in conflict-related injuries is associated with poor outcomes and excess resource consumption: a cohort study of Syrian patients treated in Jordan. *BMC Infect Dis.* 2018;18(1):233. doi:10.1186/s12879-018-3149-y.

The bedrock of these services relies on the capacity of the microbiology laboratory to diagnose and monitor the evolution and treatment of bone infection and to perform antibiotic sensitivity tests. **This comprehensive package of tertiary services is mandatory in order to help restore and recover lives.**

So far, there is no dedicated osteomyelitis treatment centre in Gaza, and although MSF had received the green light to establish a centre at one of the MoH hospitals, the capacity of the MSF-led osteomyelitis treatment centre will not be sufficient to manage the existing cohort of cases. Furthermore, the microbiology capacity across the Gaza Strip is also limited.

Meanwhile, limb reconstructive resources are scattered across Gaza and there is neither dedicated operating room capacity nor ward bed capacity. The local limb reconstruction surgeons are currently working at Al-Shifa Hospital, often facing difficulties in having access to dedicated bed space, and at the European Gaza Hospital. Supported by MAP-UK and IDEALS charity. The MoH has been conducting complex reconstructive procedures at the Al-Shifa and the European Gaza hospitals with training and additional supplies since 2014.

A baseline assessment by the Health Cluster revealed that the ICRC had been running a 40-bed ward at Al-Shifa Hospital for infected patients or those in need of early reconstructive or pre-reconstructive procedures. MSF-Belgium has been running a 10-bed ward at Al-Awda Hospital for late reconstruction. MDM-S is contributing to screening for late reconstructive patients.

In order to harmonize these efforts, the Health Cluster established a Limb Reconstruction Task Force co-chaired by the MoH. Members of the Limb Reconstruction Task Force, led by the MoH, agreed on the criteria for limb reconstruction screening and for identifying patients in need of major limb reconstruction surgeries. These criteria will help the MoH in identifying the actual caseload of patients needing limb reconstruction and allow it to regulate and monitor service provision, in addition to identifying the referral pathways and treatment protocols. Fig. 20 shows the limb reconstruction pathway.

Taking into consideration the current estimates, and from lessons learnt, the Health Cluster partners, together with the MoH, proposed the development of a centralized, multidisciplinary limb reconstruction unit, in addition to an osteomyelitis treatment centre and enhanced capacity of microbiology, in order to deal with the growing number of patients in need of extra specialized care. A unified screening protocol and rationalized use of antibiotics is essential.

WHO has dedicated itself to supporting the development of a Limb Reconstruction Unit led by the MoH. This will centralize knowledge while rationalizing human resources, time, equipment and costs. Visiting medical teams will also be able to focus their interventions in a centralized structure, maximizing training opportunities, in particular for the younger resident staff.

“
The team worked with me step by step. I am very grateful for all the specialists who helped me. They gave me my life back”,
”

Moneer, injured person

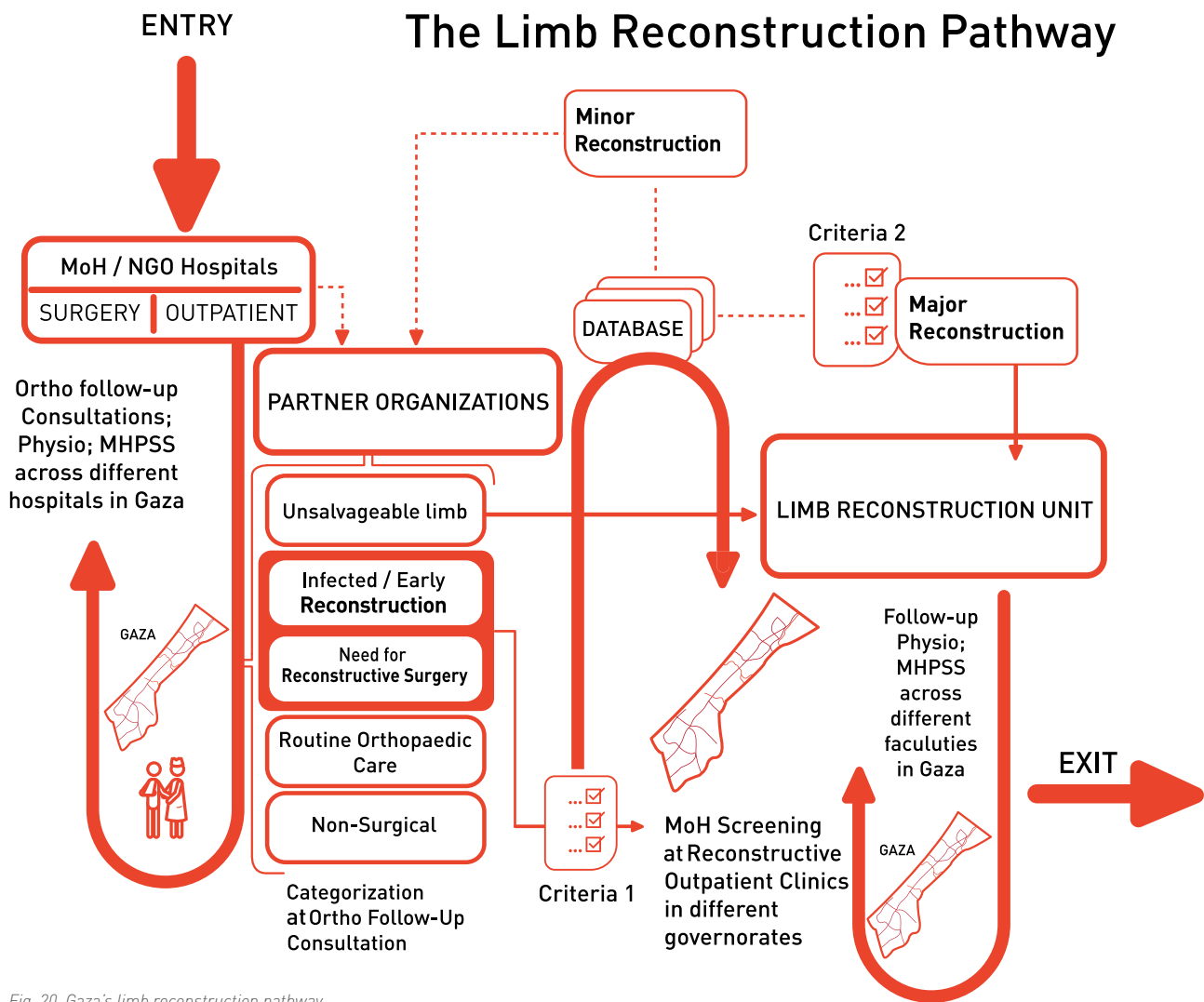


Fig. 20. Gaza's limb reconstruction pathway

Preventing further disability

- Investment in microbiology, osteomyelitis, limb reconstruction and other tertiary services such as neurosurgery is essential for preventing further disability
- Multidisciplinary rehabilitation teams need to be scaled up to help restore lives, including the provision of mental health and psychosocial support
- Strengthening of the existing information systems and referral mechanisms between hospitals and rehabilitation providers is critical.



Performance of the referral pathway



Prehospital health care

Timing

Two weeks before the start of the mass demonstrations, WHO conducted an Emergency Medical Team (EMT) Awareness Workshop in Gaza, with a focus on the development of national emergency medical teams. Following this workshop, the MoH decided to operationalize the EMT concept, in view of the upcoming protests planned for the end of the same month, by establishing TSPs in surge support of the Palestinian Red Crescent Society (PRCS).

Location

A total of 10 TSPs were established across Gaza, located within 400 to 1000 m of the Israeli perimeter fence, where the mass demonstrations are held. Five TSPs were managed by the PRCS and five by the MoH. The distribution and number of the PRCS TSPs changed according to the needs throughout the period of the event. In fact, the flexible and inflatable tented structures of the PRCS TSPs allowed for ease of mobility and could be set up strategically close to the mass demonstrations. On the other hand, the MoH TSPs were improvised structures built with local materials and containers and therefore fixed. The strategic location of the TSPs meant that ambulances could be placed on standby at each of the 10 TSPs, ready to immediately transfer stabilized patients to the hospitals.

Structural components

Initially, the TSPs absorbed only a proportion of minor injuries, allowing severe patients to be directly transported to the hospitals. This approach meant that the TSPs were not being used to their full potential, as the most severe patients were not stabilized before reaching the emergency departments, potentially facing a higher risk of death during transportation. **Over the course of the year, WHO, with the timely support from ECHO, backed the MoH and PRCS to evolve the TSPs from an improvised treatment point for lightly injured patients to a mandatory triage, treatment and stabilization point for all casualties.** This included restructuring and increasing the numbers of staff, training and capacity-building of the existing staff on conflict-related trauma care, and improved internal organization of the TSPs to have dedicated room for “red patients”, otherwise referred to as severe patients. Over this period, the main function of the TSPs evolved from triage, treatment and discharge of patients with minor injuries to include resuscitation, stabilization and referral of those with more critical injuries.

Aiming to increase quality of care and patient safety at the TSP level, WHO adapted the global [WHO Trauma Care Checklist](#) to the crisis context in Gaza to improve the quality of prehospital trauma services. The checklist aims to ensure that trauma patients have a better chance of survival through life-saving interventions provided directly at the TSPs. Refer to Annex 1 for the field-adapted trauma care checklist.

Transportation

As TSPs evolved, ambulances were placed on standby at each TSP to be ready to transfer patients to the emergency departments. With 161 ambulances in the Gaza Strip¹⁸ distributed across 10 TSPs in five different governorates, this ensured that severely injured patients always had available transport.

As the mass casualties continued to overload the system, the main providers of ambulance care, the PRCS and the MoH, were surge supported by other service providers. These providers included the Civil Defence, Union of Health Workers Committee (UHWC), Palestinian Medical Relief Society (PMRS), Public Aid Hospital, Hayfa Charity Hospital (HCH) and Dar Assalam Hospital. The additional ambulance providers also provided first-aid care and ambulance transportation from the point of injury, near the fence, to the TSPs.

¹⁸ -The breakdown of ambulances is 70 PRCS, 69 MoH and 22 NGO ambulances.

Coordination

The MoH activated their Emergency Operations Centre and subsequently the Health Cluster activated the Prehospital Task Force in order to standardize care at the prehospital level.

Data collection

Information about the number and type of casualties has significantly evolved during the 1-year period. Both the collection process and the analysis were subject to dedicated interventions to ensure proper standardization of the information being collected, as well as its subsequent analysis and dissemination. In 2019, the Health Cluster continues to support both MoH and PRCS TSPs and ambulance services to move into electronic data collection at the point of care. This will further enhance the system's capacity to collect and analyse data in real time.

Through the Prehospital Task Force, MoH, PRCS and the Health Cluster worked together to standardize the prehospital trauma indicators, taking into consideration the current limitations of the system. In particular, time-bound trauma indicators, such as time to haemorrhage control, or time to TSP, were deliberately not included because of the limited resources in the system to adequately capture these data.

Outputs

Initial findings reveal that the upgrade of the TSPs led to an unprecedented decrease in the number of patients arriving at the hospitals. In fact, throughout the period of analysis, **of 21 161 casualties presenting to the TSPs, 11 392 cases were treated and discharged, removing a burden of over 40% from the already overloaded and under-resourced hospitals.** MoH and PRCS TSPs treated and discharged 65% and 35% of the casualties, respectively, with an average "treated and discharged rate" of 54%.

Sustainability

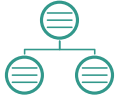
Lessons learnt are still being incorporated into daily practice and are strengthening the system that will remain in place even beyond this emergency. According to global WHO guidelines, these TSPs have been developed to fit a special category of health-service delivery known as Emergency Medical Team-Type 1 Fixed, but in this case, they are designed to manage trauma patients in conflict settings.

In addition, the local TSPs can be integrated within the national preparedness and response plan for future emergencies. Global positioning system mapping of alternative locations for TSP deployment inside Gaza has already been conducted, and several places have been identified in the different governorates, including schools, parking lots and sports fields. This planning will very much facilitate the operationalization of future TSP deployments in response to future emergencies in the occupied Palestinian territory, including conflict, sudden-onset disasters or outbreaks.

Furthermore, converting PHC doctors and nurses into front-line trauma managers, who provide life- and limb-saving interventions, is not an easy task anywhere in the world, but this successfully took place in Gaza through training and the development of standards of care.

Additionally, the combined efforts of all partners allowed for the training of 985 paramedics and first aid providers and 3882 community members. Refer to Table 6 for a summary of prehospital activities.

Table 6. Summary of prehospital activities



Structural processes

Training for **985** paramedics, **50** trauma stabilization staff and **3 882** community first responders

10 trauma stabilization points (TSPs) led by PRCS and MoH

9 ambulance service providers



Outputs

13 229 injured treated in the field by community first-aid volunteers

21 161 injured taken from the field to the TSPs for stabilization, treatment or referral

11 392 patients treated and discharged from TSPs (54%)

9679 injured transported to the hospitals by ambulance (including TSP bypass)



Coordination and information

Activation of the MoH Emergency Operations Centre

Health Cluster established the Prehospital Task Force

Development of standardized patient forms, data collection, and analysis by MoH and PRCS supported by WHO

Identified and agreed on prehospital trauma indicators for measuring system performance

Partners:

AAH, HCEP, HCH, MDM-F, MoH, PCRf, PMRS, PRCS, UHWC, UNICEF, WHO

المستشفى العربي
Gaza - غزة
Ahi Arab Hospital



Hayat Center
For Emergency Preparedness

PCRf
Palestine Children's Relief Fund



unicef
for every child

World Health
Organization

وزارة الصحة الفلسطينية
Ministry of Health

“

"Mohamed Abu Assi, 24 years, is a field nurse volunteer. While on duty, he was shot in the chest. Mohammad was immediately taken to the TSP in the resuscitation area, where he was intubated and a chest tube placed; he was then referred to the hospital. Mohammad is now alive. The TSP played a critical role in saving Mohammad's life".

”

Dr Salah, TSP Coordinator

Hospital health care

Location

Nine main hospitals responded to the increasing trauma casualties during each day of the mass demonstrations: Al Awda (NGO hospital), Al Aqsa (MoH), Al Najjar (MoH), Al Quds (NGO PRCS hospital), Beit Hanoun (MoH), European Gaza Hospital (MoH), Indonesian (MoH), Nasser (MoH), Al-Shifa (MoH). Of these nine hospitals, seven are MoH, one is PRCS (Al Quds) and one is governed by an NGO called the Union of Health Workers Committee (Al Awda Hospital). Three of the nine hospitals are located in the North Governorate of Gaza, two are in the Gaza City Governorate, one is in the Middle Area Governorate, two are in Khan Younis and one is in Rafah. Other NGO hospitals such as Al-Ahli Arab, Algerian, Amal and Kamal Udwan, as well as the MoH Ophthalmic Hospital, were also involved in the response but to a lesser degree. Annex 3 illustrates the locations of these hospitals in the Gaza Strip.

Structural components

For some time, key health partners, including the ICRC, have invested in upgrading the emergency departments. This has led to improved organization and clinical skills. Furthermore, many of the local surgeons working in Gaza have had long-term exposure to conflict and are well rehearsed for working in high-intensity emergency settings with limited resources.

However, **the ongoing chronic challenges in Gaza have hindered further progress and there is a clear need for further investment in emergency medical services, including trauma surgery.** For example, emergency medicine is not a recognised specialty in the occupied Palestinian territory; there is therefore a severe shortage of dedicated emergency physicians and nurses in the local health system and few formal training opportunities to upgrade the skills of those working in the emergency departments. Furthermore, in Gaza, triage systems are not consistent and standardized, and there needs to be further investment in a national adopted triage protocol. For example, some agencies were training health-care staff on the emergency severity index triage algorithm, whereas others were training them on the simple triage and rapid treatment system. This multitude of protocols tends to take place in countries where there is no national adopted system; therefore, every effort should be made to encourage the local authorities to adopt a national system for all guidelines and protocols.



During the ongoing influx of casualties, many hospitals were responding to the trauma casualties while simultaneously struggling to respond to ongoing non-trauma needs. This meant that many services were affected during the mass demonstrations, including elective surgeries. Within a context like Gaza, where mass casualty events are frequent, it may be more resource effective to have dedicated trauma hospitals with dedicated backup hospitals to absorb the non-trauma emergency patients.

Lastly, crowd-control measures in hospitals appear to be an ongoing challenge, not only for family and relatives of the patient, but also for health-care staff when treating a patient.

Although there is room for continued improvement, there are also good examples of best mass casualty management practices found at Nasser Hospital and Al Awda Hospital. These hospitals, the former from the MoH and the latter from UHWC, prove that it is possible in Gaza, to achieve high standards of care during mass casualty events.

Supplies

The availability of medicines, disposables, laboratory reagents and basic medical equipment was chronically limited throughout the response. Not only was there a lack of resources across the Gaza Strip, but there was also a clear inequity between the governorates, with Najjar Hospital, located in Rafah, being particularly under-resourced and in need of urgent support.

As a collective response to the trauma emergency, WHO and Health Cluster partners supplied US\$ 6 226 322 worth of drugs, US\$ 3 333 493 worth of consumables, US\$ 2 738 404 worth of medical equipment and US\$ 866 700 worth of laboratory reagents. In total, approximately US\$ 13 164 918 million worth of medical supplies was provided. The majority of these donations were released to the MoH hospitals.

Surgical capacity

The lack of surgical specialities in Gaza, aggravated by the ongoing blockade, meant that operating rooms were often understaffed. On multiple occasions, the MoH requested additional support for key specialities, including vascular surgeons, orthopaedic surgeons, plastic surgeons and neurosurgeons. However, Gaza remains a chronic emergency, and specialized EMTs are needed for longer periods of time, which is challenging to implement. Nonetheless, partners responded by reorganizing local resources and by deploying international EMTs, in addition to absorbing cases in need of elective surgery in order to alleviate some of the burden from public hospitals.

The Palestine Children's Relief Fund (PCRF), Medical Aid for Palestinians-UK (MAP-UK), Médicos del Mundo-Spain (MDM-S), Médecins du Monde-France (MDM-F), Qatar Red Crescent Society (QRCS) and Physicians for Human Rights-Israel (PHR-I) deployed a total of 75 international EMTs (not including MSF and ICRC). These EMTs were international health professionals as surge support in response to the crisis in Gaza but none were verified according to the WHO EMT initiative. The 75 international EMTs were not always full teams often lacking in critical staff, such as anaesthetists and nurses.

An EMT call was issued by WHO in May 2018 to the global EMT community. There were a number of responders, but eventually no WHO-verified EMT was deployed from this global call.

Meanwhile, national partners, such as PRCS, UHWC, HCH and Al Ahli Arab Hospital (AAH), expanded their existing emergency services and offered secondary health-care services to patients of the mass demonstrations free of charge.

Coordination and communication

Many of the deployed EMTs were embedded in the local system, as proposed by the WHO EMT initiative under the “surgical specialized cell” EMT concept¹⁹. However, they were often without full teams and required local staff to provide essential support. As these EMTs are still not fully in line with the global EMT initiative, WHO has been encouraging them to upgrade their capacities in line with the EMT minimum standards.

Making sure that these teams meet the minimum standards of care, as well as tasking and monitoring their activities, should be the role of the MoH through a dedicated “emergency medical teams- coordination cell” (EMT-CC). This is the command and control centre for all matters related to EMTs, either national or international. In Gaza, due to the protracted emergency, EMTs have been managed for many years in a non-standardized way. This is why the setup of this permanent coordination cell is critical for the future of EMT operations in the occupied Palestinian territory, as it will give the MoH a powerful tool to optimize, coordinate, monitor and integrate the emergency health activities being performed by a multitude of actors as part of the wider support to the health emergency situation.

Towards the end of 2018, WHO initiated a programme to help establish a permanent subnational EMT-CC in Gaza as an MoH structure. This project is ongoing and is expected to be completed by May 2019. Until then, the Health Cluster has established a temporary mechanism to identify each EMT location, duration of mission, type and speciality by developing a simple online EMTs calendar on the oPt Health Cluster website²⁰.



Photo credit to Union of Health Workers Committee Al Awda Hospital

Data collection

The different health information systems used in the emergency departments are not well designed to deal with acute emergencies and escalations of violence. Private NGO hospitals currently operate their own systems, which are not linked to the MoH, and the MoH electronic system has not been fully deployed in all MoH hospitals and departments. When patient documentation is undertaken, the records are not fully complete, which makes it challenging to conduct a thorough analysis of the activities conducted at the hospital level. Many hospitals need to upgrade by investing in electronic health records, proper patient data collection at all levels and analysis for evidence-based policy decisions.

19 -Classification and minimum standards for foreign medical teams in sudden onset disasters. Geneva: World Health Organization; 2013 (https://www.who.int/hac/global_health_cluster/fmt_guidelines_september2013.pdf?ua=1, accessed 15 April 2019).

20 -EMTs calendar. Occupied Palestinian Territory Health Cluster (www.healthclusteropt.org, accessed 31 March 2019).

Detailed surgical records from operations performed are being manually collected at the time of writing. Therefore, a complete and detailed analysis of emergency surgeries for injuries resulting from the mass demonstrations has not been included here.

Outputs

The international EMTs collectively supported local staff in providing a total of 744 acute surgeries to 549 patients injured during the mass demonstrations and supported public and NGO hospitals in performing 2467 elective surgeries on 2456 patients in order to bridge the gap created by the large surge of trauma patients²¹. The MoH coordinated service delivery at the hospital level.

Sustainability

Generally, access for health-care staff to leave Gaza in order to upgrade their skills is extremely challenging. Instead, the local doctors, nurses and health-care staff were able to draw on the skills of visiting EMTs and learn on the job. This allowed for an alternative way to train and build skills in the local health system.

A cumulative number of 2594 doctors, 637 nurses and 10 laboratory and x-ray technicians received training. Training sessions on key areas included first-aid, resuscitation, debridement, osteomyelitis treatment and limb reconstruction. However, training provided by various agencies was often based on different curriculums, ranging from 1-day workshops for over 100 people to 3-day classroom training for 20. This explains the high number of doctors who received some form of training as part of the response to the Gaza mass demonstrations.



Photo credit to Union of Health Workers Committee Al Awda Hospital

Until the end of March 2019, a total of 1757 patients were screened for reconstructive surgery; however, initial analysis revealed that screening among partners was not harmonized because of the lack of a dedicated national screening protocol.

Medical teams were able to perform 493 early reconstructive surgeries and 376 late reconstructive surgeries. Refer to Table 7 for a summary of hospital activities.

²¹ -In addition, MSF operated on 2008 patients and conducted a total of 3428 surgical acts.

Table 7. Summary of hospital activities



Structural processes

Provision of essential medicines, disposables, laboratory reagents and medical equipment with a total value of approximately US\$ 13 million distributed as follows:

- **US\$ 6 226 322** for drugs
- **US\$ 3 333 493** for consumables
- **US\$ 2 738 404** for medical equipment
- **US\$ 866 700** for laboratory reagents

75 international EMTs were deployed

On-the-job and clinical training for:

- **2 594** doctors
- **637** nurses
- **10** laboratory and x-ray technicians



Outputs/Service delivery

16 622 patients were admitted to hospital emergency departments, including **4 390** patients received at non-MoH hospitals

75 international EMTs deployed

744 acute surgeries performed on **549** patients at non-MoH hospitals²²

393 injured patients further referred from non-MoH hospitals to MoH hospitals

2 467 elective surgeries performed on **2 456** patients by international teams in non-MoH hospitals

1 757 patients screened for reconstructive surgery

493 early reconstructive surgeries

376 late reconstructive surgical interventions

MoH hosted the development of the ICRC ward in Al-Shifa Hospital and other incoming EMTs



Coordination and information

Activation of the MoH Emergency Operations Centre

Health Cluster established the Hospital Task Force

Health Cluster developed the EMTs calendar to temporarily map the EMTs

WHO to support the setup of a subnational EMT Coordination Cell within the MoH

Health Cluster established a Limb Reconstruction Task Force co-chaired by the MoH lead limb reconstruction surgeon

MoH, together with the partners, set criteria for identifying patients in need of major limb reconstruction surgeries

Partners:

AAH, ACS, HCH, IRP, MAP-UK, MDM-F, MDM-S, MoH, PCRF, PHR-I, PMRS, PRCS, QRCS, UHWC, UNICEF, UNRWA, WHO



22 -In addition, MSF operated on 2008 patients and conducted a total of 3428 surgical acts

Postoperative and rehabilitative health care

The postoperative journey of a patient starts at the inpatient departments of the MoH and NGO hospitals, where the patient receives postoperative and rehabilitative care, including primary wound management, additional surgical treatment, physiotherapy, provision of assistive devices, and mental health and psychosocial support.

In the MoH facilities, discharge of inpatients was accelerated earlier in the week, in anticipation of the increased trauma load associated with the weekly Friday protests. A proportion of these discharges could be considered premature. **The limited resources, staff and capacity hindered the progress of postoperative care and rehabilitation and resulted in a high dependency on international and national NGOs to cover the gaps in service delivery.** As a result, after discharge, the vast majority of patients opted to seek services from NGO service providers.

Seventeen partners responded to needs by providing surge postoperative care, with Humanity & Inclusion (HI) playing a key role in terms of raising the profile of rehabilitation needs and the establishment of multidisciplinary outreach teams in partnership with five local NGOs. The expansion of the primary health-care services of the United Nations Relief and Works Agency for Palestine Refugees (UNRWA) to integrate postoperative and rehabilitation care for those injured from the mass demonstrations helped absorb a significant proportion of the caseload. Other providers, such as the PMRS, established outreach teams and encouraged a multidisciplinary approach. MSF was also one of the main providers for postoperative care through their clinics across the Gaza Strip and conducted 118 890 post-operative dressing sessions, in addition to 78 482 physiotherapy sessions.

Not including MSF, an additional 100 508 postoperative dressing changes were completed from 30 March 2018 to 30 March 2019. This high prevalence of postoperative dressing changes is the result of several factors, one of which is that no surgical solution is currently available for patients with complex injuries. In addition, the limited coordination among service providers led to duplication of services and patients “shopping around” for the same service from different providers.

With the objective to coordinate service delivery at the postoperative stage of the trauma pathway, and in order to prevent duplication and shopping for services among patients, the Health Cluster established the Postoperative Care and Rehabilitation Task Group.

In coordination with the MoH, the Health Cluster also developed the [Patient Allocation Tool \(PAT\)](#), which allows tracking of trauma patients at the postoperative and rehabilitation stages. Although efforts are under way to fully utilize this tool, further progress needs to be made before duplication of services can be completely eliminated.

One of the key areas of weakness was the lack of mental health and psychosocial support services integrated within the existing services, which was often limited by the lack of resources and skilled health-care staff available in Gaza.

WHO's expert Mental Health & Psychosocial Support (MHPSS) team provided technical support to the Health Cluster response in order to better integrate MHPSS into trauma care. Although previous efforts had been done to strengthen community mental health services through the integration of mental health into primary healthcare centres, using the WHO mental health gap action programme (GAP), nevertheless, as the cohort of complex injuries continues to grow, the effort to upscale the MHPSS response in Gaza remains stagnated because of a lack of resources.

Partners throughout the response noted the limited information on patient referral, particularly those in need of protection services, including GBV. This remains an outstanding challenge as there is a clear need to strengthen the inter-cluster coordination between the Health and the Protection Cluster for patients in need of protection.

Outputs

From 30 March 2018 to 30 March 2019, Health Cluster partners conducted 100 508 dressing changes, 75 078 physiotherapy sessions and 12 501 occupational therapy sessions. In addition, 8701 assistive devices were distributed to people with injuries. In support of the well-being of patients and caregivers, partners conducted 14 131 mental health support sessions, 798 group therapy sessions and 21 160 psychosocial support sessions. Refer to Table 8 for a summary of postoperative and rehabilitation interventions.

Table 8. Summary of postoperative and rehabilitation interventions



Structural processes

Provision of essential medicines to patients, worth US\$ 6 million

Training of:

61 physiotherapists

15 rehabilitation professionals

598 households of beneficiaries



Outputs/Service delivery

100 508 postoperative dressing changes²³

75 068 physiotherapy sessions²⁴

12 501 occupational therapy sessions

8 701 assistive devices distributed

35 291 mental health and psychosocial support sessions

798 group therapy sessions



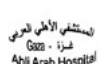
Coordination and information

Health Cluster established the Postoperative Care and Rehabilitation Task Force in order to improve coordination

Health Cluster developed the Patient Allocation Tool (PAT) to improve coordination of postoperative care among patients. This is now in the process of being transferred to the MoH

Partners:

AAH, ACS, DWWT, GCMHP, HCH, HI, MAP-UK, MDM-F, MDM-S, MoH, NCCR, PCRf, PHR-I, PMRS, PRCS, UHWC, UNICEF, UNRWA, WHO



²³ -In addition, MSF conducted 118 890 post-operative dressing sessions.

²⁴ -In addition, MSF conducted 78 482 physiotherapy sessions.

Health access for those injured during demonstrations

Patients needing access out of Gaza through Erez terminal to health facilities in Israel and the West Bank, including East Jerusalem, are required to apply for Israeli permits to travel. From 30 March 2018 to 30 March 2019, according to Gaza's Coordination and Liaison Office, there were 524 applications to Israeli authorities by those injured in demonstrations to exit Gaza via Erez crossing. Of those applications, 92 (18%) were approved, 141 (27%) were denied and 291 (56%) were delayed. According to Rafah terminal authorities, 245 patients injured during the Great March of Return exited to Egypt in 2018.

“

"My daughter was injured. Whenever my husband passes by and sees our daughter bedridden, he tells me it is my fault that her future is ruined. This has a huge negative impact on the mental well-being of my daughter and I",

Mother of an injured person

”



Violent incidents involving health care

Violent incidents involving health staff and health facilities can prevent or hamper the effective delivery of medical care, including effective trauma response.



From 30 March 2018 to 30 March 2019, there was a surge in violent incidents involving health care. **WHO recorded 446 incidents involving health care in Gaza; in comparison, in 2017, 24 incidents were reported during the year.**

During the reporting period, three health workers were killed and 731 injured in 446 recorded incidents involving health staff and facilities, and 104 ambulances, six other health vehicles and six health facilities were damaged. In addition, a hospital, a specialized health centre for people with disabilities and the MoH central ambulance station were damaged as a result of Israeli air strikes, as well as three medical points on the eastern side of Gaza Strip. Refer to Fig. 21 for incidents involving health care and Fig. 22 for a breakdown by cause of injury on violent incidents involving health workers.

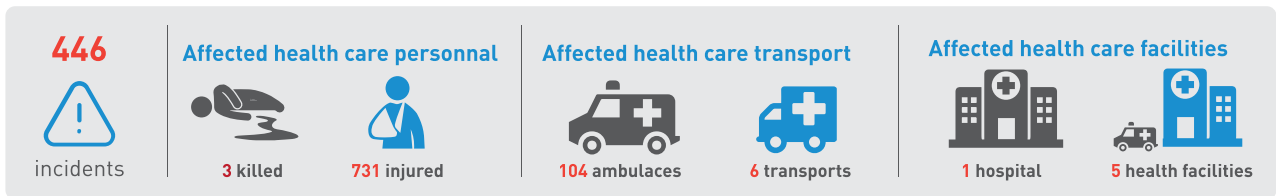


Fig. 21. Incidents involving health care

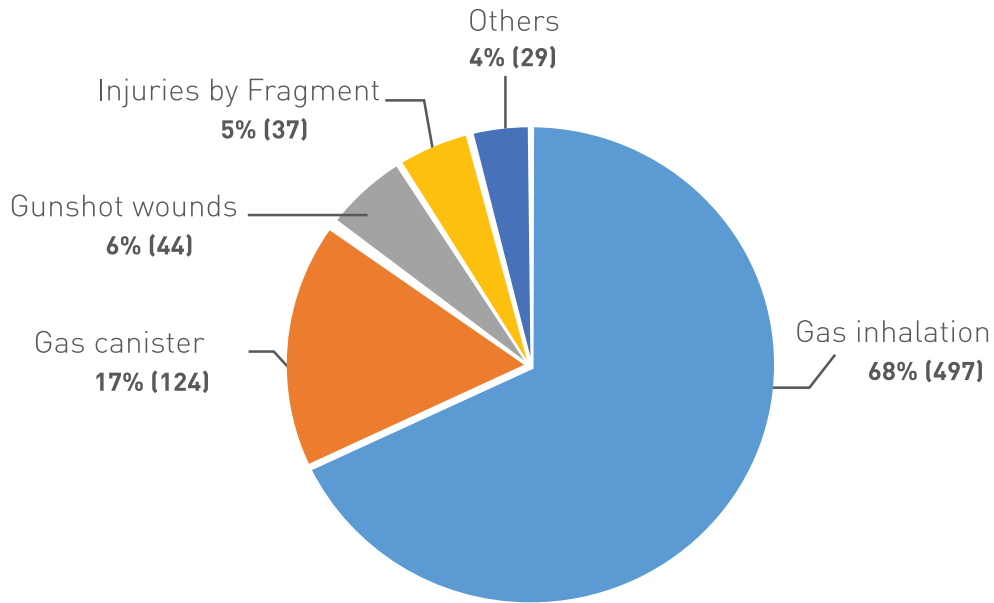


Fig. 22. - Violent incidents involving health workers. Breakdown by cause of injury; n = 731

“

"I accept what happened to me and believe that God will replace those days with better ones,"

M.J, injured person

”

Impact of trauma on other health services



“A crisis on top of a catastrophe”

The surge in humanitarian needs took place within the context of an already under-resourced and chronically challenged health system coping with a 12-year blockade and successive conflicts.

Factors such as the energy crisis, shortages in medicines and medical disposables, departure of health staff and the Palestinian political division have also added substantial burdens to the existing fragile humanitarian situation, described by the United Nations (UN) Coordinator for Humanitarian Aid and Development in oPt, Mr Jamie McGoldrick, as “a crisis on top of a catastrophe”.

Depleted medical resources

In Gaza, there are chronic shortages of medicines, disposables and other medical supplies such as equipment. Lack of medicines and disposables is particularly severe, according to the Central Drug Store in the MoH.

The Central Drug Store in Gaza supplies all 14 MoH hospitals (2349 beds)²⁵ and 49 MoH primary health care (PHC) clinics in Gaza. These health facilities provide 40% of Gaza’s PHC, covering approximately 600 000 people and 90% of all hospital care services.

The available data from the monthly Central Drug Store MoH reports reveal that the percentage of zero stock medicines was between 45% and 47% in January and February 2018, respectively. **After the first month of the demonstrations in April 2018, Gaza’s Central Drug Store reported that 50% of medicines had reached zero stock (defined as less than a 1-month supply); the burden of trauma meant a higher consumption rate of essential drugs and disposables.**

These numbers oscillated between 48% to 50% during the first 4 months after the demonstrations from April to July, but then decreased again, reaching minimum levels of 39% in November. We can conclude that the impact of the trauma burden on the supply of medicines was absorbed in a timely way by the system that was put in place and that ultimately, the mobilization efforts from the different partners to respond to the trauma needs were beneficial for the whole system. Refer to Fig. 23 for a monthly analysis of the percentage of medicines available at less than 1 month’s supply at the Central Drug Store, MoH.

²⁵ -According to the Health Cluster Health Resources Availability Mapping System (HeRams).

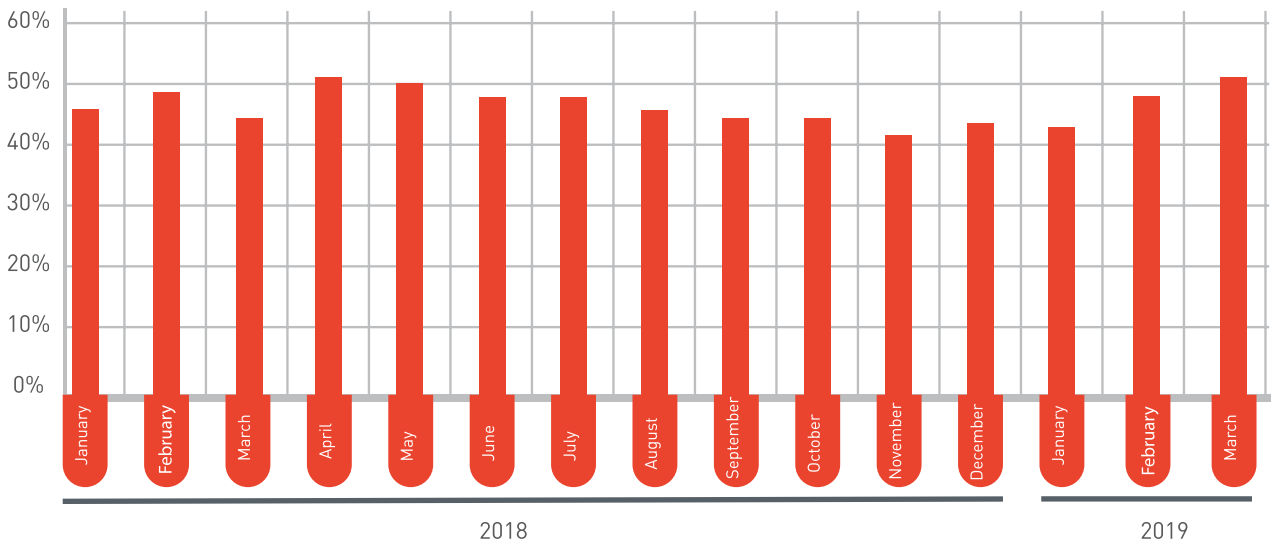


Fig. 23. Percentage of essential drugs at zero stock level (less than a month of stock) in the Central Drug Store in Gaza, 2018–2019.

Energy crisis

The limited and unpredictable electricity supply to the Gaza Strip, with an average of 7 hours of electricity per day from the grid in 2018, had negative implications for the health sector. Hospitals and clinics depend on the provision of fuel to supply emergency generators.

Analysing the existing data extracted from the Health Resources Availability Mapping System (HeRAMS)²⁶, for a period of 3 months after March, there was a slight increase in fuel consumption due to the decrease of available energy from the main grid on a daily basis. The average number of hours of electricity from the main grid kept increasing until the end of the year, with a maximum of 15 hours of availability in November 2018. This reduced dependency on the backup fuel for generators. With the limited amount of information, it is not possible to determine whether or not there was a direct impact on the fuel needs as a result of the mass demonstrations; however, anecdotal evidence would suggest that the increased number of surgeries on each day of the demonstrations (often on Fridays) meant that hospitals had to stay open for longer, relying on the main electricity or the backup fuel. Refer to Fig. 24 for the average hours of electricity per day from the main grid.

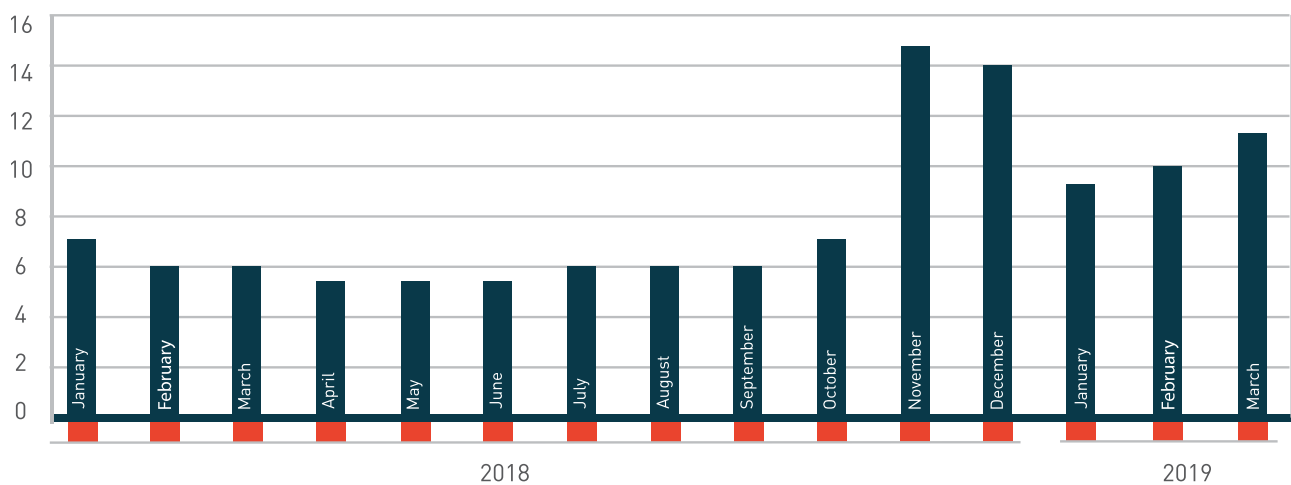


Fig. 24. Average hours of electricity from the grid per day in Gaza, 2018–2019 [source: OCHA]

26 -HeRAMS dashboard (hospitals). Occupied Palestinian Territory Health Cluster (<http://healthclusteropt.org/pages/9/herams-hospitals>, accessed 31 March 2019).

Indirect victims

The health system's capacity to adequately meet the rising needs and absorb the high rates of trauma casualties has been stretched to the limit. To accommodate the new influx of trauma cases every Friday, hospitals discharged existing in-patients in advance of their planned discharge date. A proportion of these discharges may have been premature.

In addition, non-trauma patients were also affected by limited access to secondary and tertiary health-care services, as the majority of service providers were focused on absorbing the high numbers of trauma casualties. **In 2018, the MoH reports that approximately 8000 elective surgeries were postponed due to lack of hospital capacity.**

Analysing the number of elective surgeries performed per month in MoH hospitals (see Fig. 25), it is clear that there was a decline in the number of elective surgeries from March to May (2849 down to 1217). The number of elective surgeries had been progressively increasing since then, but by the end of December, they had still not matched the number of elective surgeries conducted in the first quarter.

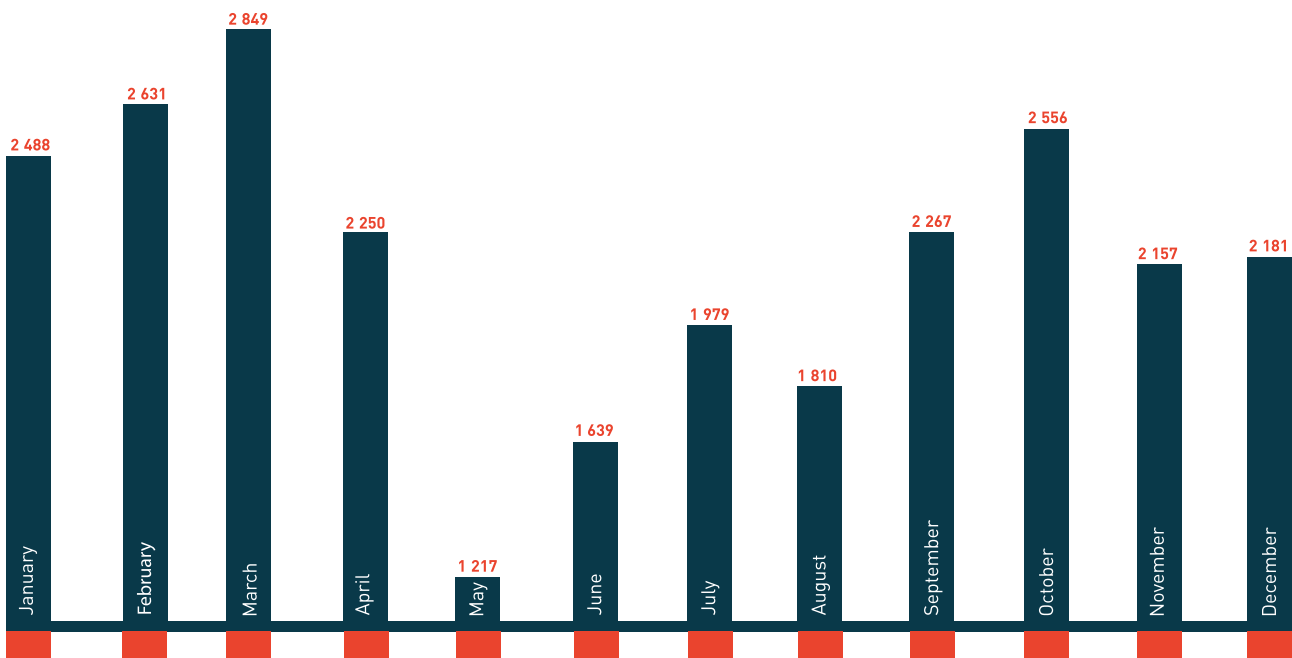


Fig. 25. Total number of elective surgeries performed by month in Gaza (2018)

“In the past year, I have seen so many desperate patients and families. Our job gets too overwhelming. After work, I go home mentally and physically exhausted. I'm unable to interact, either with my wife or my child. I keep thinking of the cases we see. It makes me incredibly sad”.

Mohammad Ghazal, social worker

Furthermore, using ear, nose and throat (ENT) elective surgical procedures as a measurable indicator of elective procedures (Fig. 26), the average waiting time for ENT elective surgery in Al-Shifa Hospital (Gaza's largest hospital) in the first quarter of 2018 was 12 months²⁷. This number increased in the second quarter, reaching a maximum of 16 months in June, and then decreased again to 14 months for much of the third and fourth quarters of the year. One explanation for the decreased waiting time in these quarters for ENT elective surgery lies in the effort made by two local Health Cluster partners, Al Ahli Arab NGO Hospital and Al Awda NGO Hospital, to absorb approximately 400 cases at their hospitals. One year after the start of the demonstrations, the waiting time for ENT surgery was at the levels of February 2018.

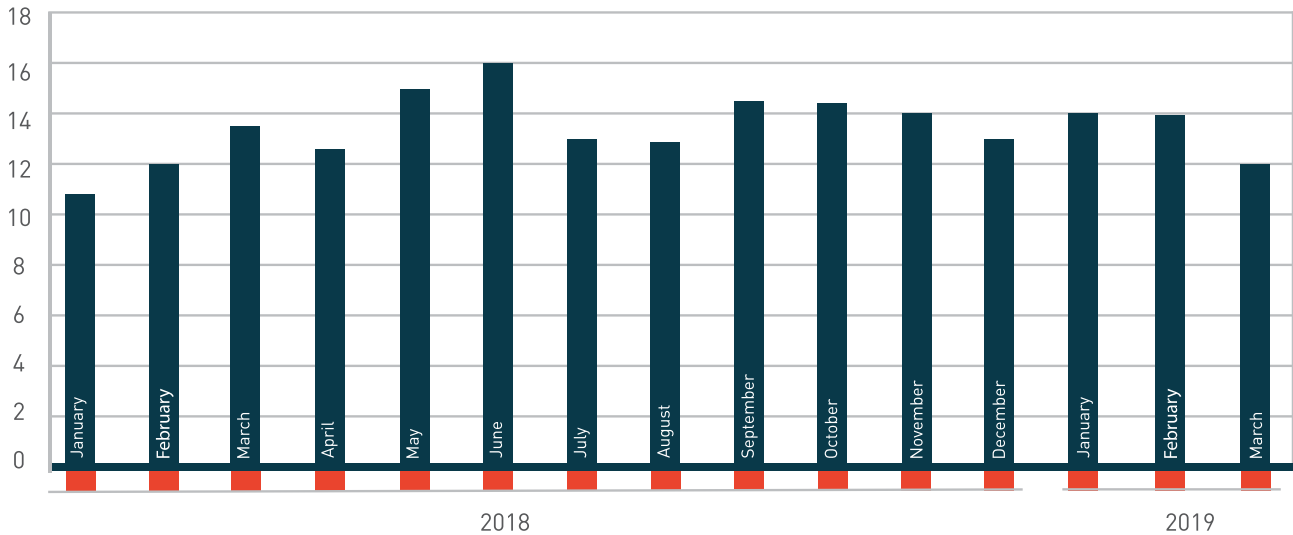


Fig. 26. Waiting time in months for elective surgeries (e.g. ENT) at Al-Shifa Hospital

We can conclude that there was a real impact on the number of elective procedures and waiting list time as a consequence of the increased trauma burden. Although the average waiting time for elective surgery has recovered to pre-demonstration levels, the number of elective surgeries taking place remains below the levels before the demonstrations.

With the limited amount of available data, it was not possible to determine whether there was any impact on non-trauma emergency cases. In addition, it was not possible to analyse the level of care in the intensive care units.

“

"No life is bearable with despair. Life is like a river, it keeps going. I almost lost hope, but thanks to NCCR, I have regained my faith in life".

Atallah, injured person

”

²⁷ -WHO is monitoring the elective waiting time each month.

Salary payments for health staff

The split of the Palestinian civil service has reduced the capacity of local institutions in Gaza to deliver basic services, to respond to emergencies and to enforce the rule of law, increasing the hardship of the population.

According to the MoH in Gaza, there were 10 498 employed staff working for the MoH at 49 PHC centres or at the 14 hospitals across the Gaza Strip. Of these, 6066 employed by de facto Gaza authorities have received an average of only 40% (340 US dollars at a minimum) of their total salary every 40–50 days since 2014. The remaining employees are on the Palestinian Authority payroll and an increasing number have had their salaries cut by 30–50% since March 2017.

The impact of the salary cuts has led to health professionals leaving Gaza to find employment elsewhere. This further contributes to professional unaccountability and an almost generalized lack of quality control over clinical care. In 2018 alone, 84 doctors left Gaza.

Access for health professionals

Access for health professionals entering and exiting the Gaza Strip is restricted. Data collected by the Ministry of Civil Affairs on applications for exit permits for work-related reasons for people in Gaza are not disaggregated for health-care professionals. However, only 23% of applications made by WHO for 48 health professionals to exit Gaza from 30 March 2018 to 30 March 2019 were successful. The majority of applications (69%) remained pending.

Health staff, including international emergency medical teams (EMTs), applying to enter the Gaza Strip to assist in the humanitarian response also face barriers to entry: 77% of health staff applications to enter Gaza were approved by Israel from 30 March 2018 to 30 March 2019.



Lessons learnt and the trauma toolkit

The occupied Palestinian territory, like many other contexts in the region, is suffering from an epidemic of trauma. The trauma analysis and partners' stories in this publication provide important lessons learnt for future efforts to improve the emergency response in similar contexts. These lessons can be easily applied to other locations, while giving weight to the local problems and adapting methods of working to the context of the operation.



Local champions

One cannot underestimate the power of local champions when it comes to implementing system changes. A committed health professional who is open to feedback, works directly in the field, and understands the difficulties, setbacks and challenges is often the key to successful implementation. **Identifying these key people at the onset of the response, investing in their skills and empowering them to further enhance the system are the fundamental ingredients for lasting change.**

There are many health champions in Gaza. Their role in disseminating protocols, procedures and best practices can only be praised. The TSP programme, for example would not have been a success without the commitment and dedication of two local champions, Dr Salah and Dr Fawas, TSP coordinators of the MoH TSPs in Khan Younis and Rafah, respectively.

Combined and comprehensive approach

There is enough evidence to demonstrate that improvements in infrastructure, equipment, communications and training are most effective when instituted together. The caveat is that this multifront simultaneous approach puts additional strain on the implementing organizations, which are already limited in terms of human resources and logistic capacity. A common pitfall among implementing agencies is that, often, additional emergency funding is used to cover existing staff, rather than to expand their capacity and deploy additional expertise. This is often a result of the chronic lack of funding available overall.

A combined and comprehensive response requires dedicated additional resources, including staff and long-term in-house expertise. This fact should not discourage the use of a system-wide approach, but rather alert the partners to the need to reinforce their human resources capacity in order to maximize effectiveness, results and outcomes.

Community involvement

The community, whether individuals or organized civil society, can also be active participants and key members of many of the trauma care interventions, as is the case with the volunteers who provide first-aid care at the pre-TSP level. More than 3800 community first-aid workers have been trained and are still being trained as part of the emergency response in Gaza, this is a good example of how a specific response activity builds resilience in the system by creating a pool of first-aiders who will persist beyond the demonstrations.

According to the available data, only 2 patients of 5969 who had high-energy GSW injuries to the limbs died on-site from compressible exsanguinating haemorrhages (overall case fatality rate 0.03%). This is a clear example of how basic training for community volunteers in conflict settings can improve survivability within the first 5 minutes, otherwise known as “platinum 5”, which is way beyond the traditional civilian “golden hour” target^{28, 29, 30}.

Evidence-based policy decisions and political commitment

No emergency response can be properly delivered without policies and political commitment from the local authorities. This is even more important when an ongoing emergency is grafted on top of a chronic underlying situation.

Much coordination, diplomacy and engagement are needed among the decision-makers, as well as between authorities and partner organizations. The local authorities must be able to identify diseases that demand exhaustive resources from the health system, such as trauma. A health system that is already crumbling and does not have the ability to meet ongoing needs, such as medicine for cancer patients and treatment for myocardial infarctions (heart attacks), while responding to the trauma mass casualties requires evidence-based prioritization. For example, the prioritization of trauma interventions over non-trauma when the emergency departments are overloaded and patients are being prematurely discharged from the wards needs to be well understood and justified. Clear plans to develop backup mechanisms to absorb non-trauma needs must also be considered.


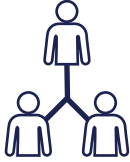



28 -Daban JL, Falzone E, Boutonnet M, Peigne V, Lenoir B. [Wounded in action: the platinum ten minutes and the golden hour]. *Soins*. 2014;(788):14-5. French.

29 -Clifford CC. Treating traumatic bleeding in a combat setting” *Mil Med*. 2004;169(12 Suppl):8-10, 4.

30 -Kotwal RS, Howard JT, Orman JA, Tarpey BW, Bailey JA, Champion HR, et al. The effect of a golden hour policy on the morbidity and mortality of combat casualties. *JAMA Surg*. 2016;151(1):15-24. doi:10.1001/jamasurg.2015.3104.

Briefing the health authorities regularly and working together on joint strategies that safeguard the underlying ongoing needs of non-trauma patients promotes trust and, most important, opens the door to political commitments.

Boxes 1 to 4 present a summary of the lessons learnt from the Gaza trauma response and lays the framework for a toolkit for future interventions.

| Box 1. The Gaza Trauma Toolkit: Overarching issues | | |
|---|--|--|
| Overarching issues |  Trauma pathway | <p>Recognizing the importance of the trauma care pathway and the continuum of care, from the point of injury to front-line emergency care, adequate transportation of casualties, injury management at secondary and tertiary hospitals, and postoperative and multidisciplinary rehabilitative care.</p> |
| |  Coordination | <p>Active engagement and partnership with the MoH ensures timely and effective delivery of care.</p> <p>Establish an EMT-CC for the overall coordination, allocation and monitoring of EMTs.</p> <p>Establishing a Trauma Working Group with dedicated task forces or task groups in key areas is essential for overall coordination and for ensuring a continuum of care.</p> <p>Close liaison between the Health and the Protection Cluster is essential to establish a clear referral mechanism for patients in need of protection.</p> |
| |  Patient data | <p>Standardization of patient forms, data collection and analysis should be mainstreamed across the trauma pathway at each level of care: prehospital, hospital and post-hospital.</p> |
| |  Sustainability | <p>Investment in development and coordination of national and local structures (including local NGOs), which can be further supported by international EMTs during a surge, can provide effective and sustainable trauma care that saves lives.</p> <p>Using international EMTs as an opportunity for training local health professionals contributes to sustainability.</p> |
| |  Support from the UN Humanitarian Country Team | <p>Active engagement of the Humanitarian Coordinator in raising the profile of trauma needs.</p> <p>Country-Based Pooled Funds, managed by OCHA, are a timely and flexible pool of funding resources that were an essential element in the Gaza trauma response.</p> |







| Box 2. The Gaza Trauma Toolkit: Prehospital | | |
|---|--|--|
| Prehospital |  Community front-line responders | Training community members in basic first aid is a highly effective and efficient approach to improving prehospital care, particularly where there is limited access or resources. |
| |  Trauma stabilization points | Airway and haemorrhage control interventions done within the first few minutes of injury, otherwise known as "platinum 5" at the TSPs, contributed to saving approximately 435 - 1227 lives. Triage at the TSP level allowed for severe patients to be prioritized for ambulance transportation. More than 50% of the patients were diverted from the hospitals, allowing for hospital resources to be allocated to the most severe patients |
| |  Ambulances | Clear referral lines from TSPs to hospitals with availability of specific services is critical to rationalize the use of ambulances. A centralized dispatch centre is an important function of prehospital care to ensure access to priority patients in a timely manner. |
| |  Patient data | There is need for further improvement in the quality of patient data to include time-bound indicators such as "time to control haemorrhage". |

Photo credit to WHO



Box 3. The Gaza Trauma Toolkit: Hospitals

Hospitals

| | |
|---|--|
|  <p>Human resources at the emergency departments</p> | <p>The ongoing chronic situation in Gaza led to a lack of dedicated emergency physicians and nurses in the local health system.</p> <p>A minimum doctor-to-nurse ratio of 1:2 should be the target in emergency departments; however, this is not a reality in Gaza. Training a cohort of local emergency nurses should be a priority for strengthening emergency systems.</p> <p>Basic trauma management protocols are sometimes disregarded during mass casualties.</p> |
|  <p>Mass casualty management</p> | <p>During mass casualties, emergency departments of major hospitals should shift into “trauma only” mode, backed up by secondary MoH and NGO hospitals in each governorate for non-trauma patients.</p> <p>In Gaza, triage systems are not consistent and standardized due to the lack of a national adopted protocol. WHO should advise the MoH to develop a national triage protocol.</p> <p>Internal and external crowd control is still a problem. Most hospitals do not implement efficient crowd control measures at the emergency department level.</p> |
|  <p>Patient data</p> | <p>Emergency department patient records are often incomplete and not standardized.</p> <p>Information on acute surgeries is often limited and incomplete, for example time-bound indicators are not included.</p> |
|  <p>Tertiary care</p> | <p>Investment in microbiology, osteomyelitis and limb reconstruction is essential for preventing further disability among the cohort of complex limb injuries.</p> <p>A screening protocol for limb reconstruction patients needs to be standardized and a centralized database must be created in order to designate patients to NGOs offering tertiary treatment.</p> <p>There must be clear national criteria for when to amputate.</p> <p>Antibiotic treatment protocols are lacking, leading to an increased risk of antibiotic resistance.</p> |



Box 4. The Gaza Trauma Toolkit: Postoperative care and rehabilitation

Postoperative care and rehabilitation

Patients are discharged early to make room for the weekly waves of trauma casualties. This contributes to wound complications, in particular when there is limited follow-up capacity.

Local authorities rely heavily on NGOs for community-based rehabilitation care. There is often a gap in the in-hospital rehabilitation care.

There are limited referral mechanisms between hospital care providers and rehabilitation providers.

Upgrading rehabilitation at existing PHC centres is an effective method of bridging the gap between in-hospital rehabilitation and community-based rehabilitation.

Multidisciplinary rehabilitation teams need to be scaled up to help restore lives, including the provision of MHPSS.



Partner's response and their stories

Prehospital stories



وزارة الصحة الفلسطينية
Ministry of Health

Story 1

Khan Younis TSP

“The mass influx of casualties from the Great March of Return in Gaza created a huge burden on the already overstretched hospitals. The trauma stabilization points (TSPs) were essential in alleviating some of this burden”.

“The Palestinian Ministry of Health, in collaboration with Health Cluster partners and with technical support from WHO, established TSPs throughout the critical zones, throughout the demonstration sites. The TSP is the first stop in the trauma pathway for the injured. It plays an important role in decreasing the mortality rate and morbidity of the victims, as well as in reducing the workload on the hospitals by treating and discharging minor injuries on the spot”.

“One of the TSPs is in Khan-Younis district, at the border of Khuzaa. It provides medical and paramedical services for injured cases. Despite the critical humanitarian situation due to the blockade and lack of adequate basic services, the Khan Younis district administration took full responsibility to prepare, run and follow up on the work at the TSP. The TSP was divided into five different areas: gas inhalation area, green area, yellow area, red area and resuscitation area. All primary health-care providers at Khan-Younis district – nurses, doctors and administrators – participated in the provision of emergency services at the TSP. They were trained in dealing with emergency cases. Additionally, many volunteers received permission to help and work after they were interviewed and trained”.

“Mohamed Abu Assi, 24 years, is a field nurse volunteer. While on duty, he was shot in the chest. Mohammad was immediately taken to the TSP in the resuscitation area, where he was intubated and a chest tube placed; he was then referred to the hospital. Mohammad is now alive. The TSP played a critical role in saving Mohammad's life”. Dr Salah, TSP Coordinator





وزارة الصحة الفلسطينية
Ministry of Health

Story 2

Rafah TSP

“The establishment of the trauma stabilization point (TSP) in Rafah was more challenging than the other TSPs. Rafah Governorate has a population of 265 000, with only four primary health-care clinics. However, the TSP succeeded. Every Friday, there were at least 10 doctors, 15 nurses, 54 volunteers and even an anaesthesiologist working in the TSP”.

“We feel proud. The TSP is a new step in our health system, and we succeeded in facing mass casualties in different categories, from simple trauma to extensive and severe trauma. At the beginning of the demonstrations, we faced serious difficulties in preparing the schedule for medical staff working in the TSPs. We had several meetings with all partners who worked in the medical field and started establishing a unified team. We succeeded in establishing one TSP in Rafah. We started with different health workers from different organizations, including PRCS, Kamal Udwan Hospital and PMRS, and the rest mainly from the MoH. We integrated the recommendations from WHO and the MoH in our daily activities. We started to work with about 27 medical volunteers, and eventually we ended up with about 85 medical volunteers and a huge number of youngvolunteers. We organized the activities by providing a schedule for each one of them and gave each person a chance to participate in the activities. Each Friday we refreshed our knowledge through some tutorial sessions, including information on staying safe”.

“The TSP was a big challenge, but we succeeded. Thanks to the follow-up of WHO through Nelson and Sara and every organization in Rafah. Thanks to everybody who helped us to achieve this goal”. Dr Fawaz Abu Ziada



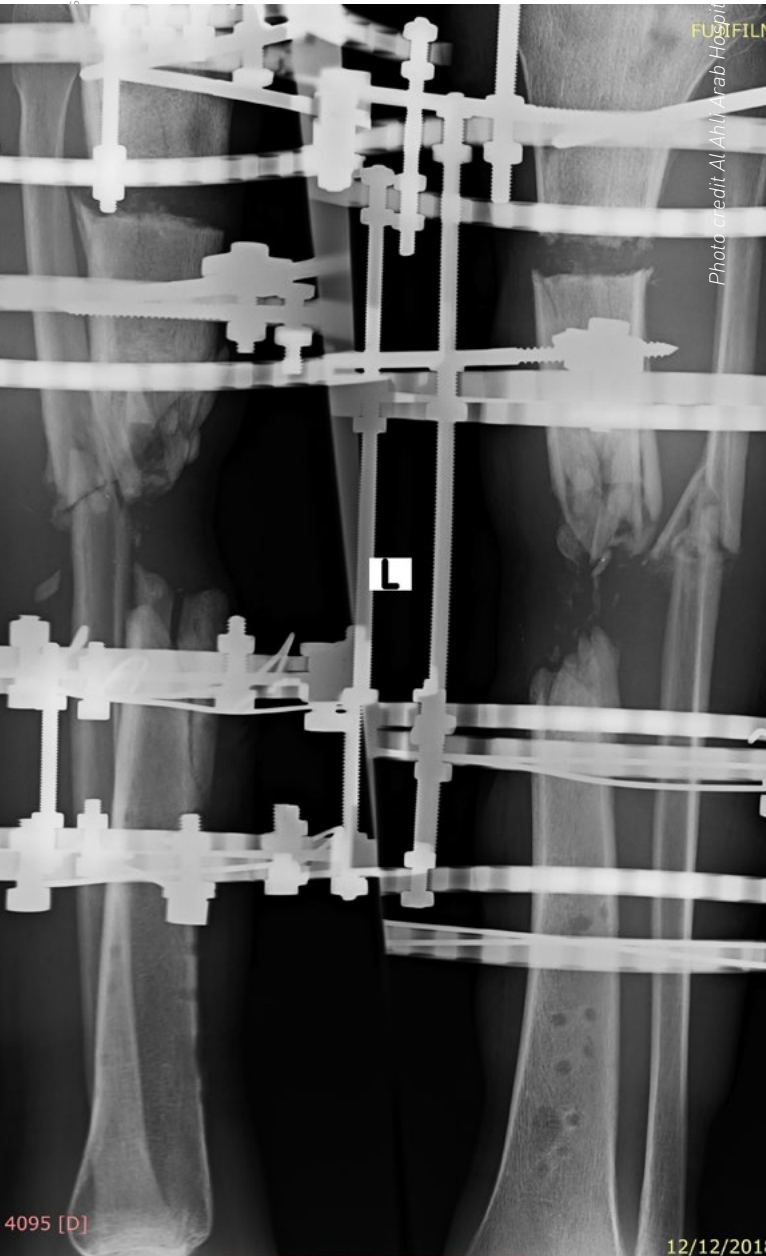
Photo credit: WHO

Hospital stories

المستشفى الأهلي العربي
غزة - غزة
Ahli Arab Hospital

Story 3

Ahli Arab Hospital (AAH) Wound management and infection control



Proper wound management and infection control has become a major issue in Gaza. Multiple factors, such as nosocomial infection, over crowdedness, lack of appropriate environmental hygiene and lack of resources, result in increased rates.

AAH has managed wounds for hundreds of injured patients. However, some of the wounds were not healing due to infections. "Infection control is crucial to minimize complications such as osteomyelitis and to prevent amputations and even death," said Dr Maher Ayad, Medical Director at AAH.

AAH management and Infection Prevention Control teams traced the source of the infection and collected 22 swab cultures from different locations of the hospital, including operating rooms and dressing rooms. The investigation showed that the bacteria *Klebsiella pneumoniae* was the source of infection. The appropriate antibiotic was selected and the infection treated. Colistin has proved to be the proper antibiotic to combat the bacteria.

"We have collected swab cultures from many locations, even from the operating room light, to learn whether the bacteria were in the hospital or came with patients, and we found that they came with certain patients", said Mr Ahmed Jarad, head of the laboratory department at AAH.

The infection prevention control team took additional measurements to control the infection, such as quarantine for the infected cases and use of a separate dressing kit for each patient.

"After 2 weeks, results were impressive and wounds were healing appropriately", Dr Maher Ayad added.

Atia Madi, a 21-year-old injured patient said, "My wound was severely infected, and I was hopeless. Doctors said that my body doesn't respond well to antibiotics. After 2 months at the hospital, there was still no progress. However, after they determined the bacteria responsible for the infection, the results were miraculous. My wound healed in no time and I was able to walk again."

"The success was not only to prevent amputations among injured patients, but also to determine the infection source and to control it," said Dr Fadel Naim, Head of the Orthopaedic Department at AAH.



Story 4

MAP-UK Changing lives through EMT missions

Mohammad is a 39-year-old father of four children from Khan Younis. He is a teacher and a gardener. He was shot during the mass demonstrations and it changed his life.

“On 14 May, which was the day when the American Embassy moved to Jerusalem, tens of thousands of people joined the demonstrations. I was just standing among the protesters about 150 meters away from the border the moment that random shooting started. I was about to run when I suddenly found myself on the ground, bleeding. I was on the ground for 30 minutes. No one helped. No one came. Then a nurse came with a tourniquet to stop the bleeding, just before an ambulance arrived,” Mohammad explained.

Mohammad was shot in the left leg below the knee, and the explosive bullet created a bone gap of about 10 cm. Unfortunately, the operating theatres were busy that day and there was no chance for Mohammad to undergo an urgently needed surgery. However, the bleeding was controlled by the doctors and nurses in the emergency department, and a cast was applied. The next day, the first operation was conducted, followed by multiple surgeries over the months, with no progress.

“Before the injury I was very active, working day and night. The bullet changed everything, leaving me paralyzed. I once was a productive person, but now I had become dependent on donations to support my family,” Mohammad said.

In June 2018, he was evaluated by MAP’s EMT. They provided Mohammad with the treatment he needed and helped his bone heal faster. “They saved my limb and made me throw the wheelchair away. Now, I can walk around with the aid of two crutches, visit relatives and friends, and go to pray in a nearby mosque. What a success!” Mohammad explained.



Credit MAP-UK

Postoperative and rehabilitation stories



Story 5

PMRS Emergency mobile clinic

The PMRS is a community-based Palestinian health organization that has been working in the oPt since 1979. PMRS provides emergency mobile clinics to follow up with patients who are discharged prematurely from the hospitals. They provide patients with daily home visits to dress their wounds and offer physiotherapy and other needed medical services.

Abed Qadom, 28 years old, works as the physiotherapist in the PMRS emergency mobile clinic in Gaza City. Mohammad Sour, 28 years old, is the nurse; Mohammad Ghazal, 32, is the social worker; and Alaa Ajrami, 36, is the driver and paramedic. They work 6 days a week to provide 140 injured people in Gaza City with needed medical follow-up.

"This is my role: to receive phone calls from the families of the injured people and decide the needs of the patients and put together the weekly schedule for the mobile clinic team", Ghazal said. "In the past year, I have seen so many desperate patients and families. Our job gets too overwhelming. After work, I go home mentally and physically exhausted. I'm unable to interact, either with my wife or my child. I keep thinking of the cases we see". "It makes me incredibly sad", he added.

Abed has been working as a physiotherapist since 2012. "The patients I have been helping in the past months have the worst injuries I have seen in years. During the last 3 wars, I worked with so many patients, and their recovery was so much faster than the patients we are seeing recently. I don't know the exact reason, but the types of wounds are different this year. The damage that is caused by the bullet is incurable. In previous years, the bullets damaged one tissue in one area. But now, one bullet can rupture the intestines, liver and exit from your back and damage the spinal cord" Abed continued "I get so frustrated when I can't get some patients to walk again, but if I manage to help one patient, I feel that the world cannot contain my happiness".



“Our job is too demanding but at the same time rewarding. Every time I feel that I can’t tolerate the mental stress, I remind myself of the responsibility I am taking. We are saving the lives of these patients, and we are their only hope for recovery. If we don’t visit the patients at home, who will?” Souri said.

Every Friday, Alaa works as a paramedic in the field during the mass demonstrations. During the week, he works as a driver for the mobile clinic. “Our job is becoming impossible. Every time a person is injured in the demonstrations, we must go as a big group of paramedics to help because there is a high chance that one of us will be shot. I must admit I get scared when I am carrying injured people, and I whisper: Please God let me go home alive and see my family tonight”, Alaa said.

Zuhdieye is a 37-year-old woman from Gaza City who was injured during the mass demonstrations. Often, the team from the PMRS emergency mobile clinic visits Zuhdieye and changes her wound dressings.

The injury took place on a Friday on 6 July. Zuhdieye cooked for her children, then took off to the border with her aunt and two friends. “Many people participated on that day. I lost my aunt among the crowd and I started looking for her in the front lines, fearing that something may happen to her. I finally saw her, and I went and stood next to her. A few minutes later, I felt an electric shock hitting my legs, and a hot liquid dripping on my body. My aunt started screaming. It was then that I realized that I was shot by a bullet and the hot liquid was my blood. Paramedics rushed towards me. They first took me to the trauma stabilization point, but my wound was so serious that they immediately transferred me to Al Shifa Hospital. The last thing I remember was the ambulance”, Zuhdieye said.

The bullet ruptured Zuhdieye’s uterus, bladder and part of the large intestine and exited from her leg. The doctors were unsure if she would make it. But she did. Zuhdieye underwent complex surgery.

She spent 22 days at the hospital. Al-Shifa Hospital, like other hospitals in Gaza, is forced to discharge patients prematurely due to the limited number of beds for the weekly influx of trauma patients. Zuhdieye is now home but cannot move out of bed due to the wounds and her leg injury. She does not sleep well because of the pain and she cannot eat well either. The electricity comes on only 4 hours a day. She does not have the luxury of drinking cold water or even showering most of the time. “I feel frustrated as I can’t take care of my children anymore, I can no longer cook or clean. I feel completely helpless. I wanted to protest my right to live in dignity, but now I can’t even go to the toilet. I am grateful that at least I have a medical team visiting me at home. I have no idea what might have happened if they didn’t visit me daily”, Zuhdieye said.





Story 6

HI provides rehabilitation and psychological support

Moneer is a father of three children and works as a commercial driver. He suffered a GSW on 22 April during the mass demonstrations near the Khan Younis border. “I was standing next to the protesters, when suddenly a bullet shattered my leg. People started screaming for help. In no time, an ambulance came. The experience of being shot was painful, but the experience of seeing my children in fear with tears was devastating. The injury left me bedridden for 3 months”, Moneer said.

At the hospital, the nurses told Moneer that he would not be able to work and support his family for at least a year. This caused more frustration and devastation for Moneer. He was discharged from the hospital, still unable to walk.

After some time, a team from the National Society for Rehabilitation, a local implementing partner of HI, reached out to Moneer. The team developed an individual multidisciplinary rehabilitation plan to address his mobility and reintegration challenges. Twelve physiotherapy sessions were provided to improve his muscle power and prevent complications from a limited range of motion. In addition, he received nine occupational therapy sessions to improve his independence in daily activities. Moneer’s condition was improving. First, the team started using a donated wheelchair to minimize his bedridden status, and then Moneer was capable of walking by using axillary crutches. The psychologist had a crucial role in supporting Moneer to overcome his devastation.

Moneer responded well to the rehabilitation plan. After a few months, he was able to walk without the use of any assistive devices and went back to work.

“The team worked with me step by step. I am very grateful for all the specialists who helped me. They gave me my life back”, Moneer said.





Story 7

NCCR No life with despair

Atallah Al Fayoomy was 18 years old when an Israeli soldier fired a bullet that shattered his right leg during the mass demonstrations on 13 April. The explosive bullet caused an amputation above the knee, leaving Atallah with post-traumatic stress disorder. He refused an artificial limb. He refused to eat or to socialize. He was in deep shock. His family reported that Atallah was seriously considering suicide.

The National Centre for Community Rehabilitation (NCCR) home-care team visited Atallah. The team evaluated his condition and decided that he was in need of medical services, along with physiotherapy sessions and urgent psychological support.

The nurse regularly changed wound dressings to prevent infection or contamination of the amputation and trained Atallah on how to change the dressing himself, in case the team was unable to reach him. In addition, the nurse provided Atallah with essential tips on nutrition needed to help heal the wound.

The psychologist helped Atallah to express his feelings. Atallah talked about his despair and loss of interest in life. The psychologist helped give Atallah a more positive outlook on life to focus on, and Atallah managed to boost his self-esteem. NCCR invited him to group psychological support sessions so that he could engage with people with similar experiences.

The NCCR team helped Atallah prepare physically and psychologically for an artificial limb. He started thinking of his future and drew up a plan to overcome the challenges and adapt to his disability. He also started to socialize with people and communicate with his family.

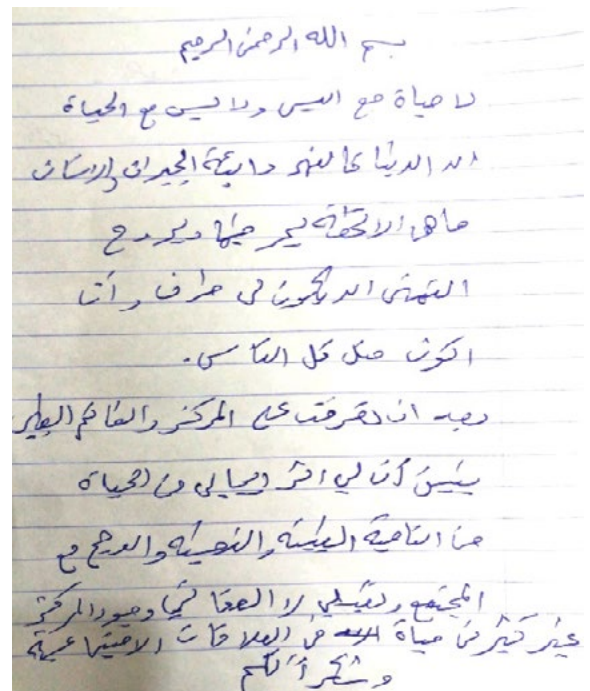


Photo credit NCCR. Atallah's note.

"No life is bearable with despair. Life is like a river, it keeps going. I almost lost hope, but thanks to NCCR, I have regained my faith in life", Atallah said.



Providing Atallah with home-care physiotherapy support



Story 8

Médecins Sans Frontières (MSF) MSF's clinics responding to the Gaza crisis

With 6846 people shot by the Israeli army during the course of protests in Gaza, it is easy to lose sight of the individuals involved. For each of those people, however, the often-complex injuries sustained mean months of pain, uncertainty, and reduced ability to lead a normal life.

That is why MSF tripled its pre-existing capacity to care for trauma patients in clinics and hospitals across Gaza. MSF is running five clinics in Gaza, offering dressings, physiotherapy, surgical assessments and pain management to patients after they are discharged from Ministry of Health facilities. There are also three surgical teams and two in-patient departments offering plastic and orthopaedic surgeries.

MSF admitted 4099 trauma patients to its clinics over the year of the protests, changing 118,890 dressings and completing 78 482 physiotherapy sessions. MSF operated on 2008 trauma patients, performing 3428 surgical acts and by the end of March 2019, they were still following just less than 1000 patients.

Mahmoud, 20, is typical of the patients that MSF have seen: shot in both legs, he said that he was surprised to be shot. "I was far from the fence, just drinking juice with some friends, watching the protests. I was thinking about leaving and then – all I felt was electricity." He was taken to a Ministry of Health hospital for immediate treatment, where his left leg was fitted with a whole-leg external fixator. He was discharged after a week.

"My neighbour was also injured and he told me about MSF, so I came to the clinic," he remembered. At first, he was visiting the MSF clinics daily for dressing and physiotherapy, and had further operations to stabilise his wound. After some months, the fracture in his right leg healed, the entry and exit wounds were closed and MSF were able to remove the external fixator below the knee. Although he is still awaiting a bone graft, and will require more physiotherapy to return to full health, his prognosis is good. "The pain is not so bad now," he says, "I'm just bored and it's hard for my family."

Despite the huge increase in MSF's activities, MSF continues to expand further. MSF is planning to open an osteomyelitis treatment ward and a microbiology laboratory in 2019, as well as expanding its existing reconstructive surgery activities.

Patients with gunshot wounds in the waiting room of the MSF clinic in Gaza City. February 2019. Gaza. [Simon Rolin/MSF]





Story 9

United Nations Population Fund and gender-based violence (GBV): Gaza's women overcoming barriers

The high number of injuries has also had negative repercussions for women's lives, often resulting in emotional stress at the household level, including higher exposure to GBV.

Some women have reported psychological and physical abuse by their husbands, who held them responsible for their participation in the demonstrations and the injury or loss of their children. In the case of the loss of a husband, widows have been exposed to social and economic violence. Moreover, young girls in families who lost a breadwinner face a higher risk of child marriage. All in all, key GBV service providers have received double the number of GBV cases that they received in 2017 because of the mass demonstrations.

"My daughter was injured. Whenever my husband passes by and sees our daughter bedridden, he tells me it is my fault that her future is ruined. This has a huge negative impact on the mental well-being of my daughter and I", a woman said.

UNFPA is one of the UN's lead agencies working to further gender equality and women's empowerment, as well as to address the physical and emotional consequences of GBV. The programme provides women with the GBV psychosocial support activities, including group and individual support, in addition to counselling sessions. To ensure access, these activities are conducted in GBV safe spaces (one-stop shops) located in clinics, as health is the culturally accepted entry point to detect, treat and refer GBV cases.

Hewaydaa, 32 years old, is married with three boys and four girls. Her husband had a leg injury during the mass demonstrations. After attending psychosocial and counselling sessions, she said, "My life and well-being changed for the better. I started to take better care of myself. The headaches that I suffered from disappeared. I also applied all that I acquired from the sessions with my children and husband. I supported my husband and renewed my relations with others, and my insomnia disappeared".

By accessing multisectoral and gender-responsive assistance, affected women and girls have been able to release their fear, anxieties and stress; solve problems with their children; express their feelings; and build their self-esteem and confidence.

However, there is still a great need for more GBV mental health and psychosocial support services and better case management for marginalized women and girls affected by trauma.

23 May, east of Gaza: An injured woman who participated in the Great March of Return and is one of the participants in the focus groups



Way forward

The Gaza trauma response illustrates that investment in national and local structures can improve emergency and trauma services – from the point of injury to rehabilitation – along the trauma pathway. From 30 March 2018 to 30 March 2019, between 435 and 1227 lives were saved as a result of the adopted trauma strategy; at the same time, the needs and response are continuing and the chapter has not been closed. The results also demonstrate that a coordinated response that targets and prioritizes the weakest links in the broad survival chain is probably the right strategy, and the overall low case fatality rate of 1% (or 3% considering only GSWs) is in itself an expression of the success of the interventions.

Moving forward, rapidly upgrading the existing services for osteomyelitis and limb reconstruction remains a key priority as we move into the second year of the emergency. The existing estimated cohort of approximately 1209 to 1746 patients in need of specialized tertiary treatment must receive the appropriate care if they are to reach their maximum potential health outcome. This essential package of specialized services includes microbiology capacity, osteomyelitis treatment, limb reconstruction, mental and psychosocial support, patient education, and physiotherapy.

In addition, the continued efforts to upgrade the emergency departments must be expanded, not only as a response to the emergency, but also as a longer-term investment in upgrading the local health system. The Health Cluster is committed to supporting health programmes and activities that combine emergency response with building the resilience of the local health system; however, development donors seem to be largely absent from the discussions on trauma and emergency care. In this regard, the current gulf between humanitarian and developmental aid must be adequately addressed.

Meanwhile, overarching challenges, such as collection and analysis of patient data, must be streamlined across all levels of emergency and trauma care. Data is the raw material on which every emergency response should be built. Good quality timely data (or the lack thereof) play a critical role in such a dynamic complex emergency, in particular in a conflict setting. Data is needed to convince decision-makers, not only in order to demonstrate that the enacted activities are evidence-based and can be measured, but also that there can be no proper monitoring, improvements and evaluation without data.

The resilience of the local health system under the leadership of the local authorities, in particular the health-care staff, including doctors, nurses, technicians and administrative staff, must be commended. In Gaza, political measures cause permanent salary delays and cuts in health-care staff. Delivering health services while attacks on health-care staff are on the rise, and when there is a permanent threat of heightened conflict leading to mass casualties, can be demotivating. Yet, the morale, commitment and level of dedication among health-care workers in Gaza is praiseworthy.

At the same time, the international community must recognize and acknowledge that more can be done to protect health workers and the health system from ever-increasing salary cuts, lack of essential basic supplies and violent incidents resulting in death and injury.

The right to health – as promoted by WHO – is a basic and universal human right. The people in Gaza, especially the most vulnerable who require life-saving medical care, should no longer be deprived of it.

ANNEX 1 - Field adapted "Trauma Care Checklist"

Trauma Care Checklist Field Adapted

Immediately after primary and secondary surveys:

| | | |
|---|---|--|
| Full survey for (and control of) external bleeding including: | <input type="checkbox"/> LIMBS <input type="checkbox"/> SCALP | <input type="checkbox"/> PERINEUM <input type="checkbox"/> BACK |
| Is further airway intervention needed ? May be needed if: • GCS 8 or below • Hypoxaemia or hypercarbia • Face, neck, chest or any severe trauma | <input type="checkbox"/> YES, DONE | <input type="checkbox"/> NO |
| Is there a penetrating wound to the chest or high risk of tension pneumo-haemothorax ? | <input type="checkbox"/> YES, CHEST DRAIN PLACED | <input type="checkbox"/> NO |
| Is the pulse oximeter placed and functioning ? | <input type="checkbox"/> YES, DONE | <input type="checkbox"/> NOT AVAILABLE |
| Large bore IV placed and fluids started ? | <input type="checkbox"/> YES, DONE | <input type="checkbox"/> NOT INDICATED <input type="checkbox"/> NOT AVAILABLE |
| Clinical evidence of internal bleeding ? | <input type="checkbox"/> YES, RECORDED | <input type="checkbox"/> NO |
| Is pelvic immobilization needed ? | <input type="checkbox"/> YES, DONE | <input type="checkbox"/> NOT INDICATED |
| Limb fractures immobilized and neurovascular status of all 4 limbs checked ? | <input type="checkbox"/> YES, DONE | |
| Is spinal immobilization needed ? | <input type="checkbox"/> YES, DONE | <input type="checkbox"/> NOT INDICATED |
| Is the patient hypothermic ? | <input type="checkbox"/> YES, WARMING | <input type="checkbox"/> NO |
| Does the patient need (if no contraindication): | <input type="checkbox"/> URINARY CATHETER <input type="checkbox"/> CHEST DRAIN | <input type="checkbox"/> NG TUBE <input type="checkbox"/> NOT INDICATED |

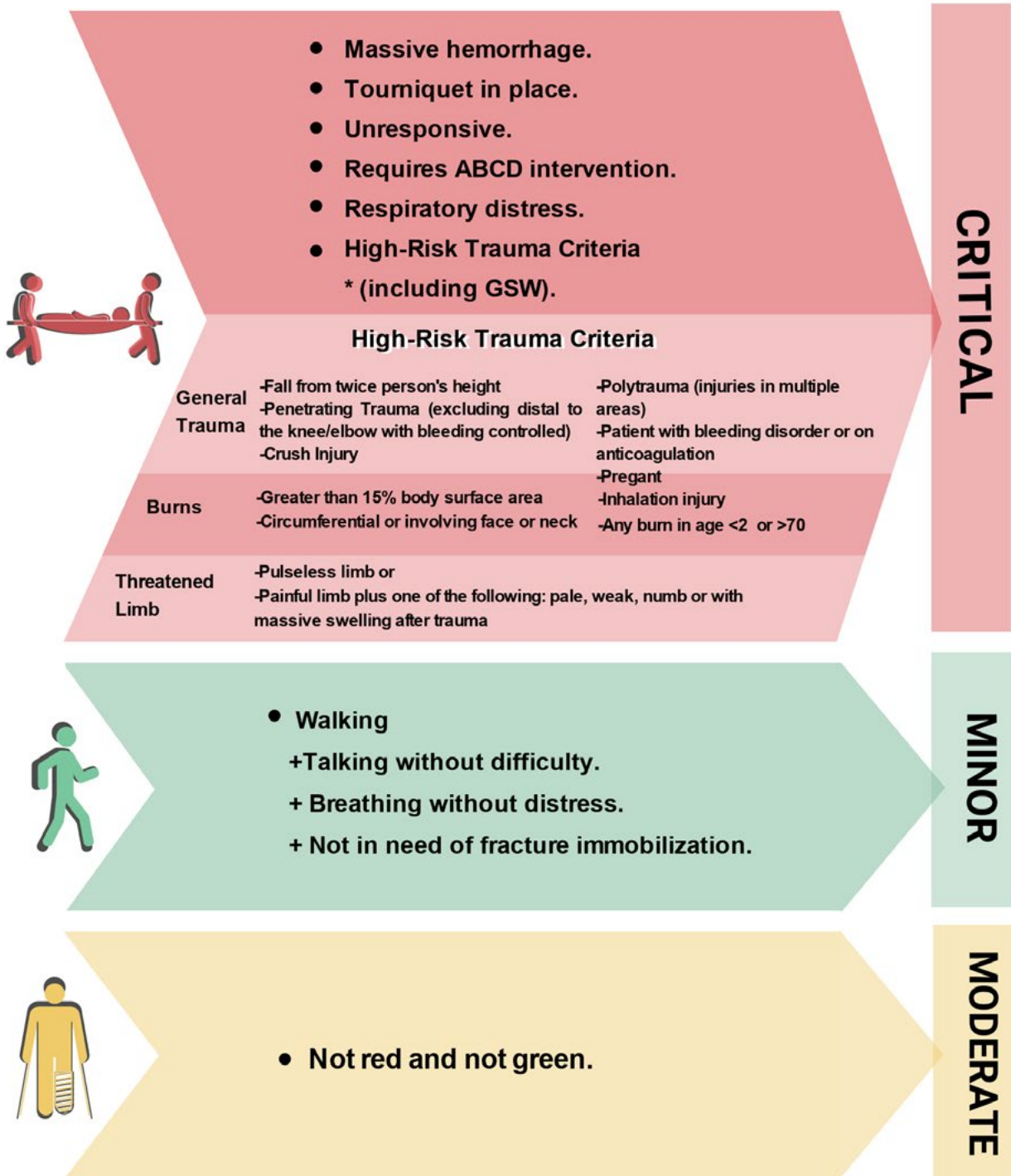
Before team leaves patient:

| | | |
|--|--|--|
| Does the patient need: (administer now if available or mark as needed on the referral form) | <input type="checkbox"/> TETANUS VACCINE <input type="checkbox"/> ANTIBIOTICS | <input type="checkbox"/> ANALGESICS <input type="checkbox"/> NONE INDICATED |
| Log book completed ? | <input type="checkbox"/> YES, DONE | |
| Referral form completed ? | <input type="checkbox"/> YES, DONE | |

ANNEX 2 – TSP triage system



Triage Trauma Stabilization Point (TSP)





Emergency Trauma Response to the Gaza Mass Demonstrations 2018–2019

“A One-Year Review of Trauma Data and the
Humanitarian Consequences”

