



CONTEXT



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SCENARIO

You have recently set up a type 2 EMT in an earthquake zone, when a significant aftershock occurs.

You, your team, and your facility, are unaffected. The district health officer calls to alert your team to expect between 25-50 casualties to be sent to your facility. How should you prepare for the incoming wave of patients?



Figure 1. ICRC staff assist patients in a hospital staging area. (ICRC)



TYPE 1

- Type 1 EMTs must be prepared to manage large numbers of patients.
- A recognized system for the assessment of injury severity should be employed to identify those requiring life-saving first aid, urgent and non-urgent surgery, and minor injury care.
- The use of the "expectant" category for patients should be done in consultation with the ministry of health whenever possible.



TYPE 2

- Type 2 EMTs should concentrate on surgical triage and identifying those with life threatening medical and obstetric presentations.
- The EMT should be able to triage appropriately 200 cases daily.
- The EMT must have a plan to deal with overwhelming situations by arranging referral to higher levels of care.



TYPE 3

- Type 3 EMTs should reserve resources for referral from other facilities.
- Type 3 EMTs must retain their ability to manage patients who self-present as well.
- A method of triage involving available specialists should be available for the triage of complex patients referred to the type 3 facility.

PITFALL

Triage at type 3 facilities is complex and often time consuming. It should be managed by specialists or the facility will quickly be over-run with cases that are inappropriate for type 3 specialty care.

TRIAGE

TERMINOLOGY

Using common language is important for documentation and communication, particularly when arranging patient transfers. The categories below are a widely accepted system for triage.

- » **Category 1:** Immediate medical or surgical management
- » **Category 2:** Patients who are able to wait
- » **Category 3:** Patients awaiting ambulatory care
- » **Category 4:** Patients with little to no hope of survival regardless of care delivered

COMMON TRIAGE MISTAKES

Triage in austere situations, while never an easy task, can be made more difficult by specific challenges that will vary depending on the situation.

- » **Cultural:** Different cultures have different values. For example some cultures will prioritize caring for the dead over caring for the injured.
- » **Ethical:** The idea of deciding not to deliver care to an acutely injured patient can be uncomfortable for many physicians from high income settings who are used to delivering care to all or nearly all patients. Additionally, it should not be forgotten that these situations may be very distressing to the local population as well.
- » **Contextual pressures:** Individuals can face pressure from community leaders, armed groups or other influential individuals when making triage decisions.
- » **Logistics:** Even in well resourced and rehearsed facilities, triage areas are frequently chaotic with little opportunity for human dignity. Triage areas should not be used for initiating treatment.



Figure 2. ICRC staff teach local staff to triage and manage a mass casualty incident. (ICRC)

PHASES OF DISASTERS

TERMINOLOGY

Trying to place the features of a SOD in terms of a chronological sequence is unhelpful as, in reality, it is more a case of overlapping phases. A country with a more developed health system may be able to restore at least some degree of services fairly quickly, while a country with a less well-developed health system may require much more time and assistance to recover from a SOD of a similar scale.

Therefore, it is useful to view the phases of disasters in a conceptual framework that reflects the state of the affected country and society.

» PHASE 1

Pre-Event Status – Assessing the degree of damage that a society incurs following an event is impossible without a baseline for comparison. This phase describes the existing infrastructure, hazards, population profile, culture, economy and security.

» PHASE 2

Event – The event phase captures the immediate event, however long it might last. The event can be as short as an earthquake or as long as a civil war.

» PHASE 3

Structural Damage – This phase comprises the physical damage to structures or human beings. Like phase 2, it can be brief, as with an earthquake, or prolonged, as with flooding. That is why using time to describe these events is so problematic.

» PHASE 4

Functional Damage – This phase encompasses all the changes from an event resulting from the first 3 phases. An increase in burns following an SOD is a prime example, because functional damage to infrastructure leads to an increase in cooking over an open flame.

» PHASE 5

Relief – The phase associated with efforts to minimize the effects of structural and functional damage, primarily through the delivery of security, water, food, shelter, sanitation, and medical care.

» PHASE 6

Recovery – This phase is associated with restoring pre-event levels of functioning for the affected population, and not simply alleviating immediate pain and suffering.

BURDEN OF DISEASE IN SUDDEN ONSET DISASTERS

Depending on the situation the type of casualties expected by EMTs can vary. Understanding the situation on the ground and the burden of disease it creates is crucial to the planning of any intervention. Large waves of patients can be created both by disasters (earthquakes) or by conflicts (short term focused military interventions or terrorist attacks). In contrast some situations such as enduring conflicts (a long running civil war) or disasters (drought leading to famine) can create a steady long term flow of patients. A primary goal of the WHO's EMT Initiative is to aid governments and EMTs in delivering the appropriate type of medical surge capacity that a situation requires. This can best be understood by thinking about burden of disease in waves.

» WAVE 1

Days 1-3 – This wave encompasses many of the head, neck, chest, and abdominal injuries that are rapidly fatal without intervention. International EMTs are unlikely to be able to intervene in this phase. Protecting populations during this wave is primarily achieved by building resilience into national health systems and through the response of local or possibly regional EMTs.

» WAVE 2

Days 4-20 – This wave consists of those injuries that were not immediately life threatening, the majority of which will be to the limbs, and constitutes the largest group of victims. These teams must be prepared to manage not only these cases but other surgical emergencies that arise, particularly abdominal cases and C-sections.

» WAVE 3

This wave actually starts at day 1 but peaks later. It consists of the infectious disease issues faced by internally displaced persons (IDPs), as well as the NCDs and mental health issues faced by a population recovering from a SOD requiring a surge in healthcare capacity. **It is unacceptable for EMTs to come only for surgery and have no plans to address endemic and infectious diseases and their complications.**

» WAVE 4

This wave has variable timing depending on the phase 1 health needs of the affected population. Wave 4 refers to the background surgical, oncological, and NCD needs of the population that have likely gone unaddressed due to the SOD.

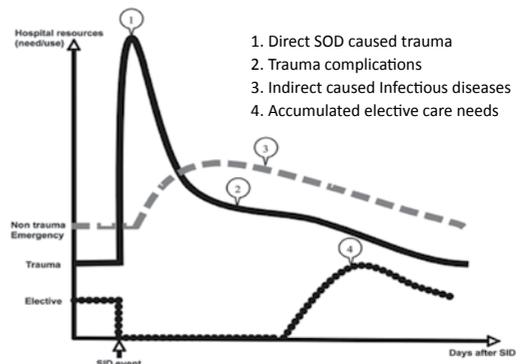


Figure 3. Waves of burden of disease during a disaster graphed as hospital resources required over time. (von Schreeb J, Riddez L, Samnegård H, Rosling H. Foreign field hospitals in the recent sudden-onset disasters in Iran, Haiti, Indonesia, and Pakistan. *Prehospital and disaster medicine* 2008; 23(02): 144-51.)

EARTHQUAKE

Earthquakes are some of the highest profile situations that EMTs can respond to. Their relative unpredictability, combined with the obvious destruction of buildings and infrastructure make these events widely reported and often widely responded to.

It is crucial for EMTs to understand the needs and limitations of earthquakes when deciding whether to respond to these events.

- » The patient load and demand on EMTs can differ widely depending on the degree of preparation of the society prior to the event.
- » Earthquakes carry a low death-to-injury ratio with approximately 1 death for every 3 injuries, meaning that surgical response can result in decreased morbidity and mortality by treating wounds and fractures.
- » Earthquake victims frequently present with crush type injuries that can progress to crush syndrome. This clinical scenario can present some difficult management challenges, particularly for those inexperienced in dealing with these types of injuries. Management may require ICU care or even dialysis.
- » The collapse of structures brought on by earthquakes changes the nature of the demands for EMTs. If healthcare facilities are destroyed then the demand for more advanced, totally self-sufficient type 2 and 3 EMTs becomes greater.



Figure 4. An ICRC and Haitian Red Cross Team survey damage after the Haiti Earthquake. (ICRC)

PITFALL

Deployment of surgical resources outside of the 2 week window following a disaster is unlikely to aid the population and will likely place an increased burden on the local infrastructure, a scenario that could possibly divert needed resources from the local health system or recovery efforts.

TSUNAMIS

- » Tsunamis create a much different context compared to earthquakes. They carry a much higher mortality ratio of approximately 9 deaths for every 1 injury.
- » The relatively small number of injured patients means that fewer surgical teams are needed. However, they may demand other types of EMTs such as medical or public health teams.
- » The surgical need that does exist following a tsunami tends to center around soft tissue injuries and infections sustained during the event or the immediate aftermath. These wounds are made worse by continuous exposure to wet, contaminated conditions.
- » There may be some role for bolstering local surgical capacity by EMTs that can deploy temporary structures while local structures are being rehabilitated, as the aftermath of Tsunamis can involve significant structural damage due to either the tsunami itself or the inciting earthquake. However, this need should not be assumed to be present unless the host government issues a specific request.

FLOODS

- » The need for a surgical response and the factors affecting what types of EMTs would be of greatest value are highly dependent on the cause of the flood, the state of health-care facilities and the rapidity of the flooding.



Figure 5. ICRC volunteers search for Tsunami victims. (ICRC)

ARMED CONFLICT

- » Wounds obtained in armed conflict have their own specific epidemiology and demand principles of management that sometimes differ from civilian practices.
- » Unlike SODs where many or all of the patients are injured simultaneously, conflicts can deliver a steady tide of patients that ebbs and flows based on the situation on the ground.
- » Areas of conflict present hostile difficult environments that can change rapidly. This can place constraints on the locations and scope of care that EMTs are able to deliver.
- » Many surgeons receive training in large institutions, from which there is no higher level to transfer patients to. Surgery in conflict areas is often provided as a series of operations performed in successive echelons of care, according to resources and the principles of damage control surgery.
- » In conflict surgery, as in all types of SODs, the traits of professionalism, sound judgment, common sense, and adaptability are key to successfully delivering care.
- » While the laws and principles governing the delivery of care in armed conflict can be complex, two simple principles should guide the actions of humanitarian actors in these situations:
 - The human dignity of all individuals should be respected at all times without any kind of discrimination.
 - Everything that can be done should be done to alleviate the suffering of those who take no part in the conflict or have been put out of action by sickness, injury, or captivity.

HEALTHCARE IN DANGER

- » The Geneva Conventions protect medical facilities and personnel. However, recent conflicts have seen a drastic increase in attacks on healthcare providers and facilities. This results in the destruction of resources for populations that require care and inhibits future providers from coming to fill these gaps.
- » The minimum standards require EMTs to provide their practitioners with a safe environment in which to operate and to have a security risk management system in place.
- » National EMTs and health providers, sometimes with remote support, may be the only responders in very high risk situations.



Figure 6. The main hospital in Aleppo following a bombing raid. (ICRC)



Figure 1. Soft tissue infection in a diabetic foot. (Norton)

SCENARIO

You are in a type 2 EMT deployed to a country struck by a tsunami four days ago. There are still large amounts of standing water throughout the area in which your hospital is set up.

A 67-year-old man with clear evidence of vascular disease and diabetes presents with an infected wound on his lower leg.

- » What specific concerns do you have for this patient given the context of the disaster?
- » How should your management change, given the likely disruption of the healthcare system in the country to which you are deployed?



Type 1 EMTs must be capable and self-sufficient to manage minor exacerbations of chronic diseases that require emergent care on an outpatient basis.



Type 2 EMTs must be prepared and self-sufficient to manage acute exacerbations of chronic diseases requiring inpatient admission.



Type 3 EMTs must be prepared and self-sufficient to manage acute exacerbations of chronic diseases requiring intensive care management as per the normal standard and context of the country.

PATIENT FACTORS

- » Provision of good patient care requires the ability to communicate. The patient's own language should be used for the discussion of all surgical interventions and clinical management.
- » Identifying individuals from the local population or selecting team members for deployment who speak local languages is important for provision of safe, ethical patient care.
- » In many austere settings, family members will perform many of the functions associated with nursing staff in high income countries.
- » It is important to demonstrate clearly to these family members how care should be provided to the patient. Often pictorial instructions may be useful, particularly when language barriers are present.
- » Tasks such as pressure care, limb elevation, ambulation, toileting, eating, and drinking will likely require the assistance of family members, especially for patients in traction.

PITFALL

- A close family member of the patient may communicate his or her own thoughts rather than those of the patient when translating.
- Using a child to interpret is not advisable given what may be lost in translation, and because it may compromise the child.



Figure 8. Patients on a hospital ward. (ICRC)

NONCOMMUNICABLE DISEASES

A growing proportion of the world's disease burden is noncommunicable diseases (NCDs). SODs or conflicts can lead exacerbate NCDs through destruction of healthcare infrastructure, displacement, loss of housing and trauma from which patients with co-morbid conditions may have a more difficult time recovering. The UN Interagency Task Force splits the management of these issues into two response phases.

» **FIRST 30-90 DAYS**

The focus should be on the treatment of life-threatening or severely symptomatic conditions.

» **AFTER 90 DAYS**

Attempts to expand management to include sub-acute and chronic conditions should begin. This may involve shifting from EMTs with surgical capacities to those designed to supplement the primary healthcare portion of the health system while it rebuilds.

PRINCIPLES OF NCD MANAGEMENT

NCDs should not be forgotten during a disaster. These conditions can result in morbidity and mortality when exacerbated by stress or trauma. Objectives for management of NCDs during the initial response are:

- » **Ensure clinical management via referral or by stabilizing the patient.** EMTs standard operating procedures (SOPs) should include processes for identifying patients in need of palliative care and pain relief.
- » **Ensure identification for NCD patients for whom interruption of treatment could be fatal or critical.** These patients include patients requiring dialysis, type 1 diabetics, patients who are status post organ transplant, or patients with mechanical heart valves..
- » **Avoid sudden discontinuation of care** and prioritize resources.
- » **Primary health clinics should be identified to triage and treat as many symptoms of NCDs as possible.** Restoration of services at type 1 EMTs may allow type 2 and 3 EMTs to manage remaining surgical or complex medial conditions.

SPECIAL CONTEXTS

CHRONIC ARTERIAL OCCLUSIVE DISEASE

- » Always assess and record the vascular status of a foot or lower leg prior to debriding a lower extremity wound. If a patient with chronic ischaemia of the lower leg presents with a wound, debridement should be performed very cautiously. The healing process can be very slow in these patients.

SUGGESTED RESOURCES

1. von Schreeb J, Riddez L, Samnegård H, Rosling H. Foreign field hospitals in the recent sudden-onset disasters in Iran, Haiti, Indonesia, and Pakistan. *Prehospital and Disaster Medicine* 2008; **23**(02): 144-51.

REFERENCES

1. Birnbaum ML, Daily EK, O'Rourke AP. Research and Evaluations of the Health Aspects of Disasters, Part III: Framework for the Temporal Phases of Disasters. *Prehospital and Disaster Medicine* 2015; **30**(6): 628-32.
2. Bar-On E, Abargel A, Peleg K, Kreiss Y. Coping with the challenges of early disaster response: 24 years of field hospital experience after earthquakes. *Disaster Medicine and Public Health Preparedness* 2013; **7**(05): 491-8.
3. Gerdin M, Wladis A, von Schreeb J. Foreign field hospitals after the 2010 Haiti earthquake: how good were we? *Emergency Medicine Journal* 2013; **30**(1): e8-e.
4. Noji EK, Kelen GD, Armenian HK, Oganessian A, Jones NP, Sivertson KT. The 1988 earthquake in Soviet Armenia: a case study. *Annals of Emergency Medicine* 1990; **19**(8): 891-7.
5. Chambers AJ, Campion MJ, Courtenay BG, Crozier JA, New CH. Operation Sumatra Assist: surgery for survivors of the tsunami disaster in Indonesia. *ANZ Journal of Surgery* 2006; **76**(1-2): 39-42.
6. Norton I, Von Schreeb J, Aitken P, Herard P, Lajolo C. Classification and minimum standards for foreign medical teams in sudden onset disasters. Geneva: *World Health Organization* 2013.
7. Herard P, Boillot F. Triage in surgery: from theory to practice, the Medecins Sans Frontières experience. *International Orthopaedics* 2013; **37**(8): 1429-31.
8. Trelles M, Stewart BT, Kushner AL. Attacks on civilians and hospitals must stop. *The Lancet Global Health* 2016.
9. Giannou C, Baldan M. War surgery: Working with limited resources in armed conflict and other situations of violence, Volume 1. Geneva: International Committee of the Red Cross; 2009.
10. Noncommunicable Diseases in Emergencies. 2016. http://apps.who.int/iris/bitstream/10665/204627/1/WHO_NMH_NVI_16.2_eng.pdf (accessed 1 November 2016).
11. Demaio A, Jamieson J, Horn R, de Courten M, Tellier S. Non-communicable diseases in emergencies: a call to action. *PLoS Currents Disasters* 2013.

EMT Website: <https://extranet.who.int/emt/page/home>

AO/ICRC/WHO Training Resources: <http://www.aofoundation.org/icrc>