Disaster Management

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Objectives

- **DEFINE disaster/mass casualty incident**
- **REVIEW classifications of disasters & response**
- **PRINCIPLES of disaster planning**
- **PRINCIPLES of disaster response**
- **DESCRIBE orthopedic surgery in austere conditions**

DEFINITION

- **DISASTER**
  - **An occurrence of a severity and magnitude that normally results in deaths, injuries, and property damage, and that cannot be managed through the routine procedures and resources of government (FEMA)**
  - **Usually develops suddenly and unexpectedly**
  - **Immediate, coordinated and effective response needed to meet needs and speed recovery**

- **LIMITED MASS CASUALTY EVENT**
  - **Greater than normal number of injured victims but can be handled with resources at hand**

DEFINITION

- **Mass Casualty Incident**
  - **Casualty load overwhelms available resources**
  - **Evacuation or redistribution of casualties needed because they cannot be handled locally**

- **CATASTROPHE**
  - **Loss of all capacity to provide medical care**

Disaster Classification

- **Helps understand the event and probable impact**
- **Natural versus Man-made**
  - **Natural – geophysical versus weather**
  - **Man-made – accidental versus intentional**
- **Open and Closed**
  - **Open – devastating over a large geographic area e.g. flooding**
  - **Closed – easily defined contained area e.g. a bombing of a building**

Disaster Classification

- **Duration: Finite versus ongoing**
  - **Finite – defined limited time frame**
  - **Ongoing – prolonged with severe damage strains on resource**

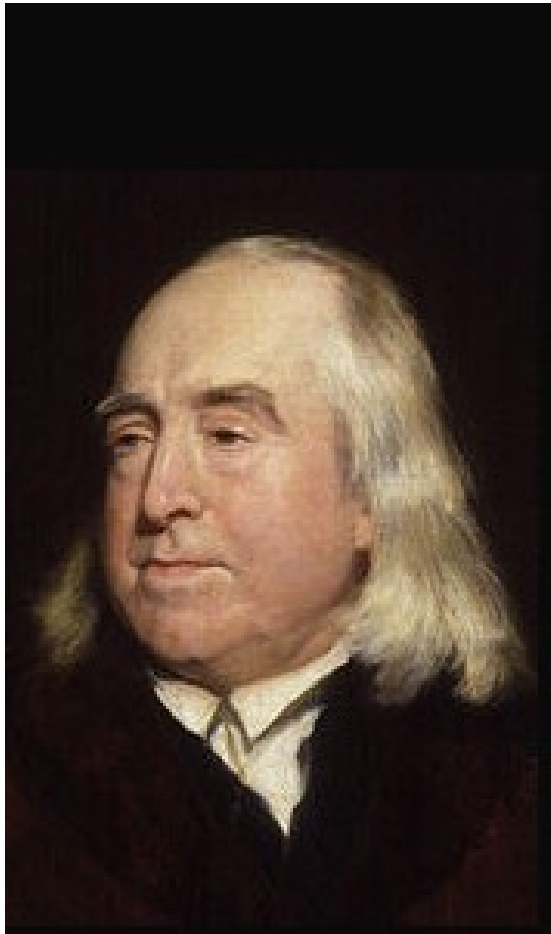
- **Levels: help to predict the impact on resource**
  - **Level I – only local resources needed**
  - **Level II – regional resources needed**
  - **Level III – allocation of large scale resources for state, national or international**

NYC COVID 2020

FUNDAMENTAL CHANGE IN CARE PRIORITY

- **GREATEST GOOD FOR GREATEST NUMBER**
  vs greatest good for each individual

- **The population, rather than the individual, must be the focus of medical care**



It is the greatest good to the greatest number of people which is the measure of right and wrong.

(Jeremy Bentham)

SIX *Ps* of DISASTER MANAGEMENT

- ***P***reparation
- ***P***lanning
- ***P***rehospital
- ***P***rocedures for hospital management
- ***P***atterns of anticipated injuries
- ***P***itfalls

PREPARATION

- **Acquisition of the core knowledge for planning and execution of disaster response**
- **“Failures of Imagination”= poor preparation**
- **Rarity of events leads to complacency and lack of motivation to learn**

PLANNING

- **Established plans need to exist**
  - **Once the disaster occurs it's too late to start planning**
- **Plans should be be based on principles, be flexible and generic**
- **Avoid the paper plan syndrome—assumption that written plan covers all eventualities**
- **Most studies show that paper plan is discarded almost immediately**

ESSENTIAL ELEMENTS OF DISASTER PLANNING

- **Valid assumptions about injury patterns, threats, human behavior, and needs**
- **A basis in the results of past disasters and established disaster-response principles**
- **An interorganizational or "systems" approach of many elements working together**

ESSENTIAL ELEMENTS OF DISASTER PLANNING

- **Inclusion of the participants (providers and administrators) in a disaster response in the planning process**
- **Knowledge and acceptance of the plan by the participants in the disaster response**
- **Training and education of the participants**
- **Regular drills and exercises to test a plan's workability and revise as necessary**

PRE HOSPITAL

- **Needs Assessment—what assets are required**
  - **Hazardous materials? Decontamination?**
- **Restrict Access to scene**
- **Search and Rescue**
- **Tiered Triage**
  - **Improves accuracy of triage**
  - **Decreases unnecessary hospital overload**
  - **MINIMAL ACCEPTABLE CARE**

Geographic Effect

- **Tendency to ship all comers to the nearest hospital**

- **Take advantage and designate a triage hospital**
  - **Cannot know which hospital this will be so all should be prepared**
  - **From here, systematically distribute casualties to avoid overloading any given hospital**

PROCEDURES FOR HOSPITAL MANAGEMENT

- **Casualty reception and management**
  - **Rapidly clear ED, ORs and ICU to extent possible to create capacity**
  - **Institute security to restrict access of unnecessary persons**

- **Repeat triage preferably outside the hospital**
  - **Decontamination as needed**
  - **Determine next step ?ICU? OR? Med/surg bed?**
  - **Create one way flow of patients**

- **PROTECT MEDICAL ASSETS**

Triage Categories

- **Immediate — immediate treatment for life-threatening problem**
- **Delayed — requires treatment, but it may be delayed without affecting outcome**
- **Minimal — no treatment required beyond first aid**
- **Expectant — alive but expected to die even with treatment**
- **Dead**

- **GREATEST GOOD FOR THE GREATEST NUMBER**

PATTERNS OF INJURIES

- **Need knowledge of injury patterns likely to be encountered in any given event**
- **Hazard Analysis critical**
  - **Chemical poisoning**
  - **Acute radiation syndrome**
  - **Blast injury**
  - **Crush**
  - **Dehydration**
  - **Hypothermia**
- **Combination of these issues is common**

Boston Marathon Bombing 2013

Prognostic Factors for Mass Casualty Outcome

- **Magnitude of insult**
- **Associated structural collapse**
- **Indoor vs outdoor**
- **Urban vs rural**
- **Anatomy/multiplicity/complexity of injuries**
- **Triage accuracy**
- **Immediate availability of specialty expertise**

PITFALLS

- **Communications—repeatedly shows up as a problem in crises**
  - **Media—can help or hurt**
  - **Coordination critical**
- **Authority—needs to be clear who is in charge**
  - **Chain of command should be well established**
  - **SMALL span of control—5-7 people under any given person**
- **Security—minimize interference with care and minimize further injury and loss of life**
- **Medical Care—GREATEST GOOD FOR THE GREATEST NUMBER**
- **Disaster Plan—avoid paper plan syndrome**

Principles of Response

Principles of Response

- Have a plan in place with designated roles, hierarchy, plan for activation
- Triage patients
- Temporize patients to treat as many as possible

Two main responses

- On site
  - Sort, Assess, Lifesaving interventions, Treat/Transport (SALT)
  - Active shooter: Threat suppression, Hemorrhage control, Rapid Extrication to safety, Assessment by the medical provider, Transportation (THREAT)
- Hospital: Simple Triage and Rapid Treatment (START)
- Incident Command System (ICS)
  - Simple reproducible adaptable system
  - Over all disaster ICS and hospital ICS
  - Responsible for command, operations, planning, logistics and finance and administration
  - Section commands report and directed by central ICS

Principles of Response –Scene

- **Search and rescue, triage and evacuate to safety**
- **Avoid the instinct to head toward the site or hospital**
- **While well intentioned, this can worsen access to care and put people in unnecessary danger**
- **Respond to the established response plan**
- **need a designated incident command center in place**
- **Allow shift and role changes to have the most people effectively treated**

Role of Orthopedics in Disasters

- **Orthopedic injuries prevalent in many disasters**
  - **ex: Boston Marathon bombing, USS Cole, Las Vegas shooting, Pulse nightclub, Haiti earthquake**
- **Important to have a departmental response plan developed prior to the event**
  - **ER triage of injuries**
  - **OR damage control surgery**

Orthopedic Section Leadership Roles

- **Incident Commander: ortho team leader, coordinates department's response with hospital's incident command**
- **ED controller: triages patients**
- **OR controller: coordinates with OR staff, supplies**
- **Ward/ICU controller: maintains patient log**
- **Satellite hospital controller: coordinates transfers, keeps in touch with ortho departments from adjacent hospitals**
- **Logistics Officer: creates 12 hour shifts to rotate leadership and clinical responsibilities**

Incident Commander - Orthopaedics

- **Typically on call person or chair of orthopaedic trauma**
- **Activates response within the orthopaedic department**
- **Coordinates with hospital incident commander**

Orthopaedic Surgeons

- **Part of the overall response team**
- **May be assigned an orthopedic role**
- **May be needed to support other aspects**
- **REMEMBER THIS IS A TEAM SPORT**

Triage

- **Paradigm shift from routine care**
- **Goal = greatest good for greatest #**
- **Critically ill with greatest chance of survival take priority**
- **Preserve limited resources for those who most likely to benefit/survive**
- **Patient Labeling**

Triage Categories

- **Immediate – most severe require emergent lifesaving intervention**

  (airway compromise, hemodynamic instability)

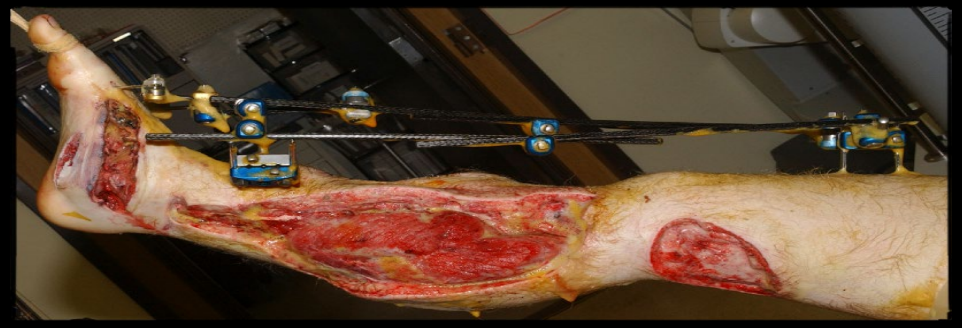
- **Delayed (serious, but not immediately life-threatening injuries)**
  - **irrigate, immobilize (splint or ex fix), antibiotics for open fractures, delay definitive management, walking wounded**
- **Expectant: require a large amount of time and resources if available and would jeopardize the care of others**
- **Dead**

LeapFrogging

- **Most critically ill patients are transported to closest appropriate hospital**
- **Less injured transported to further hospitals**
- **Makes use of Level II and non-trauma centers**
- **Preserves resources at closest hospital and higher levels of care**
- **Removes patients from the disaster site**

Surgical Principles

- **Rapidly provide emergent treatment to allow the next patient to be treated – Damage control**
  - **debridement**
  - **rapid provisional stabilization (ex fix)**
  - **fasciotomies**
  - **antibiotic beads**
  - **negative Pressure Assisted Treatment**



Crush and Blast Injuries

- **Crush Injuries**
  - **difficult extrication can lead to delayed presentation**
  - **supportive care if presenting 24-48 hours post-injury (fasciotomies increase risk of infection and reperfusion syndrome when delayed)**
  - **hydration**
- **Blast Injuries**
  - **may require coordination with military and plastic surgeons**

Austere Conditions

Limited Resources compared to demand for care

Causes of Austere Conditions

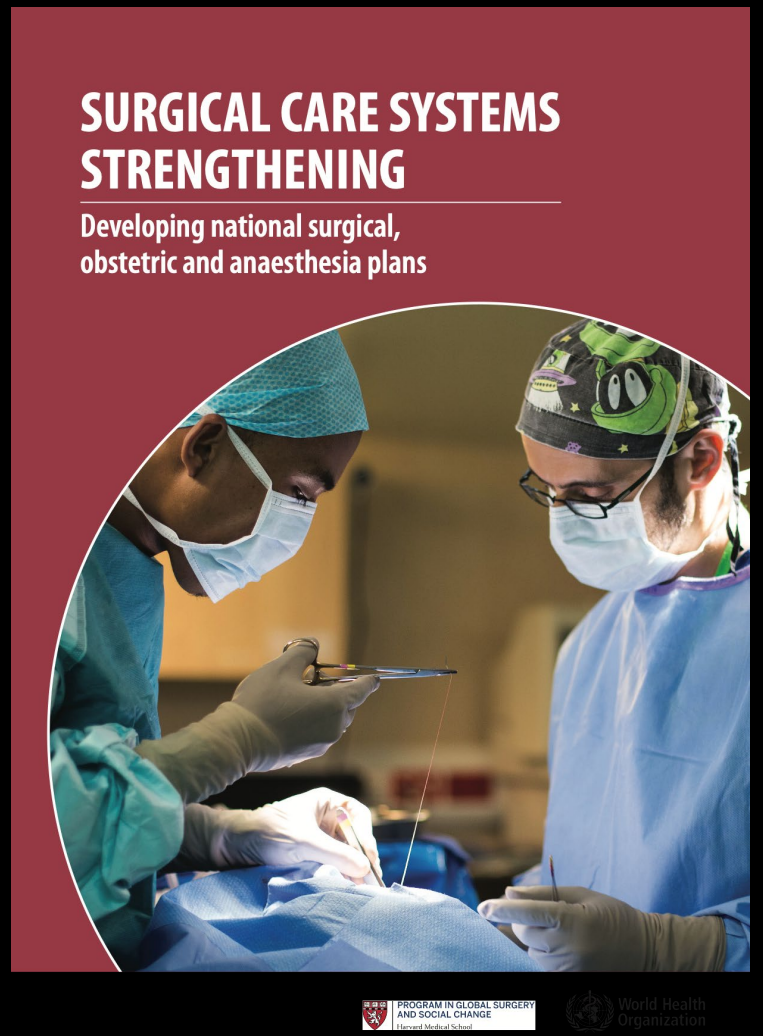
- **Low income**
- **War environment**
- **Natural disaster**
- **Pandemics**

Trauma Care in Low and Middle Income Countries

- Trauma is a major source of morbidity and mortality in low income countries
- Disproportionate amount of ortho trauma compared to higher income areas
- More years (disability-adjusted life years) lost to trauma than HIV/AIDs, malaria, and TB combined

Goals in Low and Middle Income Countries (LMIC)

- **Provide a sustainable model that empowers local surgeons to provide long-term care**
- **Cultural competence**
- **Partnerships with manufacturers for supply access**



Challenges in the LMIC

- **Communication**
- **Access – distance to care**
- **Safety**
- **Disease transmission**
- **Limited resources**
- **Complex injuries**
- **Specialty Training and Retention**
- **Credentialing**
- **Follow up**

Addressing Challenges

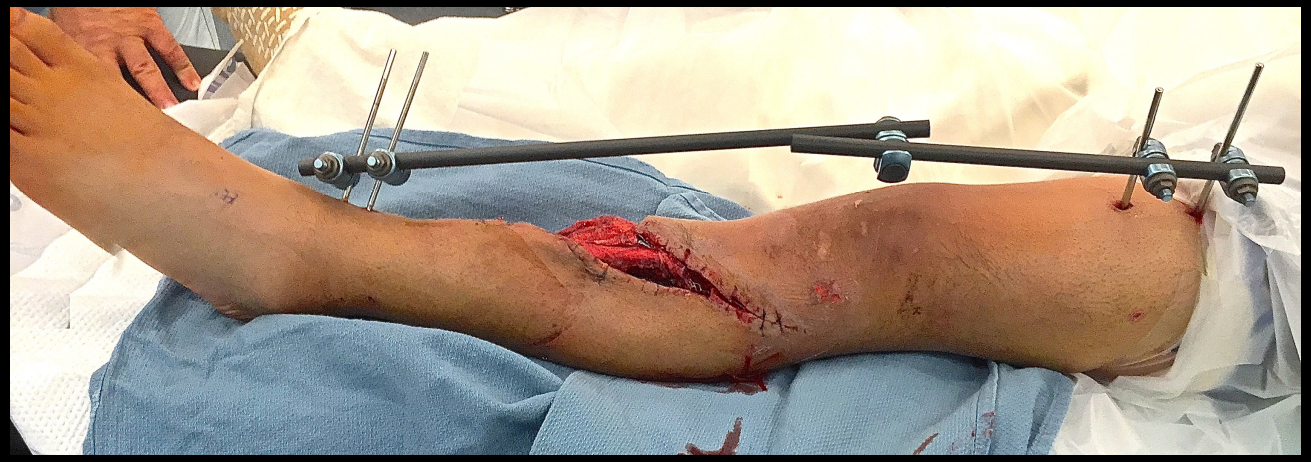
- **Institute for Global Orthopaedics and Training**
  - **Surgical Management and Reconstructive Training (SMART) course with SIGN**
  - **trains surgeons in LMIC in coverage techniques**
- **SIGN Fracture Care International**
- **AO Alliance provide cultural specific trauma and fracture care education**
- **World Health Organization**

SIGN Nail

- **Solid intramedullary nail**
- **Does not require flouroscopy**
- **Utilizes hand reaming**
- **High rate of union**

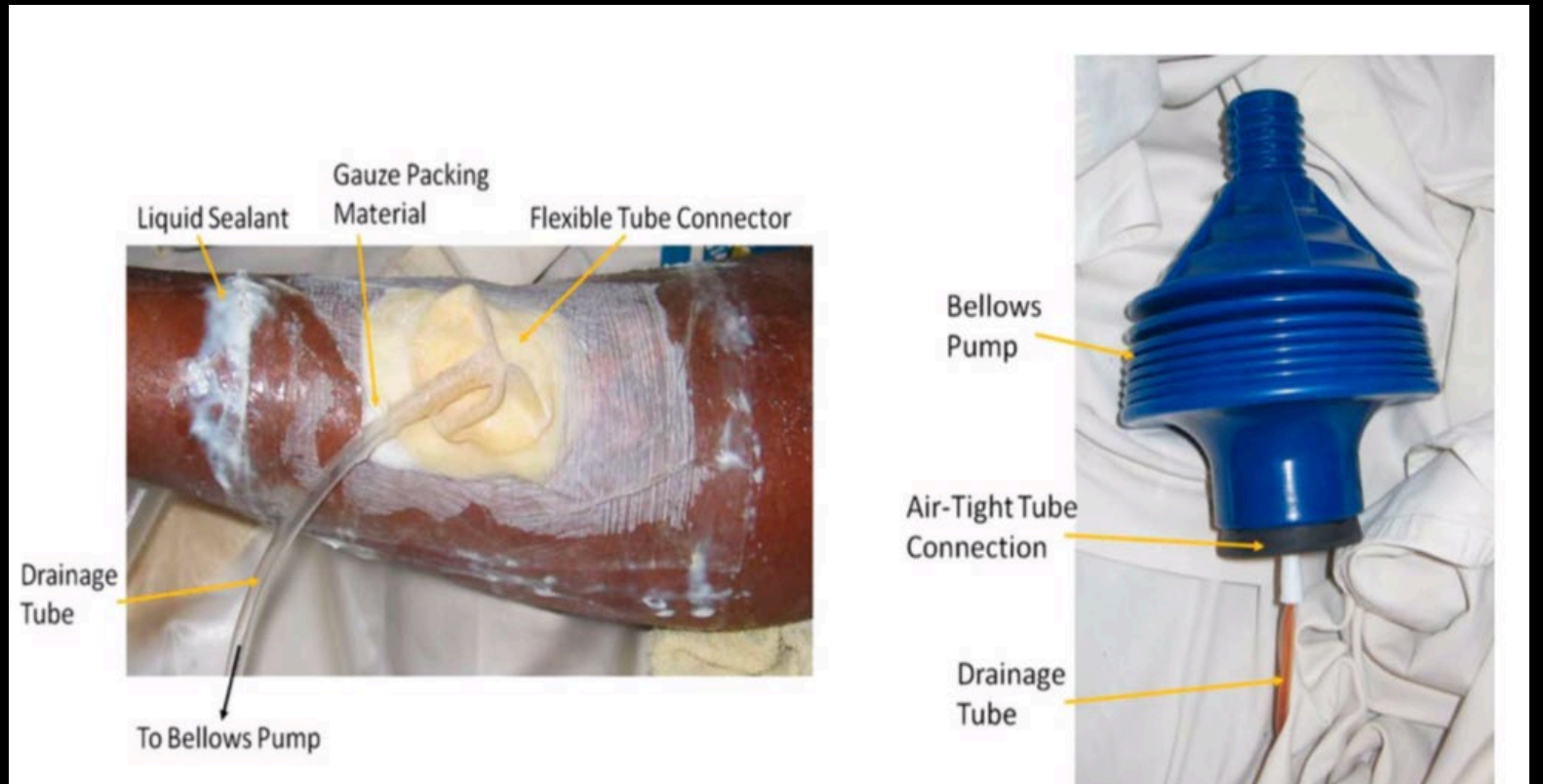
External Fixator

- Primary stabilization to protect soft tissues
- Decreases risk of infection
- Allows evacuation to safer environment in combat zones and natural disasters
- Basic set allows more people to be treated



Simplified Negative Pressure Wound Therapy

- **Dressing and drape attached to a pump**
- **Faster closure and fewer dressing changes compared to wet to dry**



Unique Infection Risks

- **CDC lists recommended vaccines and prophylaxis prior to traveling**
- **Risk of surgical site infections by atypical organisms**

Surgical Site Infections

- **25-50% of combat injuries**
- **Risk of fungal infections (aspergillus, mucor, fusiform)**
- **Gram negative organisms in setting of agriculture and floods**
- **Can lead to proximal amputations and death**

Treatment for Fungal SSI

- **Agressive debridement**
- **Amphotericin**
- **Dakin’s instillation or dressing**

Military Settings: Humanitarian

- **>50% of care in Iraq = humanitarian care**
- **Includes acute trauma and deformity tx**
- **Mutual benefits:**
  - **local surgeons learn techniques used in US**
  - **US doctors gain experience in mass casualty, complex deformity and blast injuries**
- **US military provides humanitarian care to civilians in**
  - **Air Force Theater Hospital at Balad Air Base**
  - **USNS Mercy and Comfort**

Military Settings: Combat

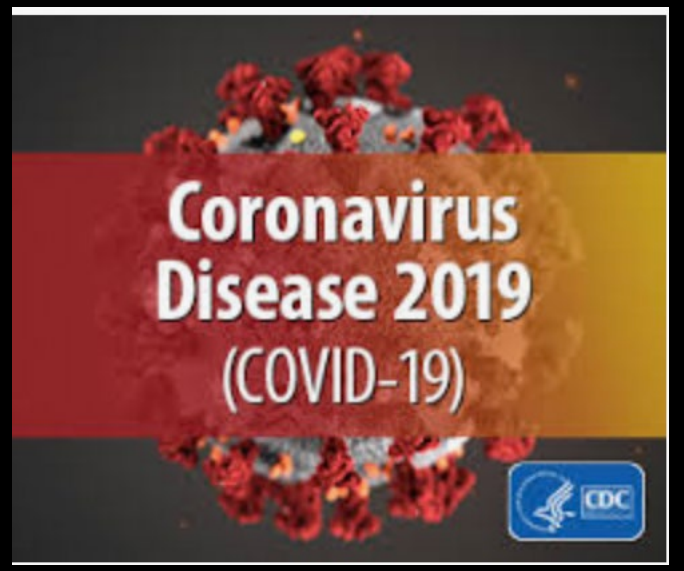
- **Improved body armor = more surviving casualties with extensive ortho injuries**
- **Damage control by forward units: tourniquets, ex fix, debridement, antibiotics, amputation**
- **Risk of novel organisms and contamination**

Role of Orthopedics in Pandemics

- **Free up resources**
  - **free up ORs by performing surgeries in surgery centers and naval ships**
  - **decrease burden on ER by seeing patients with MSK injuries**
- **Redeployment to other units**

Triaging During Pandemic

- **Urgent**
  - **OR within 48 hours, rapid d/c**
- **Non urgent**
  - **surgery center**
- **Non-op**



AAOS/OTA Disaster Response Initiative

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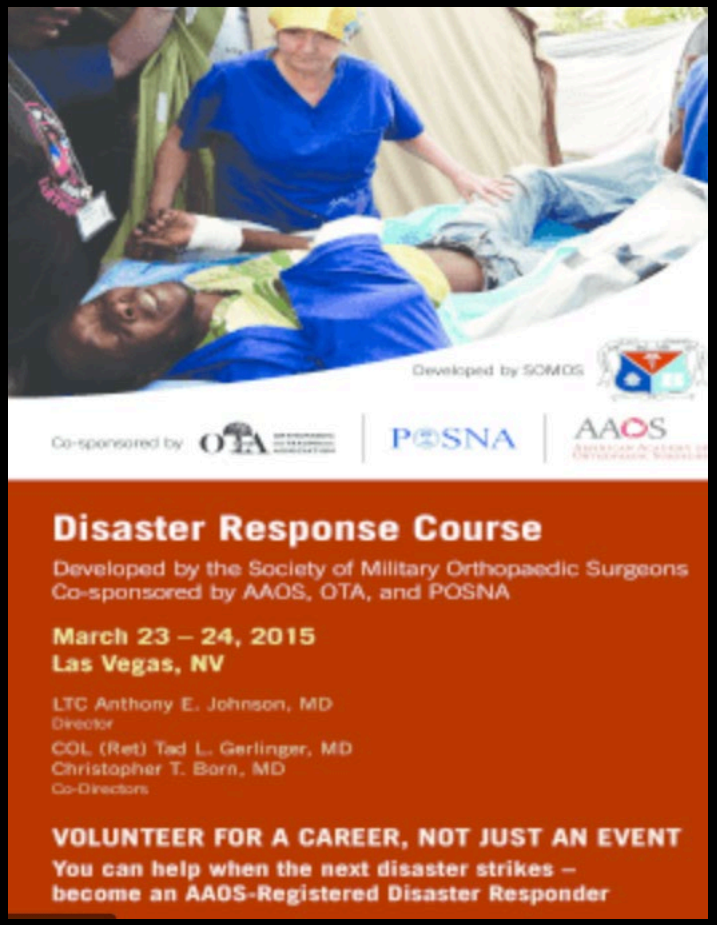
- **Developed after the response to Haiti earthquakes**
- **Collaborative effort between Orthopaedic Trauma Association (OTA) and the Society of Military Orthopaedic Surgeons (SOMOS)**
- **Disaster Response Course**
- **https://www.aaos.org/membership/volunteer-opportunities/dpr_resources/**
- **2016 JBJS review article**

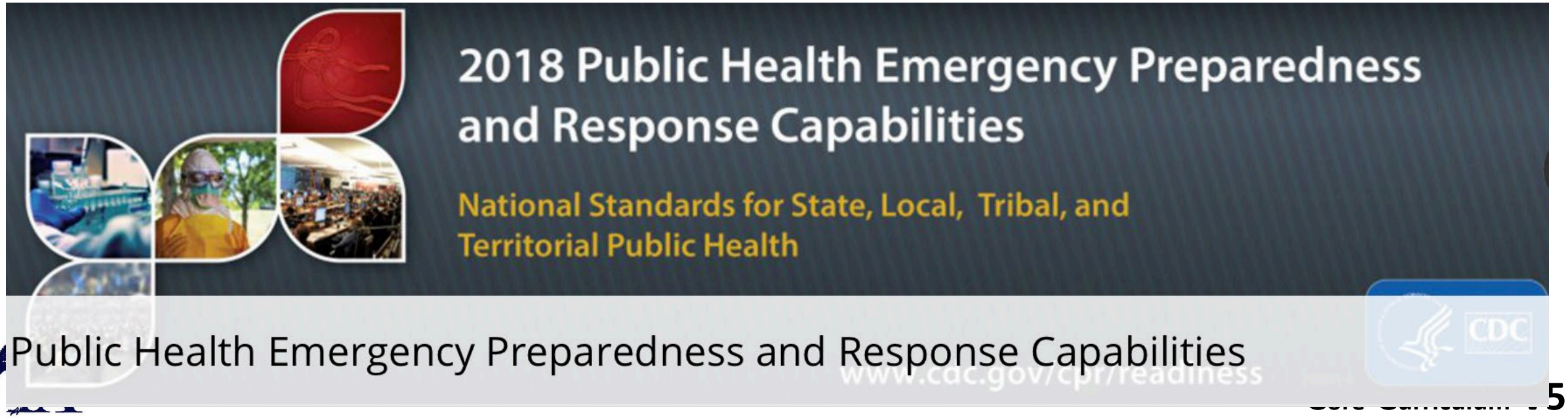
Disaster Response Course

- Training program for orthopedic surgeons to respond to mass casualty situations
- Topics include principles of ex fix without imaging, fasciotomy, vascular shunts, basic flaps, and amputation
- Part of the path to become a registered disaster responder with the AAOS



Resources include Guidelines for

- **Trauma care and preparing to care for war victims**
- **Operating in austere environments**
- **Travel prep (vaccine information, Dept of State and CIA facts)**



OTA Resource

- https://otaonline.org/video-library/45037/annual-meeting-and-conferences/multimedia/18674141/domestic-mass-casualty-and-disaster-coming-to-your

References

- The American Academy of Orthopaedic Surgeons/Society of Military Orthopaedic Surgeons/Orthopaedic Trauma Associations/Pediatric Orthopaedic Association Disaster Response and Preparedness Course Anthony E. Johnson, MD,* Tad L. Gerlinger, MD,† and Christopher T. Born, MD‡ (J Orthop Trauma 2015;29:S23–S25)
- C Born et al JBJS Reviews: Disaster Management Response Guidelines for Departments of Orthopaedic Surgery 2016;4(1):e1-8·
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