

Abstracts of Scientific Papers-WADEM Congress on Disaster and Emergency Medicine 2017

Community Disaster Risk Reduction using Indigenous Knowledge, Integrating with Climate Smart Interventions in Coastal Andhra Pradesh

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Study/Objective: Using indigenous techniques to reduce the dependency on outside resources.

Background: Andhra Pradesh (AP) is a state that has suffered the most from the adverse effects of severe cyclones, floods, and drought. It is estimated that about 90% of AP's total territory are vulnerable to tropical storms, floods, and related hazards, while the coastal belt is even more vulnerable to natural disasters, and the state's population is compounded by the recurrent impact of disasters.

Methods: Vulnerability Analysis, Situational Analysis, Participatory Vulnerability Capacities Assessment, Hazard Hunt Capacity building.

Results: The project is a model to all the vulnerable communities; capacities of vulnerable communities are increased and confident of combating the disaster situations. Innovative elements and results: Horizontal trainings by trained taskforce members in other vulnerable villages are conducted on their own initiation. Cost Effectiveness: There is no need to purchase anything from outside to implement this initiative at vulnerable villages. Workshop with the Education Department officials: Workshops with the department and regular one-on-one meetings have been organized. Lessons Learned: Flexibility and patience in order to survive and grow the structures, admit to mistakes, and correct them.

Conclusion: CHALLENGES: Initially, there was no response from the government as well as from the local communities. How to improve similar initiatives in the future? A similar intervention can be implemented in other villages overcoming the above mentioned challenges, involving the trained children and task force groups of this project. Replication: This intervention can be replicated in any part of the world, at a vulnerable village or school based on the type of disaster - but same methodology can be adopted for any type of disaster. This can be replicated to any context either for Tsunami or Cyclone prone, floods or flash floods, fire accident zone, or in a peacetime.

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Risk Factors of an Earthquake Hospitalized Patient Death in the Wenchuan Earthquake Victim Database

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Study/Objective: This paper is aimed at identifying the contributing factors of mortality and providing a clinical reference for the management of those injured in earthquakes.

Background: Few epidemiological studies have been conducted on the determinants of the mortality of patients hospitalized after an earthquake. The West China Hospital Earthquake Database includes earthquake injury cases who were treated in Sichuan Hospitals in the Wenchuan Earthquake, the Luahan Earthquake, and the Yushu Earthquake.

Methods: A hospital-based, case-control study was conducted. Records from West China Hospital Earthquake Database included all deaths (n = 36) due to earthquake injuries. Controls were the quake survivors from the same hospital. A conditional logistic regression was performed to assess the Odds Ratio (OR) of variables used in the study. A chi-squared test for trend was performed to reveal the possible relations between risk factor (variable) number and case fatality.

Results: People with a severe Traumatic Brain Injury (TBI) had the greatest risk of death (adjusted OR = 63.3). Multi-system Organ Failure (MSOF) and infection significantly increased the risk of earthquake-related death (adjusted OR = 87.8 and 11.2).

Conclusion: Based on the West China Hospital Earthquake Database, Severe Traumatic Brain Injury, Multisystem Organ Failure, and infection are the significant determinants of earthquake-related inpatient death.

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Physical Rehabilitation in the Context of Natural Disasters:

A Case Study in Nova Friburgo, Rio de Janeiro, Brazil

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Study/Objective: To identify and analyze the needs of physical rehabilitation, and the health care seeking behavior related to recovery and preservation of physical capacities of people affected by disaster

Background: Disasters may cause physical injury and generate incapacities and deficiencies as consequences. In January 2011, the major disaster registered in Brazil occurred in the Mountain Region of Rio de Janeiro. Rains caused floods and landslides, killing approximately a thousand people.

Methods: A case study was performed in one of the most affected municipalities– Nova Friburgo. Data related to types of medical complaints in local emergency services, one week before and after the disaster was collected. Victims, health professionals and public health managers were interviewed. The requirements for physical rehabilitation and the responsiveness of health services in the disaster’s recovery period were explored. Simple frequency measures were applied for quantitative data and the content of interviews was analyzed.

Results: Twelve affected people were interviewed, nine women (average 47 years old) and three men (average 43 years old). Only one woman had private health care insurance. Seven women and three men had jobs before the disaster, 40% of them were able to keep working after the disaster. The proportion of traumatic complaints in the emergency municipal service tripled in the week after the disaster. However, there was no increase in the demand for rehabilitation services in the municipality. Possible explanations arise from the analysis of interviews: lack of knowledge about physical rehabilitation possibilities, lack of confidence concerning the public health services, prioritization of other activities related to life maintenance (eg. overcome losses and family care) and misconception of patient complaints by health professionals, hampering the continuity of care.

Conclusion: The demand for rehabilitation was suppressed after the disaster, being of utmost importance to actively seek the victims out.

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Disaster Complexity: South Pacific Origins of the Blizzard of 2016

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Study/Objective: Apply complexity science to a disaster case study.

Background: The Blizzard of 2016 produced blizzard conditions and heavy snowfall throughout the Mid-Atlantic and Northeast United States during January 22–24, 2016. This Category 4 (“crippling”) nor’easter created significant human impact due to its passage over densely-populated coastal “megalopolises”, extending from Washington D.C. to Boston.

Methods: A multidisciplinary team was assembled to review this storm from a complexity sciences vantage. The blizzard was distinguished by its dynamic, “globally-networked” risk landscape, a hallmark of complexity. Investigators explored how factors related to climate change, including record-setting global temperatures and a powerful El Niño, ultimately contributed to the season’s strongest winter storm.

Results: The Blizzard of 2016 was a natural hydro-meteorological disaster; combining elements of winter storm, nor’easter, blizzard, and coastal flood; that disrupted transportation and infrastructure for millions. With snow depths exceeding 3 feet in some areas, the blizzard covered an estimated 434 thousand square miles and impacted more than 100 million people. The antecedent climate events that led to the

blizzard included an explosive, thunderstorm-generating interaction between the east-to-west migrating Madden-Julian Oscillation (MJO), emerging from the Indian Ocean, as it encountered peak ocean temperatures associated with an extremely strong 2015/2016 El Niño Southern Oscillation (ENSO). This took place in the tropical Pacific Ocean, just north of American Samoa, in the vicinity of the equator where it intersects with the International Date Line. This destabilizing MJO-ENSO interaction affected the jet stream and set in motion a cascade of atmospheric effects, that ultimately influenced the development of a powerful blizzard several weeks later and 7,000 miles (11,000 km) away.

Conclusion: From a disaster complexity point of view, the Blizzard of 2016 reveals the intricate interconnections among weather systems worldwide, and illustrates how natural and anthropogenic (eg. climate change) phenomena interact to produce far-ranging consequences.

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A Framework for Analyzing Performance Under Pressure in Diverse Healthcare Settings in Ecuador

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Study/Objective: To better understand the performance of health workers under pressure.

Background: This paper addresses a challenging landscape for health care professionals, and endeavours to analyze the healthcare system at a national level, and how it has adapted to the many challenges of both internal and external conditions. I have undertaken complex and extensive research to identify the factors that influence the responses of health professionals in diverse and changing scenarios, so as to examine their performance under extreme crisis situations.

Methods: Forty-five detailed interviews with key professionals (doctors, nurses, paramedics) were undertaken in diverse locations in Ecuador. Participants described high pressure scenarios including: natural disasters, emergency departments, large and small facilities, intensive care and operating theaters. Grounded theory was used to develop models to better understand performance under pressure.

Results: An ‘emic’ approach was used to understand ‘pressure’: namely, participants described scenarios where they personally experienced ‘pressure’. Broad interacting classes of factors contributing to ‘pressure’ were identified. Using dramaturgical analysis, we developed a ‘performative matrix’ that helped deepen our understanding of performance under pressure as a dynamic, collectively-determined social phenomenon shaped by (1) facilities and systems (staging, props); (2) teams and personnel (roles, actors), and (3) case complexity (plots, storylines). Explanatory frameworks to emerge included dramaturgical, processual and evolutionary models.

Conclusion: Rather than capturing a static view of individuals and outcomes, performance is modeled as a complex unfolding collective drama. Using dramaturgical, processual and evolutionary

models, we are better able to conceptualize performance under pressure and to propose pathways for evaluating and optimizing performance in dynamic and complex scenarios.

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Arctic Disaster Risk Reduction and Response: Community-Based Approaches in the Face of Wicked Problems and Cascading Disasters

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Study/Objective: To examine community-based Disaster Risk Reduction and Response (DRRR) approaches to wicked problems (Rittel and Webber 1973) and cascading disasters (Little 2012; Pescaroli 2015) in the Arctic; and to understand how these approaches do or do not change in correlation with the degree/type of the wicked problem and related circumstances, such as the degree of interconnectedness of critical infrastructure.

Background: Communities across the Arctic have been subjects to climate stressors, impacts and other natural-hazard induced or man-made crises and disasters. These range from violent ocean and winter storms, landslides, floods, erosion, earthquakes, tsunamis, nuclear, maritime and aviation incidents, etc. In some cases, the response is governmentally aided, such as in the case of planned relocations of entire communities to other, safer locations (see Alaska or Norway). However, when facing disasters of a more complex nature - ie. cascading disasters, wicked problems, interconnected infrastructures across functional and national boundaries - emergency and disaster response institutions have often been slow to adapt and react. Consequently, many communities across the Arctic feel left to their own devices in dealing with DRRR.

Methods: Following an extensive literature review of the theoretical framework, this qualitative study examines and analyses case study data from around the Arctic, to shed light on community-based approaches to vulnerability and risk reduction and response to cascading disasters and wicked problems.

Results: Initial results indicate valuable insights into a novel topic, and shows the challenges and barriers faced by communities when responding to these complex events. We recognize adoption of innovative, self-help approaches such as the use of Para diplomacy and knowledge transfer with other communities around the Arctic who face similar challenges.

Conclusion: Final conclusions including, diplomatic implications, future research directions and where possible, policy recommendations, will be presented at the WADEM Toronto conference in April 2017.

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Doctor-Heli Fleet Operations During the 2016 Kumamoto Earthquake in Japan

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Study/Objective: This study described and analyzed the operations of the Doctor-Heli (DH) fleet, comprising of 14 DHs and a headquarters in Kumamoto prefecture.

Background: The “physician-on-board” helicopter system, called Doctor-Heli (DH) in Japan, is crucial in the event of a widespread disaster. During the 2011 Great East Japan Earthquake, the DH fleet carried out effective operations during a real disaster for the first time in Japan. After the earthquake, a new command and control system of the DH fleet, and headquarters at the prefectural government level, were instituted. In April 2016, the Kumamoto region of Kyushu Island, southern Japan, was hit by a major earthquake.

Methods: An air medical transport record of Kumamoto earthquake has been analyzed.

Results: In total, the 14 DHs transported 75 patients in the first five days (April 16–20, 2016). Most of the patients were transported to neighboring prefectures that were not damaged by the earthquake. The headquarters of the DH fleet in Kumamoto Prefecture, requested assistance from other organizations to use their helicopters for medical transportation. Thereafter, five helicopters from the Japan Self-Defense Forces, eight from Fire departments, and one from the Coast Guard were used for medical transportation. Of the 89 transported patients in total, 30 (34%) sustained traumatic injuries due to the earthquake, and three (3%) suffered pulmonary embolism while asleep in vehicles at the disaster site. Furthermore, dynamic satellite monitoring, which was developed after the 2011 Great East Japan Earthquake, was used for all DHs, as well as helicopters from the fire departments, and was effective for information sharing, efficient operations, and safety.

Conclusion: The command and control of the DH fleet, the headquarters at the prefectural government level, and dynamic monitoring developed after the 2011 Great East Japan Earthquake were usefully employed. More efficient coordination of the DH fleet, and cooperation with other organizations, are ongoing challenges.

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The Experience of the Ecuadorian Red Cross in the Joint Deployment of an Emergency Medical Unit Post, April 2016 Earthquake

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Study/Objective: To study the lessons learned from the joint deployment.

Background: On April 16th 2016, at 6:58 pm. an earthquake of 7.8 Richter scale, hit west of Ecuador. As a result 673 people died, 4,859 injured, 8,000 displaced, 51 health care facilities damaged, and 593,000 persons had reduced access to health care services. The Canadian Red Cross together with the Ecuadorian Red Cross deployed (on April 20th) Emergency Medical units to support the affected population. The units were deployed in Jama and El Matal, and later moved to Pedernales, where they stayed until September 30th when the services were taken over by the Ministry of Health (MoH).

Methods: Data was collected from the unit's statistics, as well as from the operation's debriefing.

Results: A total of 46,356 patients have been treated in the fixed facilities and the mobile clinic. There were 31,821 (68.6%) patients for internal medicine, 3,039 patients with GOB (mass or lump) needs (6.5 %), and Odontology needs became an issue with 3,137 (6.7 %).

Conclusion: Successful joint deployment of an International and National team. Hand-over of the EMU from the Canadian RC to the Ecuadorian RC serves as crucial local capacity building for the ERC for future disasters. The Ecuadorian Red Cross High Technological Institute, the biggest training school for paramedics in the country, served as a major resource in the response (initial and long term) allowing the deployment of more than 2,000 persons to the affected areas. This earthquake has been the only large scale disaster the country has faced in 10 years. The response capacities have been increased significantly post disaster.

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2013 Colorado Floods, Boulder's Emergency Animal Air Rescues; A Military and Animal Control Collaboration

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Study/Objective: I. Introduction of the 2013 Colorado Floods II. Preparedness for potential county-wide emergency events III. The response; Emergency Operations Center (EOC), ground rescue, and animal sheltering IV. Helicopter Evacuations; collaboration between military and animal control V. Lessons Learned and concluding remarks reinforcing the necessity and value of collaboration

Background: In September 2013 the State of Colorado suffered a major flood event affecting 17 counties. Boulder County was the most devastated county in terms of lives lost, homes destroyed, and families displaced. The Colorado National Guard and the Army were requested for assistance with human evacuations from the ground as well as the air. When the Military responded to evacuate flood victims and were faced the challenge of air-evacuating pets, their compassion for the evacuees led them to the decision to air evacuate pets as well, setting the precedent for this emergency. The Boulder Police Animal Control Unit responded to manage and supervise the staging area for incoming rescued evacuees and their animals.

Officers had key roles during this event; training military personnel on animal handling and equipment, handling a variety of animals to ensure the safety of emergency responders, evacuees, and animals; evaluation for veterinary treatment; and provided care for the animals. The use of resources, improvisation, and collaboration during this event led to the successful evacuation of over 1,500 evacuees and their pets.

Methods: Provided in Background.

Results: The 2013 Colorado Floods led to the second largest helicopter rescue for humans to date, and the largest helicopter evacuation of animals. This disaster tested both the ability and capability of aerial evacuations for varied species of animals. In the midst of disaster, the US military and animal control collaborated to successfully evacuate over 1,500 people and their pets (estimated 800-1200 animals).

Conclusion: To provide audience with capabilities, suggestions, and practical application for aerial evacuations of animals during disasters.

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Monitoring the Well-being of AusMAT Members

Deployed to Fiji following Tropical Cyclone (TC) Winston

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Study/Objective: To monitor the well-being of Australian Medical Assistance Team (AusMAT) members deployed to Fiji following Tropical Cyclone (TC) Winston.

Background: The AusMAT response to TC Winston resulted in small teams across a variety of locations. Due to the limited day to day visibility and communication with individual team members, oversight of team welfare was likely to be challenging.

Methods: An anonymous electronic survey, the AusMAT well-being questionnaire¹, was completed by team members following each work shift during deployment. The questionnaire assessed perceptions of physical workload, weather conditions, body temperature, symptoms of heat stress, access to food and fluids, fatigue and sleep factors. Responses were compiled by the National Critical Care and Trauma Response Center, ensuring anonymity of responses. A brief report consisting of two paragraphs, overall trends and recommended actions, was compiled for the mission lead on a daily basis.

Results: An example of the overall trends summary from day 3 is provided.

- ~35% of the team reported hot working conditions.
- ~50% of the team reported feeling moderately to severely hot during shift.
- ~15% of the team reported severe to extreme fatigue post shift.
- ~30% of the team aren't able to get out of the warm/hot conditions during their down time.
- ~40% of the team reported warm sleeping conditions but overall sleep data is acceptable.

Conclusion: The daily team leader report was considered critical to understanding how each team member was responding to the environment during the TC Winston response. It prompted strategies to manage heat and hydration prior to the manifestation of serious symptoms. Such information also contributed to our knowledge of the AusMAT member workloads, assisting to prepare teams for future deployments.¹ Brearley M, Ruskie S. Development of a Disaster Nurse Well-being Instrument. *Prehospital and Disaster Medicine* 30(1): s116

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Canada Task Force 2 Medical Team Deployment to the Fort McMurray Wildfire

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Study/Objective: To provide a review of the Canada Task Force 2 (CAN-TF2) medical team deployment to the 2016 Fort McMurray wildfire (FMMW).

Background: The FMMW displaced over 80,000 citizens and destroyed over 1,600 structures, making it the most economically devastating natural disaster in Canadian history, with a cost of over 9 billion CDN (6,834 billion US). CAN-TF2, an all-hazards disaster response team, was deployed to this disaster. Since its inception in 2002, the team has deployed in Alberta during the Slave Lake wildfires (2011), and the Calgary/High River floods (2013). The medical unit of CAN-TF2 engaged in its first active deployment during the FMMW. This team was designed to provide medical care for CAN-TF2 members and was comprised of paramedics, nurses, and physicians. During this event the teams scope was expanded, as it developed the only medical facility in the FMM vicinity.

Methods: A narrative review of the FMMW deployment that focused on lessons learned from the medical team standpoint, along with descriptive epidemiology of the patient encounters.

Results: Themes discussed included: (1) the development of a field hospital to support those beyond the CAN-TF2 team, which encompassed first-responders and critical infrastructure employees; (2) undertaking chronic disease management; (3) the fostering of relationships with other provincial agencies that allowed access to medical transport and critical medical supplies; (4) the integration of a critical incident stress-management team that addressed the mental health needs of first-responders; (5) the monitoring of public health markers and advocacy for actions within the incident command structure, that ensured the safety of the first-responders and self-deployed volunteers; (6) the transition from a CAN-TF2 field hospital back to a government facility run by the local medical community in FMM.

Conclusion: The medical team capacity within CAN-TF2 continues to evolve, and the FMMW deployment has highlighted a number of strengths and areas requiring further development.

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Fit for Duty? The Case for Disaster Responder Fitness Standards

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Study/Objective: To mitigate the risk of disaster responders suffering heat illness through physical fitness standards.

Background: Recent Australian Medical Assistance Team (AusMAT) deployments have encountered challenging environmental conditions, heightening the risk of heat stress impacting responders. Two intrinsic factors increasing the risk of heat related illness are inadequate heat acclimatisation and lower levels of physical fitness. Pre-deployment heat acclimatization guidelines have been developed for disaster responders¹, yet commensurate standards are not available for fitness. Furthermore, the physiological impost of responding to disasters in hot and humid conditions are poorly characterized, limiting the development of evidence based standards.

Methods: A literature review of emergency responder fitness standards was conducted. Assessment of disaster responders was undertaken according to Brearley et al. (2013)² during construction of an EMT2 facility in hot and humid conditions to determine physiological and perceptual responses.

Results: Fitness standards are common among law enforcement and civilian protection agencies, generally incorporating running to volitional exhaustion. There were no reports of fitness standards for medical disaster responders in the peer-reviewed literature. Establishing an EMT2 facility in hot and humid conditions resulted in prolonged elevation of heart rate, core temperature, and physiological strain accompanied by body temperature perceptions of warm to very hot.

Conclusion: Based upon the physiological responses of disaster responders establishing an EMT2 facility in hot and humid conditions, assessment of disaster responder fitness is warranted. Reflecting the lower physical demands compared to law enforcement and civilian protection agencies, and age range of potential disaster responders, submaximal fitness tests should be prioritized.

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Earthquake in Amatrice (Italy), August 24, 2016: The Role of the Medical Teams of the National Alpine Rescue Corp (CNSAS)

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Study/Objective: The Mountain and Speleological Alpine Rescue Corp (CNSAS) is a voluntary corps diffused in all of Italy, expert in hostile environment rescue missions. The study is a report of the first medical teams deployed in Amatrice.

Background: After the first shocks of the earthquake in Amatrice and Accumoli (August 24, 2016), the national Civil Protection activated the national disaster response and rescue teams of CNSAS and reached the affected areas under a national coordination. Expert teams on hostile and confined environments were recruited, search dogs and medical teams were recruited as well.

Methods: The immediate response (because of the deep diffusion of the Alpine Corp resources in this area) was realized by local and regional teams. A second wave of rescue teams arrived a few hours later. The teams were deployed in Amatrice, Accumoli, and 38 small villages in the province of Rieti. A helipad in Amatrice was used for Medevac operations. The farthest areas and villages were reached only with military helicopters support. Two main scenarios were faced: 1) inside the “red area”: supporting the rescue operation missions together with firefighters and police; 2) out of the “red area”: checking people with minor injuries and vulnerable categories. All the data was transmitted to the Crisis Unit in Amatrice and to the Command Control Chain of Civil protection.

Results: The experience showed the importance of:

- stockpiles and technological support;
- information and training on disaster medicine and basic procedures (triage and tracking tools);
- knowledge on tactical approach and tactical medicine;
- knowledge of the Command and Control Chain and of the Civil Protection disaster response.

Conclusion: The medical teams of the CNSAS are an essential resource to support, search and rescue missions after earthquakes. Their own role can be precious in the check and monitoring of the health needs of the people affected, inside the Civil Protection disaster response.

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Lessons from the French Society of Disaster Medicine, Stratadviser Ltd and the West African Health Organization Collaborative Group during the 2014–2016 Ebola Outbreak
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Study/Objective: Ex-post evaluation of Relevance, Efficiency, Effectiveness, Impact, and Sustainability of recommendations elicited by the collaborative group during this period.

Background: Unlike more common epidemics in the three affected countries, such as malaria (over 2,650,000 cases/year) or tuberculosis (close to 32,000 cases/year), the Ebola outbreak (around 24,000 cases/2 years) paradoxically undermined the conditions of cohesion, integrity, security, functioning, and existence of health systems and beyond the economies of the Economic Community of West African States (ECOWAS). Therefore, the collaborative group disaster medicine experts analyzed socio-economic and historical insights, and epidemiological data and field practice

observations to come up with specific recommendations on the design of Humanitarian, Health, and Economic Corridors (H2EC). This is intended to limit the spread of a virus that contaminates and disseminates progressively thanks to population movements, while promoting the movement of this population.

Methods: Due to the international nature of potential applications of the H2EC concept and design, the collaborative group followed the methodology for Center of Excellence (CoE) project evaluation, used by the European Commission, namely the Logical Framework Approach (LFA).

Results/Conclusion: The positive post-evaluation of the economic corridors design teaches broad lessons applicable to other disaster medicine situations.

To date	
Relevance and quality of design:	Comprehensive, regarding geographical environment, socioeconomic constraints, population natural behavior, and public health requirements.
Efficiency of implementation:	Scaled to local/regional scarce health care workers/assets resources.
Effectiveness:	Actually limit population displacement while allowing nearly normal socioeconomic activity.
Impact prospects:	Positively bear upon population resilience.
Potential sustainability:	Could be easily reactivated, but will still require external support to some extent.

Table 1. Assessment of Humanitarian, Health and Economic Corridors according to the Logical Framework Approach.

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Emerging Issues of Withdrawing the DMAT Headquarters, Kumamoto Earthquakes of 2016

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Study/Objective: Clarify the issues of withdrawing the Disaster Medical Assistance Team (DMAT) headquarters.

Background: It is essential that DMATs have to hand over management to the right organizations at the right time. That is why DMATs Headquarters must be withdrawn smoothly. Kumamoto earthquakes 2016 in Japan, DMATs were dispatched on April 14 to the stricken area and concluded activities by April 23. Our team had orders to manage the biggest local headquarters and to close it down. However, withdrawing was so tough on the front line due to newly emerging issues; there has been little experience in withdrawing the big headquarters.

Methods: Five emerging issues were extracted as follows: (1) Confusion on determination how and when the DMATs hand over management to other organizations. (2) Difficulties on choice of DMATs staying behind until the very end. (3) Impediment by the remaining equipment that DMATs

brought in. (4) Lack of coordination with the chief administrator. And (5) Troublesome tasks to dispose waste and litter that DMATs produced. We have considered and resolved these emerging issues.

Results: During a large-scale disaster, the agency that presides over various organizations discussion of policies is required. Handover of duties should be determined by such an agency. The point of time of ending the activities should be defined at an earlier time. If existing DMATs are exhausted, headquarters has to request the government to send reinforcements. Equipment that DMATs did not use, and the waste and litter that DMAT made, should be carried back, basically because it is awkward to handle the unwanted material in the stricken area. In addition, they may cause unnecessary confusion. Over-dependence on the Internet consumed time to directly communicate with, and hindered opportunities to, understand the strategy of chief administrator.

Conclusion: There are some important points for DMATs to take into consideration when the headquarters is closed.

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The 2013 Santiago de Compostela Train Crash: High-Speed Derailment, Medical Trauma, and Psychological Aftermath

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Study/Objective: Present a disaster complexity case study from multiple complementary perspectives.

Background: The July 24, 2013 high-speed train derailment outside Santiago de Compostela Spain was the second deadliest in Spanish history. All 13 cars derailed and 100% of the train's 224 occupants were either killed (80) or injured (144). The crash analysis focused sequentially on identifying the hazard dynamics in the Santiago de Compostela train crash, linking these train crash hazards to the medical trauma sustained, and translating Potentially Traumatizing Exposures (PTEs) into patterns of psychological distress and disorder.

Methods: An analysis of the derailment was conducted drawing upon an interdisciplinary team of experts in mechanical engineering (international authority on train wrecks), disaster psychology (internationally renowned Spanish psychologist who provided consultation and care on-scene), medical crash trauma, biomechanics, disaster health, and public health. Each expert contributed a discipline-specific account of the crash. A synthesis of key components of the event was developed by blending direct on-scene response experience, with in-depth review of investigative reports, news stories, and websites of Spanish agencies involved in disaster response and railway safety. Analysis included the construction of a hazard profile and a matrix of psychological stressors in relation to intensity and severity of exposure, informed by the Population Exposure Model.

Results: For this non-intentional, human-generated, technological/transportation disaster, distinguishing features included: human causation of a preventable event, excessive velocity,

absence of safety engineering to slow the speeding train, extreme wreckage, 36% fatality rate among train occupants, life-changing severity of medical trauma for injured survivors, psychological impact on rescue personnel, and extensive exposure of the Spanish population to prolonged graphic media coverage.

Conclusion: The Santiago de Compostela train derailment was notable as a human-caused preventable event that precipitated exceptional damage, death, and injury, leading to significant psychological trauma and demonstrating that psychological consequences are exacerbated when human causation is implicated.

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Incendie dans un bar. Particularités de prise en charge de victimes multiples en arrêt cardiaque (AC) sur intoxication aux fumées d'incendie.

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Study/Objective: La prise en charge de victimes multiples en AC sur une intoxication aux fumées d'incendie expose les équipes préhospitalières à des difficultés logistiques et organisationnelles. Dans la nuit du 6 août 2016, 14 jeunes ont trouvé la mort dans l'incendie d'un bar situé à Rouen (France) par intoxication aux fumées d'incendie suite à la combustion de matériaux d'isolation phonique.

Background: La prise en charge des victimes, dans ce contexte, nécessite diaspopies aux manoeuvres de réanimation cardiaque habituelles l'administration précoce d'hydroxocobalamine afin de lever l'inhibition de la cytochrome oxydase mitochondriale par les dérivés cyanés.

Methods: Une équipe médicale du SAMU composée d'un médecin, d'une infirmière et d'un ambulancier et des équipes de pompiers ont été immédiatement envoyées sur les lieux dès le premier appel par les témoins. Dès leur arrivée, ils ont pris en charge 5 victimes légèrement intoxiquées et brûlées et une autre en AC, avec la notion d'une quinzaine de victimes bloquées dans la cave de l'établissement.

Results: Dès la notion de victimes multiples, le plan blanc du Centre Hospitalier Universitaire (CHU) a été déclenché. Trois victimes en AC et une victime inconsciente en état de choc ont été pris en charge par la première équipe avec rapidement des difficultés d'abord des voies aériennes (oedèmes) et vasculaires nécessitant l'utilisation de mandrins d'Eischman et de dispositifs intraosseux pour l'injection d'hydroxocobalamine. La répartition des tâches était primordiale entre les intervenants. La victime inconsciente a été évacuée sans délai et non médicalisée vers le CHU. Elle est décédée un mois après. Les équipes médicales de renfort ont pris en charge 2 autres victimes. Les 8 autres victimes ont été déclarées décédées. Toutes les victimes sorties du lieu de l'incendie en AC sont finalement décédées.

Conclusion: La prise en charge de victimes multiples d'intoxication aux fumées d'incendie nécessite de disposer rapidement d'hydroxocobalamine et de dispositifs d'abord intraosseux.

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A Mass Casualty Experience: Carbon Monoxide Poisoning in a Group of Restaurant Workers

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Study/Objective: To investigate the treatment of CO poisoning using oxygen.

Background: Acute carbon monoxide poisoning is a common cause of accidental poisoning. The incident described here occurred in a restaurant in Singapore, where a group of workers were exposed to CO due to a malfunctioning ventilation system. Thirty patients were sent to our ED as our hospital has the only burn unit in Singapore, as well as being the closest in proximity to the incident site.

Methods: All patients involved in the incident were charted upon arrival and seen by a team of Emergency Department doctors, including three medical officers and two toxicologists. Once the diagnosis of the index case was confirmed with an elevated carboxyhemoglobin, he was initiated on 100% oxygen using a Non-breather Mask (NRM). Subsequent cases were also initiated on NRM once there is confirmed history of being in the affected area of the restaurant, and patients complained of symptoms of headache, giddiness, breathlessness, or chest tightness. All cases were screened with the following investigations - Chest X Ray, full blood count, renal panel, troponin T, carboxyhemoglobin, venous/arterial blood gas, and lactate levels.

Results: Two patients were admitted to inpatient and 17 to our observation unit. All cases displayed down trending of carboxyhemoglobin levels with oxygen. Three cases with raised Troponin had initial complaints of chest tightness that resolved with oxygen therapy. All patients were discharged and none required HBOT.

Conclusion: Carbon monoxide poisoning is readily treatable once the diagnosis is clinched through a thorough history taking, physical examination, and appropriate investigations. Importantly, a concomitant cyanide poisoning should be excluded, as the treatment is different. A mass-casualty situation can also happen in such instances, so a protocol should either be activated or drawn up immediately upon identification of the first few cases. Hyperbaric oxygen treatment is a consideration in severe cases.

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Disaster Preparedness and Social Media: Experience from an Earthquake in Hawassa 2016

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Study/Objective: To create awareness for the community in the region of an earthquake. To disseminate preparedness information during an earthquake.

Background: Hawassa is found within the rift valley system, known to be the most vulnerable area in the country for volcanic activity including earthquakes. It is known that an earthquake with a magnitude of 5.2 Richter scale was registered in

Yergalem, Hosana, and Werabe in Southern Ethiopia regional state a year ago. This year in January 24-25, a successive earthquake of 4.1 and 4.3 Richter scale respectively hit Hawassa, the capital of Southern Ethiopia regional state, 275 km (170 miles) south of Addis Ababa. The shock, which was also felt in Halaba and Shashemene areas, registered at approximately 9:35 pm local time, according to Dr. Atalay Ayele, earthquake science expert from the Addis Ababa University. According to regional authorities, the shock didn't bring significant injuries to people. The shock caused no serious damage to buildings except cracks in some buildings.

Methods: A total number of 100 people were reached through social media (Facebook) and a brief precaution and preparedness diagram was sent individually, as well as being posted to social media groups addressing health care. Each of the 100 social media contacts were instructed to disseminate precautionary measures to as many people as they could. Health care professionals and contacts of social media were addressed with particular emphasis.

Results: All of the 100 people responded, their thoughts in the following table:

Conclusion: In disaster situations, particularly in earthquakes, adequate disaster preparedness will benefit in preventing more serious injuries. Public media education, as well as social media, is very important in minimizing risk.

Average Likert Score of Respondents	
Content Areas	Average Score
General knowledge before for precautions.	2.9
General knowledge after for precautions.	4.9
Willingness for disseminating precautions.	4.8
Their peer response for precautions.	4.9

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“It Takes a Village”: Integration of Emergency Management in Public Health Responses

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Study/Objective: During recent public health response coordination activities in New York City (ie. Ebola Virus (2014), Legionnaires' Disease (2015) and Zika (2016), the NYC Emergency Management (NYCEM) saw an “all hands” approach, where public health and medical partners worked closely with other Emergency Support Function (ESFs). These efforts included public information, community outreach, waste management in non-clinical settings, social services support in quarantine scenarios, surge staffing licensed workers, alongside worker health and safety guidance for various tiers of exposure/risk levels. This

case study presentation seeks to propose alternative methods for public health emergency response in emergency management, through lessons learned and the development of the Emergency Operation Center (EOC) planning tools.

Background: Public health incidents pose a challenge for emergency management agencies because they do not follow the same “stand up” and “stand down” style of natural disasters or catastrophic incidents. Typically, public health incidents begin with more ambiguity than emergency managers usually encounter in other types of naturally occurring or manmade incidents. These incidents require technical, regulatory and scientific expertise that involves various non-health stakeholders for general consequence management.

Methods: NYC is currently developing a draft of Public Health Response protocols and tools that integrate SMEs from non-health, Medical and/or Human Services agencies based on preparedness and response activities, hot washes, and After-Action Reports. With the goal of connecting expertise of particular ESFs and task forces, such as waste management in non-clinical settings, public information, community engagement, and consequence management, this presentation will allow focus group members/conference attendees to think through select public health incidents (based on NYC’s case studies), that require significant non-public health and medical stakeholders.

Results: Research/field testing is still in progress but preliminary information may be available by Spring 2017.

Conclusion: More research/field testing is needed to formally integrate public health emergency management into the current ESF mechanisms used in local emergency management agency EOCs.

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Maternity Care Model during a Natural Disaster or Humanitarian Emergency Setting in Rural Pakistan

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Study/Objective: To propose a maternity care model for natural disaster or humanitarian setting in rural Pakistan, by using its existing Health Human Resource (HRH).

Background: Pakistan has been severely affected by a number of natural disasters, as well as humanitarian emergencies in the last decade. There are more than 100,000 health workers (including community and facility based midwives) in rural Pakistan which are local, trained, and most of them possess a good relationship with their community. There is a need to establish effective strategies, to utilize their services as frontline maternity care workers during emergency and conflict situations.

Methods: A mixed methods study was conducted in flood-affected villages of Sindh, which included 60 interviews (15 from women, 25 from Community Health workers, and 20 from key informants) and a survey with 669 women about their preferences of maternity care providers.

Results: In the absence of obstetric facilities in relief camps and a functional referral system, 91.2% women gave birth in

temporary shelters with the help of a traditional birth attendant (Dai) with no clean physical space available to birth. Community health workers were not involved in disaster related activities. A clean delivery kit, dignity kit, and contraception were not available at relief camps.

Conclusion: The existing health workers are recommended to be engaged at different stages of a natural disaster (preparedness, early warning, and response). The capacity building of health workers and district health officials on emergency management is highly recommended. District health authorities should collaborate with Humanitarian Health Cluster at pre-disaster time to optimal utilization of logistic, financial and human resources. A well equipped “birthing station” and “women friendly spaces” are recommended in each camp. Referral systems should be strengthened whereby all laboring women with complications, can be timely transferred (transportation provided) to the nearest rural health facility where they will be assisted by the Emergency Obstetric Care (EMoC) trained staff.

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The Social Impact of Terrorism on Civilian Populations - Lessons Learned from Decades of Terrorism in Israel and Abroad

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Study/Objective: This study considers the socio-psychological implications of terrorism, which are sometimes neglected in preparedness plans.

Background: One of the main concerns for public safety, shared by many countries, is the fear of terrorism; yet, far fewer lives are lost yearly due to terrorism as opposed to other forms of trauma, such as traffic accidents. Why does terrorism receive so much attention and incite such intense apprehension? Perhaps, terrorism “packs a different punch,” one that goes far beyond the number of injuries and fatalities. Terrorism’s main goal is to disrupt ordinary life, fostering fear and helplessness in the population.

Methods: Using Israeli experiences as a case study, this study briefly reviews four points of connection between terrorism and its psychological and social legacies: the sociopolitical aspects of terrorism, the unexpected nature of terrorism, normalization of terrorism and public resilience, and social aspects of medical care for terror-related injuries.

Results: The Israeli experience suggests preparedness plans should include planning for the socio-psychological effects of terrorism, on targeted populations, and may, in certain contexts, use Israeli approaches as a model.

Conclusion: Experience gained in Israel and elsewhere can set the stage for an appropriate response plan, striving not only for preparedness but also resilience. Efforts should be made to advance local capabilities, response plans, and resilience by

drawing on the experience of others in coping with the terror threat.

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Crocodile Human Encounter Patterns in Sri Lanka

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Study/Objective: Aim of this study is to identify what species of crocodile's attacks humans, their pattern when they attacked, where they attacked, what parts of the human body they prefer to grab most, why do they attack humans, and how crocodile human encounters are minimized so both species can live peacefully.

Background: Crocodilians represent one of the oldest constant animal lineages on the planet, in no small part due to their formidable array of predatory adaptations. As both human and crocodilian populations expand, they increasingly encroach on each other's territories, bringing morbidity and mortality to both populations. Sri Lanka has two species of crocodiles – the Mugger Crocodile (*Crocodylus palustris* or “crocodile of the marsh”) mainly found in freshwater tanks, and the Saltwater Crocodile (*Crocodylus porosus* or estuarine crocodile) which prefers estuaries and lagoon habitats. Research found both were responsible for attacking humans.

Methods: The reported cases of crocodile attacks from year 2010 to year 2015 were reviewed. During the 5 year period 150 attacks were reported and 51 were fatal. The aim was to identify the attacks by two different species of crocodiles that live in Sri Lanka. We studied timeframe, location, causes, and how they attacked humans.

Results: The popular belief is only salt water crocodiles are man eaters, and muggers are less aggressive. But our research shows that fatal attacks are done by both groups. The saltwater croc attacked and killed 27 people, and the muggers killed 49 humans, not much difference. The usual attack sites for both groups are either in shallow water or close proximity to croc infested water. This amounts to nearly 60% of attacks (90 incidents), of which 116 (77%) victims were males. They were attacked during bathing, washing clothes, swimming, collecting grass in marshy lands and playing in the water. Females were attacked while bathing, washing clothes and utensils. There were three rare cases where people were ambushed by saltwater crocodiles in a marshy area when they regularly collect firewood. Ninety-five percent of the victims were dragged to the water by both groups of crocs. Most of the incidents limbs were attacked; there were reports of attacking to the head and torso by both groups of crocodiles. Most of the victims (>92%) were aware that the water sources are infested with crocodiles, but did not care enough to think of the impending danger. We found that some people were attacked non-fatal, by salt water crocs when they approached a croc nest, the attacks launched to defend the nest. An interesting observation that emerged from the accounts on crocodile attack victims and witnesses, was that it appeared that the animals had observed people engaged in water-based activity, like bathing and washing clothes, over a period of time before the attack.

This would imply that at least some attacks, were not the result of a casual encounter with potential prey, but the culmination of a hunt at a spot where prey was known to gather. Hunting the reptile for meat or for skin made them endangered species. It has been observed that reptiles were poisoned after attacking humans, in some parts of the island. The climatic change is also an important factor as temperature decides the gender of the siblings. Reducing the croc land due to encroachment by humans, sand mining and destruction of mangroves, made reptiles attack humans as well as loitering in the land areas searching for food.

Conclusion: In this review, we examined the features of crocodilians that contribute to explaining their evolutionary success, as well as the potential hazard they pose to humans. Only by understanding reptiles' capabilities and respecting its right to live, it is possible to mitigate the potential threat to life and limb of humans.

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Perceptions on Medical Clowns in the Israeli Field Hospital after the Nepal Earthquake

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Study/Objective: Following the 2014 disastrous earthquake in Nepal, the Israeli Field Hospital (IFH) was deployed to Kathmandu to assist and treat the thousands wounded. Five Israeli Medical Clown (MCs) volunteers arrived with the IFH. The impact of a MCs in a disaster zone has yet to be described or considered at all. The objective of this study was to assess the effect of the MC presence on the work of a field hospital in a disaster zone.

Background: The use of MCs for alleviating pain and distress has been well documented. There is evidence showing the effect of a MC on the well-being of patients, especially regarding painful and distressful procedures. There is no known description of MCs in a disaster zone.

Methods: An online survey was sent to all available members of the IFH (medical and technical) with questions regarding their perception of the MC impact on the IFH staff

Results: The survey was a Likert based questionnaire (grading the impact from 1 = very little to 5 = very high). Of 92 available members, 75 completed the survey (81%). The participants were of an average age of 40.5 years old, and 75% were male. The participants were from every part of the IFH (medical and technical) and included enlisted, reserve and volunteer participants. There were 67.2% of the participants found a very positive impact on the staff, with 48.3% finding a very high impact of clowning on staff performance. Staff with previous exposure to MCs were more likely be impressed by MC.

Conclusion: MCs in a disaster zone impact both the staff and their performance. Their presence when possible can have a positive impact on both staff and patients and should be made possible when available.

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Developing a Multi-layered Bleeding Control Program in Your Community

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Study/Objective: The goal of this session is to provide participants with an overview of a bleeding control program design and implementation. The session will cover the core elements of a bleeding control program, including equipment selection, bleeding control kit placement, bleeding control training programs, and public access.

Background: Severe bleeding remains a major cause of death amongst trauma patients worldwide. Beyond the disturbing trend of complex and highly coordinated terrorist attacks, an opportunity exists to enhance society's readiness and resiliency from all types of traumatic mechanisms of injury, both intentional and unintentional. Attaining early control of severe bleeding as close to the point of injury has been established as a known strategy to improve survival on the battlefield. The expansion of these concepts to the law enforcement and pre-hospital Emergency Medical Services community is already occurring. Expert consensus groups from both government and academia advocate that bleeding control equipment and training should also be made available in the civilian population.

Methods: Howard County (Maryland, USA) has created one of the first county-wide, multi-layered bleeding control initiatives in the North America. This program includes enhanced capabilities for first responders (police, fire, and EMS) as well as elements directed toward the civilians through a public access bleeding control program. The design, implementation, and lessons learned associated with this multi-tiered program will be presented.

Results: First responders have received training and equipment to provide bleeding control and other life-saving interventions. Public access bleeding control kits have placed in every public school. Additional kits are being placed with AEDs and in other high risk locations. School health personnel have been trained in bleeding control. Free bleeding control classes are available through a community outreach program.

Conclusion: Bleeding control programs represent an easily implementable, all-hazards medical countermeasure to help increase resiliency and minimize mortality from severe bleeding.

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Active Shooter Incidents - What are we Doing to Prepare?

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Study/Objective: New York University (NYU) Langone's Active Shooter Program has been designed so that staff know what to do if such an incident occurs. This presentation walks participants through their Active Shooter Plan. Next, the presenter explains how to develop an effective Active Shooter tabletop exercise for hospital leadership across three modules. Lastly, this presentation focuses on the Training Program for all staff.

Background: Knowing what to do during an active shooter incident increases the odds of saving your life, our patients, visitors and others. The recent terrorist attacks in San Bernardino, Paris, and Belgium reminds us to be vigilant, and to be ready anywhere, anytime. Hospitals are soft targets. We all know how important it is to have a plan, being able to warn those at imminent risk, and to train our staff, faculty and students on what they can do to ensure the least loss of life possible, while making every reasonable attempt to continue caring for patients.

Methods: Attendees will learn how to develop a Plan that provides guidance regarding the expected response actions. This presentation will describe how to utilize emergency communications tools for communicating with staff during and following an incident, the support to law enforcement that may be required to provide, and the provisions for establishing a Crisis Support Center to aid recovery services for staff, faculty, students, patients, visitors and their families. This presentation will then illustrate how to conduct an executive-level Active Shooter tabletop exercise.

Results: This Tabletop Exercise (TTX) will be based upon NYU Langone's December 2015 exercise with around 50 executives and senior managers from across the enterprise, using a hypothetical active shooter scenario. The series of questions for each module put forth to the leadership to deliberate and resolve will be discussed.

Conclusion: NYU Langone developed a "Run, Hide, Fight" video to train all staff. The video will be shown.

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MDA Experience Dealing with Penetrating Injuries in Terrorist Incidents

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Study/Objective: This study is aimed at reviewing the cases caused by stabbing and shooting (penetrating trauma). The patients were triaged by the Magen David Adom (MDA) team on the scene as suffering from substantial injuries or more serious injuries (patients declared Dead on Scene were excluded).

Background: Since September 2015, Magen David Adom in Israel - MDA (the National public EMS provider in Israel) have treated 526 victims from deliberate attacks. Among them, 56 suffered substantial injuries.

Methods: The study analysis is the response to 21 patients suffering from penetrating trauma injuries (stabbing and shooting) in those incidents (triaged on scene as suffering from substantial injuries), analyzing the response, on scene and evacuation time.

Results: In 43% of the cases, the on scene time was longer than 10 minutes, and transportation time in 71% of the cases was longer than 10 min (in 28%, 21-30 minutes).

Conclusion: The results call for a comprehensive understanding of the scene: the teams are working in a scene that has not been secured, with possible presence of additional perpetrators. Personnel has to work using Personal Protective Equipment (PPE) due to that risk. Dealing with an injured perpetrator requires security checks, authorization of the security authorities on the scene, and moral dilemmas. Transportation times might be prolonged. This creates a unique environment that calls for specific on-scene protocols, as well as training of the personnel (staff and volunteers) to be able to successfully perform their tasks in this hostile environment. On-scene procedures, as well as unique procedures developed (eg, police escort to overcome traffic), and revised treatment protocols as result of lessons learned from incidents will be presented.

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Clinical Care for Sexual Assault Survivors (CCSAS): the Use of a Multimedia Training Tool.

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Study/Objective: Evaluate a multimedia training tool used to train Health Care Providers (HCPs) as key actors in improving the delivery of quality Clinical Care for Sexual Assault Survivors (CCSAS).

Background: Sexual assault rises as a global public health issue, in conflict-affected populations, where SGBV becomes a strategy of war. Training HCPs has been prioritized by humanitarian actors globally to improve the quality CCSAS. Few studies have evaluated the effectiveness of such training.

Methods: Four ToTs days were provided to relevant community HCPs working in a conflict area in Jordan, Turkey, Syria, and Lebanon. The CCSAS multi-media tool developed by the IRC was used as a unified training tool aiming to improve clinical care. The recruitment process included a general call for application, entailing a detailed syllabus for the training course whereby individuals expressed their interest in attending and submitted their resume to ensure that their qualifications were in-line with the pre-set selection criteria for the training.

Results: Six ToTs took place; in Jordan, two groups of 25 have improved by 142% and 57.6% on average at post-test in knowledge and attitudes to care for survivors. The third ToT in Turkey, 13 participants have improved by 47% on average and nine participants have improved by 82.6% on average. In Lebanon, 19 participants have improved by 62.5% on average. In Syria, 18 participants have improved by 46.2% on average. Key barriers to quality care identified included poor or lack of access to services, lack of privacy and confidentiality, and lack of essential resources and treatment including PEP, as well as an unclear referral mechanism. Action plans were developed by participants to address these barriers and follow-up to the evaluating progress was planned.

Conclusion: The CCSAS multi-media training tool showed an initial positive impact and has demonstrated effectiveness in

promoting compassion and competence among trained HCPs and improving quality of care in humanitarian settings.

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Paris Terrorist Attack on November 13, 2015 - Applying Wartime In-hospital Triage and Damage Control Strategies

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Study/Objective: The Paris terrorist attack of November 13th 2015 caused 130 deaths and 351 injured.

Background: Our work aims to show how in-hospital triage and damage control strategies, acquired during the recent conflicts in Afghanistan and Sahel, enable a rational and appropriate management of the patients.

Methods: We retrospectively reviewed the cohort of 17 patients treated at the Percy Military Teaching Hospital on the nights of November 13-14, 2015.

Results: The mean age was 39 ± 8 years. Eight patients (47%) had a thoracic injury (mean AIS = 3[1-6]), 5 (29%) an upper limb injury (mean AIS = 2[1-3]), 4 (24%) an abdominal injury (mean AIS = 3[2-4]), 3 (18%) a face injury (AIS 2 = medium [1-3]), 3 (18%) a lower limb injury (AIS = 1), 2 (12%) a spine injury (AIS = 5) and 1 (6%) a brain injury (AIS = 5). There was no patient identity error. Two patients (12%) were categorized immediate with extreme mention (T1E) (ISS 19 and 29), 6 (35%) immediate (T1) (average ISS = 24 [13-41]), 4 (24%) delayed (T2) (average ISS = 6 [1-16]) and 5 (29%) minimal (T3) (average ISS = 1 [1-3]). Four patients (24%) had a damage control procedure with a mean surgical time of 68 min (43-84). All patients were treated according to the deadlines imposed by their categorization. One patient died of multiple organ failure in the aftermath of a resuscitation thoracotomy. All patient records were reviewed and three were analyzed as perfectible, without consequences for the patients involved.

Conclusion: The current context exposes us to the threat of new possible terrorist attacks and requires that the medical community get prepared to manage multiple war casualties. The familiarization to the modern principles of war surgery seems mandatory to face this type of situation.

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Lessons of Military Anesthesiologists after Terror Attacks in Paris. Comparison with Battlefield Experience.

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Study/Objective: Objective of this study is to report the management by a military hospital of an influx of civilian casualties due to terror attacks.

Background: During the night of November 13, 2015, Percy army teaching hospital received 17 wounded in two convoys.

Methods: Retrospective, descriptive study

Results: Except one, all patients (8 AU and 9 RU) had GSW and nearly half of the patients had thoracic injuries (no body armor) in contrast to recent military series. Triage of GSW was easier than injuries by explosion. The hospital was away from sites of the attacks with a delay of two hours before the arrival of the first patient. Five trauma bays for AU were prepared with for each 1 anesthesiologist, 1 nurse, 1 anesthetist nurse. Eight patients were hospitalized in ICU. A binomial surgeon-anesthetist was in charge of triage which is the rule in French army. Before arrival of first casualties, bracelets with a temporary identity were generated to avoid any mistake of identity. During the first hours; 32 PRBC, 32 lyophilized plasmas and 3 platelet concentrates were transfused without incident. The use of the universal lyophilized plasma specific to the French army facilitated immediate transfusion. Prior to the arrival of the first patient, it was decided that only damage control procedures would be authorized regardless of the clinical condition (collective indications of damage control). The goal of this decision was to optimize the use of operating theaters. This decision was motivated by the risk of second attacks and experience of managing a large number of wounded with a limited operating theaters number during deployments. Operating theaters like the rest of the hospital were never saturated. As in times of war, the transmission of information between the different levels of care was difficult.

Conclusion: Military skills are useful in managing an influx of casualties.

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Pray for the Best, Prepare for the Worst: Cholera Treatment Ward Preparation of Novice Haitian Healthcare Staff

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Study/Objective: To describe the preparing of Haitian Healthcare staff for triaging and management of cholera patients.

Background: Haiti has endemic cholera. This is exacerbated by our (yearly) rainy season. In 2016, this was further worsened by Hurricane Matthew, allowing massive contamination of water supplies in southern Haiti. This resulted in a much greater need

for Haitian healthcare workers with no previous exposure to this patient population, to be able to effectively recognize, treat and contain potential cholera patients.

Methods: Observational discussion and lessons learned from setting up a Cholera Treatment Ward in Southern Haiti, post Hurricane Matthew.

Results: Haitian Healthcare workers with no prior experience or capacity for treating cholera developed an effective knowledge base, skillset, and Cholera Treatment Ward (CTW), thereby proactively heightening local disaster management capabilities.

Conclusion: Many of our lessons learned are applicable to a wide variety of disasters, infectious diseases, capacity building situations and would be of interest to WADEM members' attendees.

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Does Planning and Preparation Help in Disaster Risk Management? A Nepal Experience

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Study/Objective: To review the response mechanism and the preparation before the Nepal earthquake, for effective preparation and response.

Background: Nepal which lies between two large countries of China and India and is prone to natural disasters including earthquakes, floods, landslides and severe weather events. Bureau for Crisis Prevention and Recovery (BCPR) ranks Nepal as the 11th most at risk country in the world in terms of relative vulnerability to earthquake. The (last year) earthquake in Nepal had caused nearly 9,000 deaths compared to the expected 100,000 deaths, and this is due to the timing of the event. The earthquake occurred on Saturday, so all the schools and offices were on holiday, that is the one important reason for the lower number of casualties; and the other is the preparedness of the Ministry of Health and the hospitals. The first factor was not in our hands to modify but the second one was. Two factors, one was that the government had taken the lead of all the disaster preparedness by various International Non-Governmental Organizations (INGOs) through the cluster system. The Second is the training in disaster preparedness by the course called Hospital Preparedness for Emergencies developed by US Aid.

Methods: Hospital Preparedness for Emergencies (HOPE), Primary Trauma Care (PTC), Emergency protocols were conducted and the Health Emergency Operation Center (HEOC) was prepared before the earthquake which helped in saving many lives. The HUB hospital system was implemented by Ministry of Health to coordinate better among the hospitals.

Results: All of this preparedness may not have worked completely, but the review organized by WHO and Ministry of Health, Nepal after the disaster showed that these training protocols and HEOC had really helped to treat patients systematically.

Conclusion: Stakeholders should undergo disaster risk management training, and work closely with the Ministry of Health to save as many lives as possible.

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Thrombolysis of Acute Massive Bilateral Pulmonary Embolism: A Success Story in a Ghanaian Emergency

Department

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Study/Objective: To report on the first successful management of a patient with acute massive bilateral Pulmonary Embolism, at the Komfo Anokye Teaching Hospital Emergency Department (KATH ED), Kumasi, Ghana.

Background: Pulmonary Embolism (PE) is an acute silent killer in developing countries, and is primarily a diagnosis of clinical suspicion. There are limitations in its diagnosis and interventions, increasing the mortality tendencies. Acute massive bilateral PE carries an exceptionally high mortality rate even with interventions.

Methods: We sought to describe the management of the first successful thrombolysis of a patient with acute massive bilateral PE who presented to our ED at KATH, because there is paucity of literature on successful ED management of such cases in Ghana.

Results: A 23 year-old woman, 2-months pregnant, G4P0⁺, admitted with sudden onset of breathlessness, chest pain and a history of hemoptysis one week earlier. No significant past medical history. BP was unrecordable, tachycardia, saturating <90% on oxygen, with deteriorating mental status. She was intubated and started on IVFs and subsequently, dobutamine. Bedside ultrasound revealed a dilated Right ventricle, full IVC and a gestational sac. No evidence of DVT. ECG showed sinus tachycardia, extreme left-axis-deviation, S-wave in lead I; Q-wave and T-wave inversion in lead III. Wells Score was 5.5. Normal chest X-ray and chest CT-Angiography showed acute bilateral massive PE. Thrombolysis was used with Streptokinase via central line after obtaining a clotting profile. She spontaneously aborted and the evacuation of the uterus was done. CPR was done following an episode of cardiac arrest, and Return of Spontaneous Circulation (ROSC) was achieved. She was admitted to the ICU, extubated and discharged home on warfarin on Day 12. She currently attends her review sessions and was given counsel for preconception care.

Conclusion: High-risk emergencies can be managed in low resource settings. There is, however, the need for available and affordable diagnostic resources, medications and logistics to promptly identify and appropriately manage such cases.

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Association Between Water Security, Disaster Risk Perception and Preparedness Behavior of a Rural Ethnic Minority Village in Chongqing, China: A Pilot Study

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Study/Objective: To explore the relationship between water security, disaster risk and preparedness among an ethnic minority rural community in China.

Background: Increased rainfall variability and water-related disasters can be expected due to climate change. Among the resource-poor in China, these water-related disasters will increasingly affect people's water security. There is a need to understand their current water security and disaster risk, to recommend long-term water management and disaster preparedness options.

Methods: A cross-sectional, cluster sample survey was conducted in February 2015, in Xingguang Village, south-eastern Chongqing, China. The target population was 520 households of 9 sub-villages. The survey included indicators on water security (time to fetch, water sufficiency, supply stability, water storage, and price), disaster risk (perception of living in high-risk area and ability to protect from future disasters) and preparedness (disaster bag). Descriptive and analytic epidemiological analysis was conducted using SPSS. Ethics approval was obtained from Chinese University of Hong Kong.

Results: Among 52 household representatives who completed the survey, 76.9% thought climate change impacted health, and water was their main health risk concern (36.5%), 63.5% have insufficient water on a normal basis, and 84.6% rely on rain-water as their main water source. Only 32.7% perceived to be living in a high-risk area, of which climate-related disasters such as storms (44.4%) and droughts (38.9%) were most frequent. Of all water security indicators, insufficient water was significantly associated with the perception of living in a high-risk area ($p = 0.017$). No evidence was found between water security indicators and the ability to protect from future disasters. No evidence was found between disaster risk perception and preparedness.

Conclusion: Long-term water management should address water sufficiency. Interestingly, the ability to protect from future disasters is not related to water security indicators. Disaster preparedness education and further research is recommended.

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A Lethal Lapse: Envenomation and Ebola, Critical Gaps in Aid Worker Preparation

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Study/Objective: Assessment of Critical Gaps in Aid Worker Preparation during the 2014 Ebola Outbreak.

Background: During the author's time as a clinician and clinical instructor during the recent Ebola emergency response, two mambas were found in Ebola Treatment Units (ETUs). In addition to the ETU setting, the very nature of addressing Ebola necessitates fieldwork in jungle conditions. Each of the three main countries affected by Ebola have a significant number of venomous reptiles, as well as other potential plant and animal sources of toxin exposures. The author worked independently for six weeks with Liberian Ministry of Health (MoH) and the World Health Organization (WHO) as a Facilitator for Ebola Phase III "Hot" Training.

Additionally, he assisted in the preparation and opening of a 50 bed Ebola Treatment Unit (ETU), where he was also responsible for providing clinical care, comprehensive education and training, and oversaw field operations of three ambulances and associated personnel. At no point did any of the formal pre-deployment training address the potential for envenomation from the local flora and fauna. I believe this is a critical lack that should be addressed in future responses.

Methods: Comprehensive review of CDC, WHO, US Military, and aid organization Ebola training materials. Informal verbal surveys conducting as an instructor during the final phase of Ebola hot zone training.

Results: Despite the potential of a lethal envenomation, no pre-deployment coursework included material addressing this possibility. Furthermore, informal surveys of hundreds of Ebola emergency response workers representing dozens of aid agencies revealed that not one organization had prepared for an envenomation incident.

Conclusion: Despite the fieldwork that is inherent in an Ebola emergency response, there were no plans in place regarding antivenin or medical evacuation from the field. The entire focus was on preventing exposure to Ebola. This is analogous to a "distracting mechanism of injury" in Emergency Medicine and Trauma, in which tunnel vision impairs a comprehensive survey.

Conclusions: When there is a probability of encountering envenomation during fieldwork, especially potentially lethal envenomation, pre-deployment training should include both a comprehensive risk assessment; as well as appropriate contingency plans. Failing to plan is planning to fail.

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The Fatal Fruit: A Cautionary Tale in Situational Awareness

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Study/Objective: Emphasize Need for Medical Mission teams to familiarize themselves with local flora/ fauna and potential intoxications/ envenomations.

Background: A four-year-old girl presented to our Haitian hospital with profound hypoglycemia and a six-hour history of

seizures. Initially, aside from addressing the hypoglycemia and administering benzodiazepines, the staff was unable to provide definitive diagnosis or treatment. Subsequent in depth interviews with the parents via translators allowed the staff to determine that ingestion of unripe ackee fruit (*Blighia sapida*) was the probable cause of the child's symptoms.

Methods: Case Study and review of physiology, biochemistry, and management of ackee fruit toxicity.

Results: Increased readiness on the part of healthcare providers to recognize and treat Ackee Fruit Toxicity, as well as increased situational awareness regarding potential exposures outside their cultural norms.

Conclusion: Discussion: The inability to obtain a complete history and physical (as is often the case in toxic ingestions), as well as a lack of familiarity with local toxic plants potentially led to a delay in definitive treatment. This is particularly problematic when medical staff is deploying to unfamiliar regions. Conclusions: Medical Mission workers should educate themselves as to local specific toxins that they may lack familiarity with. Delays in diagnosis results in delays in comprehensive care, with potential subsequent increases in morbidity and mortality.

Failing to Plan is Planning to Fail.

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When a Little Human is Bitten Twice by a Large Venomous Snake: The Providers Disagree with the Original Consultant Recommendation

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Study/Objective: This is a case of a severely envenomed child by not one, but two bites from a confirmed large adult Florida coral snake (*Micrurus fulvius*), that exhibited with immediate systemic manifestations. Initial consultation from a wilderness medicine and emergency medicine specialist, suggested one treatment, but consultation with a toxicology service asking certain questions gave conflicting recommendations to treatment. Bringing in other experienced consultants and advocating for the patient, led to the change of recommendation by the initial consultant; and finally treatment, though delayed initially, of the patient with the appropriate antivenom.

Background: Literature is scant at best on how often even medical professionals / attending physicians might disagree with consulting specialists. However, it is important for any medical professional at any level, to be able to advocate for what might be best for the patient, as well as to educate the patient or their caretakers. This, of course, can be done civilly and professionally, although this is a skillset seldom taught. Elapid snake envenoming, specifically coral snake envenoming, requires important education to determine if and how much antivenom, the only true cure for venom, might be needed. Many online resources are incorrect or incomplete with regards to the proper treatment of snakebites, and possibly even harmful.

Methods: This is a case of a double envenoming of a young child by a Florida coral snake, leading to severe systemic effects

that for various reasons had a significant delay in treatment with antivenom. This case will be used to highlight important aspects to snake envenomation and recommendations on dealing with consultants.

Results: In the end, our young patient was ultimately discharged from the Intensive Care Unit (ICU) with significantly improved central and peripheral nervous system symptoms.

Conclusion: Conflicting treatments and patient advocacy need to be carefully balanced, and even disagreements can be handled professionally.

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Using the Epidemic Curve to Inform Social and Behavior Change at Scale During Epidemic Response.

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Study/Objective: The International Federation of the Red Cross and Red Crescent (IFRC) presents a model for Social Behavior Change in emergency contexts that supports local actors in low resources settings, and engage with communities and utilize the epidemic curve to help inform response. Using the epidemic curve at a granular level, allows national communication plans to be tailored in time and place in relation to the movement of the epidemic, ensuring messaging and activities are tailored to where and when communities are in the epidemic evolution and combines with local context

Background: The focus on community engagement and the role of ‘Social and Behavior Change’ (SBC) during development and emergency interventions is not new. Much work has been done in this area with a plethora of theories and models to support implementation across health topics and sectors, as diverse as obesity and STD prevention. These models, often based on social science, psychology and social marketing have a commonality that includes triggering motivation for change, supporting and maintaining the new behavior. They rely heavily on in depth assessments of root causes of the behavior, cultural contexts and reflective program design. However, how do these models interface in an epidemic, where time and resources can be limited, the motivation for change is often clear, the threat time limited and moving geographically?

Methods: The IFRC supports an average of 20 public health threats a year. Providing quality SBC programming at scale in low resources settings, remain a significant challenge, however new models of implementation are being field tested.

Results: A new model was developed.

Conclusion: Providing a clear link between the epidemic evolution in time, place and person allows specific targeting of interventions to support prevention, reduction and eradication of transmission to at risk groups. The combination of the improved utilization of social science to inform programming, needs to be a two-way dialogue, where epidemiological data is used to target and tailor SBC.

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Nutrition Centers in Protracted Crisis Context: Field Study from Syria

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Study/Objective: The objective of this field study is to examine the effectiveness of implementing comprehensive nutritional services at the community level in the complex humanitarian crisis in Syria; and to disseminate this knowledge among other humanitarian actors.

Background: Syria is one of the largest and most complex crises, experienced by the international humanitarian system. Difficulties of access and transportation of goods have increased the prices and reduced the availability of commodities. Cases of Severe Acute Malnutrition (SAM) and Moderate Acute Malnutrition (MAM) – both components of Global Acute Malnutrition (GAM), are on the rise in Syria. The Syrian Arab Red Crescent in cooperation with Canadian Red Cross are supporting 6 nutrition centers in Hama, Salamiyeh, Al Tal, Tartous, Aleppo and Swaida.

Methods: In Syria, the Community-based Management of Acute Malnutrition (CMAM) approach targets of acutely malnourished children under five, and pregnant and lactating women through community outreach, Supplementary Feeding Program (SFP) and Outpatient Therapeutic Program (OTP). The cases either come directly to the centers or referred by doctors or outreach mobile teams who conduct door-to-door nutritional assessments, using Mid-Upper Arm Circumference (MUAC) measurements. Quantitative and qualitative data are collected and analyzed on regular bases.

Results: Until the end of October 2016 the centers were able, collectively, to screen a total of 38,847 children and 8,434 pregnant and lactating women. We’ve identified and treated total of 254 SAM cases and 1,574 MAM cases amongst children, and 1,167 cases of MAM among pregnant and lactating women. With ensuring humanitarian principles are always respected, we consider various tactics to overcome evolving challenges that may include access, security, patients and family compliance and disruption of nutritional supplements.

Conclusion: Implementation knowledge generated from this project can model challenges and solutions in comprehensive nutritional services at the community level in complex humanitarian crisis.

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Applying the Experience of Level-2 Military Surgical Teams to Disaster Medicine

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Study/Objective: The objective of the paper is to assess the options of using the experience of level-2 military surgical teams operating in military conflict in the context of treating mass casualty and disaster victims.

Background: Procedures applied by Polish military surgical teams during foreign missions conducted from 2008 to 2013 (total number of trauma patients –1,327), specifically in terms of treating locals, and the operations of the Urban SAR Groups of the Polish State Fire Service during earthquake-related rescue missions from 1999 to 2014, were assessed.

Methods: Medical procedures applied by the Polish military surgical teams and the Urban SAR Groups were analyzed, specifically in terms of using their experience to improve the efficiency of medical treatment of disaster victims.

Results: The operations of the level-2 surgical teams in Afghanistan have greatly advanced knowledge of dealing with trauma victims with limited personnel and restricted transport resources. The challenges involved in treating local patients always include limited options of long-term observation, and treatment which necessitates modification of treatment methods. Based on the experience of the Urban SAR groups acquired during post-earthquake rescue efforts, there is significant need for more extensive medical aid, specifically in cases of dealing with damage to the extremities, wound treatment and the “crash syndrome”. Experience of and procedures followed by the level-2 surgical teams in the course of damage control surgery and damage control orthopaedics, may be directly applicable to treating disaster victims, and also if there is no continued observation of victims.

Conclusion: Damage control surgery procedures may be applied to treatment of disaster victims. However, methods and standards of treatment must be carefully tailored to the inability to provide long-term care and patients relying on local health-care services for continued treatment. That is specifically important in case of orthopedic trauma treatment procedures.

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Emergency Teams in Cascading Disasters

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Study/Objective: To analyze the role of non-medical disaster response teams in cascading disasters, and their fit within wider Disaster Risk Reduction and Response (DRR&R) efforts.

Background: The field of disaster studies has recently seen a focus on so-called “cascading disasters.” What is meant is disasters with cascading effects across functional and national boundaries, leading to secondary disasters of a similar or larger magnitude than the initial event (Pescaroli and Alexander, 2015). The notion of cascades points our focus to an important question within current disaster response: Are we sending the right people? Put differently, is the composition of our disaster response teams fit for DRR&R in cascading disasters? In this regard, the role and potential of non-medical personnel to prevent, stop, and respond to cascading disasters has received little attention. Yet, considering how cascading disasters spread across critical infrastructures, such as electrical, transportation, or sewerage systems, clearly the focus on sending predominantly medical teams to disaster zones is insufficient.

Methods: This study is conducted in three steps: 1. An extensive literature review. 2. 20 in-depth, semi-structured interviews with: a) non-medical key personnel in areas such as construction, municipal planning, and the electrical grid to understand their perceptions of their role and abilities within DRR&R in cascading disasters. and b) key personnel from international DRR&R teams to understand their perceptions of the role of non-medical personal in cascading disasters.

Results: The insights of the literature review and interviews will be analyzed and consolidated into meaningful conclusions and actionable recommendations.

Conclusion: The research aims to suggest improved compositions of response teams that may prevent deterioration in disasters scenarios rather than focusing on the initial disaster situation alone. Final conclusions will be presented at the 2017 WADEM conference in Toronto.

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Medical Response to the 2016 Fort McMurray Wildfires - Descriptive Epidemiology of Patients Presenting to a Field Hospital

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Study/Objective: To describe the epidemiology of patient presentation to a physician, nurse, and paramedic staffed field hospital during the 2016 Fort McMurray Wildfires (FMMW).

Background: The FMMW was the most economically devastating natural disaster in Canadian history, resulting in the evacuation of over 80,000 citizens, burning of over 1,600 structures, with a cost of over \$9 billion CDN. Canada Task Force 2 (CAN-TF2) is Alberta’s all-hazards disaster response team, which includes Heavy Urban Search and Rescue (HUSAR) and Disaster Medical Assistance Team (DMAT) capabilities. As part of CAN-TF2’s deployment, a field hospital was established to support the incident as a result of the evacuation of local healthcare facilities.

Methods: A retrospective chart review was conducted of all Patient Care Reports from the field hospital to determine chief complaint, organized by Canadian Emergency Department Information System (EDIS) Presenting Complaint List. Disposition and patient demographics were also recorded.

Results: A total of 162 patients were seen over a 14-day period. Medical force protection accounted for 32/162 (20%) of patient presentations, with the remainder being patients external to CANTF. Evacuation to higher levels of care was required for 23/162 (14%) patients. Table 1 describes presenting complaints. The leading presenting complaint was prescription / medication request (n = 47), followed by foreign body eye injury (n = 14), GI complaints (n = 11 and n = 9), and foot care (n = 9).

Conclusion: The majority of patients presented with primary care complaints. While CAN-TF2’s primary mission was to provide medical force protection, most of the patients treated were external to the agency. Of the incident responders who

presented for care, the majority were able to return to work. A major medical challenge encountered was responding to a serious GI illness outbreak. Future medical planning will focus on provision of pharmacy services and promoting the use of eye personal protective equipment in wildfire hazard zones.

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Discovering Best Practice for the Implementation of Evacuation Centers for Vulnerable Populations: Findings from a Japanese Pilot Study

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Study/Objective: This paper will report the preliminary findings of a pilot study, undertaken with local government officials in Japan, concerning their involvement in planning for, setting up, and managing evacuation centers for vulnerable populations in Japan during the Great East Japan Earthquake in 2011. The objective is to illuminate the challenges that officials faced, and the resolutions and lessons learned in the preparation of evacuation centers through this event.

Background: Potentially vulnerable population groups in disasters include the elderly and frail, people who are isolated, and those with chronic diseases including mental health conditions or mobility issues. The 2011 Great East Japan Earthquake disaster affected regions of Japan where the proportion of older population is relatively higher than other parts of the country. In 2008, the Japanese Government Cabinet Office implemented guidelines for the preparation and establishment of evacuation centers for vulnerable populations. However, the 2011 disaster highlighted issues regarding the role and responsibility across governments relating to planning, setup, and management of evacuation centers.

Methods: The study was comprised of two phases. The first involved interviews with local government and relevant agencies' officials who have been involved in establishing evacuation centers for vulnerable populations in Japan. Five officials were recruited from the local government area affected by the disaster in Japan. Face-to-face, semi-structured interviews were audio-recorded and thematic analysis was conducted using NVivo software.

Results: Four themes emerged. They were: (1) reflecting on role and responsibility for community, (2) awareness of the need for preparedness, (3) factors causing organizations to be under-prepared, and (4) the need for greater community resilience.

Conclusion: This pilot study demonstrated that the establishment of clear role descriptions and responsibilities are key for local governments to prepare for the establishment of disaster evacuation centers, particularly for vulnerable populations.

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Hospital Surge Capacity in the 2011 Great East Japan Earthquake and Tsunami

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Study/Objective: Until now, there is no experience or evidence about hospital surge capacity in Tsunami disasters in Japan. In the meantime, we had experienced the 2011 Great East Earthquake and Tsunami. So, we will investigate how we make hospital surge capacity in Tsunami disasters.

Background: Surge capacity is a functional expansion capability for catastrophic situations within the organization to deal with a disaster. For hospitals, it can be said that it is the ability of the health care system to accept a large number of patients that occur in a sudden disaster. Not just one of the hospitals, the hospital group, the first-aid station in the area, and more must be considered, as well as the ability of the health care system in the affected prefecture, neighboring prefectures, and nationwide.

Methods: We have investigated five hospitals in Miyagi Prefecture. All hospitals are disaster-based hospitals that were prepared for natural disasters and designated by the local government. We compared bed capacity of these hospitals at peacetime and at the time of disaster; how they effected their surge capacity, and the regional bed capacity. We studied bed capacity in Yamagata Prefecture and places next to Miyagi Prefecture at that time.

Results: Two of the five hospitals that were near the pacific coast should install additional (extra) beds. The number of beds were about two or three times short of daily new admissions. Another two of five that were placed at inland hospitals had no need for additional beds. All hospitals stopped ordinary work to make or expand their capacity of beds and medical staff. Yamagata Prefecture could make slightly more bed capacity.

Conclusion: Except big hospitals in the affected area by Tsunami, hospitals were required to expand their additional (extra) beds for two or three times the daily new admissions, medical staff, and equipment suitable for disaster situations.

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Evacuation Burden of a Safety-Net Academic Medical Center during Hurricane Sandy: Implications for Reverse Triage

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Study/Objective: We describe evacuation burdens of a municipal, safety-net academic medical center, following the largest Atlantic hurricane in United States history.

Background: Typically applied to hospitals receiving surge capacity, reverse triage models have suggested that up to

50–60% of hospitalized patients are dischargeable in acute disaster. In this case, reverse triage occurred in practice in an evacuating facility to minimize interfacility transfers.

Methods: A retrospective review of the electronic records of patients evacuated from Bellevue Hospital Center during Hurricane Sandy and its aftermath, from October 30 – November 2, 2012 was undertaken. Demographic and clinical data, equipment needs, ambulatory status, transport requirements, forensic status, and ultimate disposition were evaluated.

Results: A total of 732 patients were admitted to the hospital or undergoing treatment in the emergency department at landfall. Of these, 723 records (98.8%) were available for review. Only 226 (31.3%) patients could be discharged home; 38 (5.3%) were discharged to shelters, while the remaining 459 (63.4%) patients required transfer to neighboring hospitals, subacute nursing facilities, or correctional facilities for further care. There were 236 (32.6%) either non-ambulatory or demonstrated gait instability; 66 (9.1%) patients were being treated in intensive care settings, including 16 (2.2%) patients who were ventilator dependent, and 19 critical neonatal patients. There were 324 (44.8%) patients admitted to inpatient psychiatry. Patients were directly transported to at least 37 individual facilities in multiple hospital networks.

Conclusion: Pragmatically, we found a lower incidence of dischargeable patients than previously assumed. The burden placed on hospital staff, evacuation teams, and neighboring hospitals during evacuation of a large, urban, quaternary care public hospital is severe. Simultaneous citywide evacuation of multiple hospitals may be untenable without prior plans to coordinate resources for such large-scale healthcare system stresses. This study highlights the need to carefully reconsider evacuation, operational and modeling assumptions and solutions in at-risk healthcare infrastructures in cities across the country.

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DMAT Operation in 2016 Kumamoto Earthquake

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Study/Objective: Evaluation of the Japan DMAT activities in a recent domestic major earthquake, referring to learnings from the past.

Background: The Japan DMAT system was established in 2005. At the time of the 2011 Great East Japan Earthquake, 1,852 members responded and provided hospital operation support and patient air evacuation. However, we found that the command system, safety and function screening of clinics and small hospitals via Emergency Medical Information System (EMIS), operation hand over to the subacute disaster phase, and logistic support needs to be improved. We have evaluated if those findings improved in the 2016 Kumamoto Earthquake operation.

Methods: We evaluated all 466 who responded, DMAT post activity reports and investigated any improved activities from the past responses.

Results: There were 2,071 DMAT members who responded. Among 10-day operation, the EMIS system was utilized to screen the level of damages to the clinics, small hospitals and also the evacuation shelters. The DMAT logistic team was activated and resulted in rapid replenishment of medical supplies to the damaged hospitals, and helped shifting of the command system from onset of earthquake to the subacute phase.

Conclusion: Compared to the past, the Kumamoto Earthquake had less trauma patients even though there were a lot of collapsed housing. People stayed inside of their own car due to fear from collapse. This declined activity of daily living in all ages, and created major needs in public health and welfare improvements. It is expected that the Nankai trough Earthquake may result in the biggest damages to Japan. Therefore, with our experiences, we must establish everyday cooperation and drills with local public health services, to operate quick responses to maintain and improve public health. Also, we must establish the psychological first aid system for the patients and the rescuers, which includes DMAT, and needs to cooperate with building inspections personnel to secure the safety of medical support in the damaged buildings.

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Mitigating Matthew: 5 Lessons to Help Improve Hurricane Hospital Preparedness

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Study/Objective: Following Hurricane Katrina, US hospitals have largely improved their approach to hurricane preparedness. Yet the timing and uncertainty of hurricanes present unique challenges for hospitals and emergency preparedness officials. Here we present the experience of one coastal hospital directly in the path of Hurricane Matthew (October 2016).

Background: Hurricane Matthew made US landfall on October 8, 2016 near McClellanville, South Carolina, just north of Charleston. The storm caused nearly \$10–15 billion in damages along the southeast coastline, representing the 22nd most damaging storm in US history.

Methods: This presentation “from the field”, documents one coastal hospital’s experience preparing for, responding to and recovering from Hurricane Matthew.

Results: Key lessons addressed to better prepare hospitals for hurricanes, include decision making regarding evacuation or shelter in place, evaluation of clinical services to maintain during the storm, the preparation and organization of staff, and the importance of developing an early recovery process to resume hospital operations.

Conclusion: In retrospect, the massive mobilization of resources may have been safely modulated downward without risk. But the potential for damage was real and the early call to evacuate was the right call. Our hospital experienced a committed, compassionate and coordinated response; and with minor modifications, coastal hospitals that follow simple rules should be ready.

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The Operations of Nagasaki Prefectural DMAT Headquarters in Kumamoto Earthquake: Safety, Management and Coordination

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Study/Objective: To assess the role of prefectural Disaster Medical Assistance Team (DMAT) headquarters, on the safety management of dispatching DMAT to earthquake-hit areas, and the preparation of the advance agreement between the prefecture and relevant organizations.

Background: Nagasaki prefecture is located next to Kumamoto prefecture. Immediately after the Kumamoto Earthquake, Nagasaki prefectural DMAT headquarters was set up. The missions were dispatch and coordination of Nagasaki DMAT, and preparation for mass transport of casualties from Kumamoto in cooperation with Kumamoto prefectural DMAT headquarters. **Methods:** The coordination process of Nagasaki DMAT headquarters was retrospectively reviewed, and was also assessed for the adherence to the existing advance agreement.

Results: The following coordinations were observed. **Safety management:** 1. The coordinated arrival of more than one DMAT in Kumamoto. 2. Consistently punctual and regular communication between the headquarters and the Nagasaki DMATs in Kumamoto. 3. The request to ensure warm greetings and relaxation space, and provision of psychological care for the DMAT staff by DMAT station hospital. **Coordination:** Securing the transport means for injured people proved difficult, but was managed by a coordinated request of transport by ambulance services, nursing home taxis, and self defense forces.

Conclusion: The current state of advance agreement was not deemed sufficient for the medical support of the earthquake-hit areas. The reflection of Kumamoto Earthquake experience should lead to improved advance agreement and dispatch coordination.

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Deployment Nutrition - Development of Disaster

Responder Rations

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Study/Objective: To provide Australian Medical Assistance Team (AusMAT) members access to a broad range of food to meet their individual nutritional requirements during deployment.

Background: Given the key role nutrition plays in overall health, disaster responders should be provided with high quality food during deployments. While military rations are an option, the nutritional requirements of disaster responders and soldiers vary markedly. Hence, six ration packs were developed for AusMAT members by the National Critical Care and Trauma Response Centre (NCCTRC).

Methods: The nutritional values selected were designed to meet recommended averages for healthy Australian adults participating in moderate activity. The packs contain commercially available food that responders are familiar with, increasing the likelihood of food consumption. Responders are familiarized with ration packs during training and the packs have been provided to AusMAT members during deployments since 2011.

Results: The nutritional content pack 1 is provided as an example, with the remaining packs providing similar nutrition through different pack contents.

Conclusion: Meeting the nutritional needs of a disaster responders team in austere settings is challenging. Through the use of six ration packs designed specifically for disaster responders and containing commercially available food, the risk of inadequate nutrition impacting AusMAT members has been mitigated.

NUTRIENTS	TOTAL IN PACK
Calories	2,637.7
kJ	11,169
Carbohydrates (g)	359.2
Sodium(mg)	5,304.4
Sugar (g)	84.1
Fat (g)	92.3
Saturated fat (g)	31
Protein(g)	110.2
Fibre (g)	11.5
Zinc (mg)	5
Vitamin C (mg)	268
Thiamine (mg)	0.94
Potassium (mg)	843
Calcium (mg)	231
Magnesium (mg)	0
Iron (mg)	3.6
Phosphorus (mg)	0
Vitamin B12 (µg)	1
Vitamin B2	0.35
Vitamin B3 (mg)	2
Vitamin E	0
Omega 3	200
Folate	81

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Development of a Coordination System: Lessons Learned in Earthquakes in Nepal and Japan

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Study/Objective: Designing a local health emergency coordination system for the disaster relief, based on the lessons we learned in international and domestic disaster medical relief.

Background: Major earthquakes with a magnitude of 8-9 are anticipated to occur in Mie Prefecture, Japan. Health emergency management services in local governments need to establish an efficient and accountable coordination system.

Methods: While having participated in disaster relief in recent earthquakes in Nepal and Japan, we observed the need for coordinating immediate medical assistance and support, to maintain local healthcare in transition from acute to later phase. We utilized the concepts of a health cluster meeting, and explored the roles of disaster medical coordinators in the regions.

Results: In 2015, we visited Nepal two weeks after the first earthquake and observed that the government was overwhelmed to distribute many international and domestic medical teams focusing on trauma, and emergency medical relief for mass casualties. Although the health coordination mechanism worked in the initial phase, support to local healthcare facilities where employees were also suffering, did not gain much attention. There was a gap between the disaster support in acute phase and long-term humanitarian relief, and the national and local authorities seemed unable to fill the gap. In the East Japan Earthquake and Tsunami 2011, many medical teams rushed to the areas without formal agreement. We requested to be dispatched as a prefectural medical team under the authority of affected prefectural government, which enabled us to support an acute and recovery phase under authority of local government. Based on the experience, Mie prefecture and Mie University have developed and distributed a local coordination system adapting concepts of a cluster approach.

Conclusion: We developed a local health emergency coordination system to cope with the disasters, considering the lessons we learned at the recent earthquakes.

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Counter-Terrorism Medicine: It Is Time

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Study/Objective: To demonstrate the demand for a new medical specialty committed to the unique mitigation, preparedness, and response requirements needed to be proactive in addressing terrorist attacks, based on the growing amount of medical literature analyzing such attacks to date. There is currently no such field.

Background: Asymmetric and multi-modality terrorist attacks represent an emerging and global healthcare crisis, increasing since the September 11th attacks. The particularity of modern intentional acts of violence is their non-conventional characteristics, that often result in a surge of specific injuries and wound patterns that put high demand on our healthcare systems. In addition, such attacks carry unique target-hardening, logistics, operations, and safety issues in order to positively impact morbidity and mortality.

Methods: The authors performed a systematic review of peer reviewed literature indexed in PubMed, with no limits on year of publication or language. Exploded search terms included “Counter-Terrorism Medicine” “Terrorist Attacks”, and “Terrorism”.

Results: Search strategy yielded 12,309 citations for “Terrorism”, 2,046 citations for “Terrorist Attacks”, and 0 citations for “Counter-Terrorism Medicine” that use the words together as a phrase. There was a clear increase in articles since 2001, with 96.7% of the articles written between 2001 and 2016.

Conclusion: We found 14,355 articles reporting on terrorism and terrorist attacks in the medical literature. The majority of articles were written after the September 11th attacks. This vast amount of data supports the need for a unique area of expertise dedicated to mitigation, preparedness and response to these events. We call that specialty ‘Counter-Terrorism Medicine’.

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Response of a Tertiary Care Teaching Hospital following a Grid Collapse in North India: Through a Contingency Plan

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Study/Objective: The current study brings about the response of a tertiary care teaching hospital in the event of a northern grid collapse that occurred in July 2012 in North India.

Background: Continuous and uninterrupted supply of electricity is vital for the smooth functioning of a hospital, as it is required for the functioning of life saving equipment. Electricity failure can lead to major adverse events in a hospital. Power disruption is not always predictable or preventable.

Methods: The real challenge was not only to address individual hospital services which were dependent on feeder electricity, but also to have a fine synchronization among various hospital operations to mitigate chaos and to avert any adverse outcome.

Results: The response to this major electricity failure was a contingency plan in place. As per the plan, we had a priority power back up system in the form of Diesel Generator (DG) back up. DG sets could provide power back up for a continuous eight hours, after which it had to be refueled. A liaison was created with the city-level engineering department to remain updated about resumption of power, and with government operated fuel stations to get the required amount of diesel on payment. Concurrently, various supportive functions and services of the hospital dependant on electricity were switched over from automatic modes to manual mode, without letting the patient care services be affected by it. The communication system was catered in through the use of

mobile phones from the closed circuit user group. Vertical transport systems were affected, and hence ramps were utilized for internal transportation of patients and supplies. The water crisis was averted by impressing upon need of water conservation among various users.

Conclusion: In the event of any crisis, having a contingency plan in place is the advantage to systematically and effectively make use of resources on hand.

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