them, and the overall and health-related damages that result. They include a conceptual formula for identifying factors that affect the probability of damage resulting from an event. The formula and the concepts that it entails also should facilitate identification of the impact of measures taken to eliminate or decrease hazards (prevention, modification) and/or the risk of hazards becoming a devastating event.

Fourteen major functional elements of a society that may be affected either directly or indirectly by an event resulting in a disaster are: 1) public health; 2) medical; 3) sanitation and water supplies; 4) shelter and clothing; 5) food; 6) energy supplies; 7) search and rescue; 8) public works and engineering; 9) environment; 10) logistics and transport; 11) security; 12) communications; 13) economy; and 14) education. These fourteen basic societal functions are linked together by a coordinating-and-control function provided by the respective governments. The interaction and relative impairment of any function can be depicted as a change from the pre-event status.

A series of three templates provides a structure for the study of disasters. The first groups the chronological, continuous mayhem of a disaster into recognizable, well-defined phases: 1) pre-event status; 2) event; 3) assessments of overall damage; 4) disturbances in health status; 5) needs assessment; 6) responses; 7) changes in health status; and 8) restoration of health status. The endpoint of the management a disaster is the time when the pre-event situation for the societal function has been recovered.

The second provides a structure and guidelines for the conduct of such studies, and the third provides a structure and guidelines for the design of such studies.

Two severity scores are proposed: a disaster severity score and a health disaster severity score. The use of the proposed severity scores will facilitate the comparison of the damage of disasters of similar severity and should facilitate the identification of factors that mitigate or intensify the effects.

A set of recommendations for implementation and testing of the Guidelines and their templates is provided.

Keywords: disaster; evaluation; guidelines; methodology; severity score
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Mobilisation of Medical Resources during Catastrophes

Dr. Knut Ole Sundnes, MD, DiPH
President, World Association for Disaster and Emergency Medicine (WADEM)
Norway

Our capabilities to react promptly in case of disasters has improved significantly during the last decades. However, much of the aid provided has been, and still is, based on intuition and anticipation. This presentation discusses obstacles, possibilities and mechanisms to foster better cooperation and management in the future. Ideally, responses, after being identified in needs assessments, must be requested and coordinated by a Coordination and Control (C2) body, responsible for the overall disaster management. The C2 body must include both local and national authorities and must have continual access to all information.

The primary focus should be the needs necessary to bring supplies above the critical thresholds for minimal functioning of the society. To avoid oversupply the "Disaster Critical Control Point" (DCCP) (when supplies and assistance balance the needs) should be identified as accurately as possible. These structures, combined with disaster severity scores and standardized evaluation, should improve both the accuracy and timelines of international assistance, medical and nonmedical, and help identify any "lowest common denominator" for future disaster response. Exclusive focus on medical responses is not usually effective, since provision of health care is intimately dependant on other societal functions. Traditionally, the focus on surgical needs has been given priority in medical disaster response and, in general, the effectiveness, efficiency, efficacy, benefits, and costs of such efforts remain to be demonstrated in the overall context of resource utilization. The resources provided must be in concert with the affected society and its culture. The narrow specialisation, taking place in the western world, is highly counterproductive for medical assistance in disasters. Any team assisting in disasters must be self-sufficient and part of an experienced operational organisation.

Nationally, a cost-benefit disaster management should be feasible, but, internationally, absence of an endorsed C2-structure hamper these processes. In the 1960's United Nations Disaster Relief Coordinating Office (UNDRO) was established to give the UN a coordinating instrument for disaster management. It never fulfilled its mandate as it was opposed both from within and from outside the UN. In 1971, the UN-Secretary-General stated, "more often than not the nature of relief depends on what donors can readily supply rather than on real needs." The UN resolution "Right to Intervene" has encouraged assistance, even if national authorities neglect a dire situation, but the downside is the concomitant acceptance of interventions without a C2 structure.

Keywords: Coordination and Control; Disaster Critical Control Point; disaster management; disaster response; needs assessments; resource utilization; team; United Nations
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Emergency Medical Preparedness and Response to a Singapore Airline Accident

Wen-Huei Lee, MD
Consultant, Department of Emergency Medicine, Chang Gung Memorial Hospital, Taiwan

A Singapore Airline crash in 2000 was the first documented mass casualty incident (MCI) caused by an aircraft disaster in Taiwan. This aircraft accident was anticipated by a MCI plan revision program tested with field exercises at the airport. The new plan adopted a two-phase response model. During the secondary phase of the plan, a multiple

hospital-based site medical teams response was scheduled to provide field medical care and command.

This study reviews the emergency medical preparedness of the airport and examines its effects on the medical response during this accident. It indicates that the anticipated benefits from the new MCI plan and prior medical preparedness were not achieved in this airport MCI. Victims were not triaged and received inadequate field medical care. Critically injured patients were not transported to the appropriate hospitals with priority. Poor compliance with the new MCI plan by the airport authority was noted. In addition, the multiple site medical teams could not function as the plan had been designed.

The emergency medical service system (EMS) should be designated as the key agency for the medical response to an airport MCI. Extensive training must be provided to airport firefighters enhancing the compliance with MCI plan. Scene management cannot be dependent on site medical teams. If site medical teams are warranted under certain special circumstances, a single prearranged and well-trained team is the optimal choice. The role of multiple hospital-based site medical teams response requires further investigation.

Keywords: airline crash; emergency medical services; EMS; hospital; mass casualty incident; medical team; preparedness; management; Singapore
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3.0. Free Papers

3.1. Oral Presentations

Trauma Patient Outcome Evaluation of Trauma and Nontrauma Centers

Dr Kum S. Ham, PhD
Senior Research Associate, Healthcaredata.com LLC, USA

Objective: Beginning from 1989, efforts have been made to study operational outcomes from the regional trauma centers in Pennsylvania, USA. However, no significant statistical findings regarding trauma centers have demonstrated the positive impact of trauma centers that has justified the program. This study presents ways to solve the data collection problems by using matching methods from various data sources. We compared trauma-patient care outcomes of regional trauma centers with those of non-trauma centers.

Methods: HealthcareData.Com, under contract with the Pennsylvania Department of Health, matched all hospital in-patient discharge records with prehospital patient care (ambulance response) reports by using AutoMatch software. The trauma patients were grouped into those who were admitted to trauma centers (n = 10,327: 40.9%) and those to nontrauma centers (n = 14,9: 59.1%). From these two groups of patients, we measured their medical care outcomes of hospital inpatient discharge status (n = 25,225), death (n = 739: 3.0%) vs. survival (n = 23,998: 97.0%), and discharge pattern (n = 24,427), live discharge to home self care (n = 14,172: 58.0%) vs. to further care at to other institutions (n = 10,256: 42.0%). We also measured patient morbidity as a trauma care outcome by using length of hospital stay (n = 24,471; mean length of hospital stay = 5.7 days).

Results: Descriptive analysis showed higher mortality rate at the trauma centers (3.2%) than nontrauma centers (2.9%). This rate difference was not significant at $p = 0.05$ contrary to our expectation. We expected that significantly more patients would die in the trauma centers than nontrauma centers due to their higher injury severity and greater medical complications. We also expected that a significantly higher rate of patient mortality would emerge from the trauma center patients as we use Revised Trauma Score (RTS) in logistic regression against the outcome variable. However, the regression result (b = 0.294)with odd ratio of 1.34, not significant at $p = 0.0001$) failed to show a significant mortality difference between trauma centers and nontrauma centers despite the fact that the former group of patients had significantly higher RTS (11.77) than the latter (11.51) at $p = 0.0001$.

Among the patients who were discharged live, 70.4% of the trauma center patients were discharged to self home care as compared to 49.7% of the nontrauma center patients, significant at $p = 0.0001$. Logistic regression also showed regression coefficient of b = 0.1625 with $p = 0.0001$ and an odd ratio of 1.176. This indicates that trauma center patients were significantly more likely to be discharged to home self-care than the nontrauma center patients, holding RTS constant.

Lastly, regression analysis showed that trauma center patients had a half day longer hospital stay (b = 0.545, f = 35.9, $p = 0.0001$) than non-trauma center patients when all the patients were included in the equation, holding other independent variables constant such as patient age, gender, and RTS among others. However, when we excluded some outliers (0.95%) that show LOS more than 30 days, the trauma center patients showed b = 0.361, t = 13.31, $p = 0.0001$. This means that the trauma center patients stayed in the hospital 0.36 days longer.

Conclusion: Despite the fact that trauma center patients had significantly higher RTS than did non-trauma center patients, they did not show a significantly higher mortality rate other than some random effects. The trauma center patients stayed in the hospital between 0.36 and 0.55 days longer. However, they are more likely to be discharged to home self-care than are non-trauma center patients. Less than 70% of the trauma center patients were discharged for home self care as compared with less than 50% of the nontrauma center patients In this regard, trauma centers must be better utilized in order to improve trauma patient medical well-being as well as to improve potential long-term trauma care cost savings.

Keywords: complications; cost; data collection; hospital; length of stay; mortality; outcome; regional; trauma centers, trauma score
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