

in emergency planning for large numbers of civilian casualties. Recent experiences have emphasized the need for interdisciplinary planning and synchronized management strategies and protocols. Germany will host the World Soccer Cup in 2006, and Munich will be hosting several games for this event. Therefore, it is necessary to reevaluate the current system for dealing with mass casualties.

Methods: As the basis for the planning, a critical path model for the management of a multiple-casualty incident using evidence-based medicine was developed. The starting point is the first unit on-scene and the finishing point is the stabilization of all patients in a hospital facility or the discharge of those not requiring treatment. Triage Category 1 patients was defined as having a zero buffer time, and therefore determining the critical path in the chain. The critical path model has been transformed into a management algorithm and encompasses medical, as well as logistical procedures.

To test the viability of this model, exercises are being conducted and evaluated continuously. In parallel, hard data are being collected, giving values to amounts of resources and times of procedures needed in a computational model.

Results: The creation of an interdisciplinary algorithm has greatly enhanced the ability to work with other emergency management services and facilitators to achieve a synchronized emergency management matrix. All personnel involved in responding to such an incident have a clear understanding of their role, priorities, and dependencies.

Discussion: A more structured approach to planning and dealing with mass-casualty incidents has been the topic of many publications and conferences, and theoretical and empirical planning methods have proven ineffective. Integrating knowledge and practices from other management fields into emergency medical management will prove beneficial. The frequency of incidents involving multiple casualties is increasing and valid planning methods will become an integral part of risk management for governments and authorities.

Keywords: exercises; Germany; mass-casualty incidents; models; Munich; planning

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Tiered, Multi-Hospital Response and Joint Triage for Disaster: A Model for Resource Allocation and Surge Capacity

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Objectives: In city-wide disasters, multiple hospitals are stressed and inundated by patients, some of which have needs not routinely provided by an individual facility. Redistribution and triage of patients in a coordinated response to disasters can utilize the unique services of each hospital, while lessening the burden on any one facility. Having a city hospital, such as Kings County Hospital Center (KCHC) across the street from a state-run, tertiary care facility, such as the University Hospital of Brooklyn, is common in large urban centers. A rehabilitation nursing home and a state psychiatric facility also are located within

a radius of one kilometer. A disaster response to mass-casualty incidents was developed incorporating all of these facilities, demonstrating that it is possible to minimize duplication of services in order to provide efficient use of resources. In subsequent drills, it became apparent that a full response was neither efficient nor cost-effective for all scenarios. A graded response system was developed to prevent under- or over-utilization of resources. In this tiered system, with each level of escalation, additional surgical teams, directors, and hospital emergency incident command system (HEICS) personnel are activated.

Methods: An emergency preparedness liaison was appointed to each hospital to integrate these plans into a joint multi-hospital disaster response. The police and fire departments along with the Office of Emergency Management were integrated into this project. The following graded response plan was developed: Level I and Level II are limited responses for circumstances in which the number of casualties expected are no more than 10, or 10–30 critical victims presenting over a 1–2 hour period, respectively. As KCHC is the regional Level 1 trauma center, the first two levels of response are contained within the KCHC HEICS. A Level III center is utilized when the number of casualties are expected to exceed 30 critically injured, requiring hospital-wide disaster plans for all facilities. Integration of rehabilitation and nursing home facilities into the plan allows the trauma center (KCHC) to free up isolation beds in case of a biological disaster. Ventilated patients can be reassigned to the extended care facilities at the discretion of hospital medical officers as need arises. Families and associates are directed to the psychiatric facility where counselors are available for assistance.

Results: Disaster drills of this graded response system showed improvements in triage, tracking, treatment, and surge capacity. All city, state, and federal agencies reacted favorably to the joint hospital project, changing traffic patterns to facilitate a unified triage system between multiple hospitals.

Conclusion: It was found that interhospital and interdepartmental cooperation in disaster management is possible and beneficial to rapid, organized, and efficient resource allocation.

Keywords: cooperation; disaster management; graded response system; hospital; response; triage

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How Can Information and Communications Technology (ICT) Improve Coordination and Control in Disaster Response?

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Introduction: Successful coordination and control depends on all parties having access to up-to-date information. Current approaches are based mostly on verbal communication (by phone/radio), and by the exchange of written forms. Experience has shown that these methods often are inadequate. The use of information and communications technology (ICT) offers great potential in providing a common, up-to-date picture of the situation. But this

potential only can be realized fully if implementations are based on a solid understanding of the key factors that determine the usefulness of such systems.

Objective: To provide a framework for analyzing and evaluating the key factors involved in the design of ICT-based systems for coordination and control of disaster response.

Methods: A prototype system for gathering and sharing emergency medical information was implemented using hand-held computers and a wireless network. Based on experiences with this system, a framework was developed for the design of ICT systems for coordination and control, providing: (1) definition of indicators of the effectiveness of information sharing enabled by a technological solution; (2) classification of the types of information to be shared during disaster response; (3) classification of mechanisms for information sharing (including traditional mechanisms); and (4) assessments of which methods are best suited to which types of information.

Basic level, ICT-based information-sharing ensures that individual data items are delivered to everyone involved, but does not process the data into information. More advanced systems can collate information (e.g., produce reports indicating how many persons are suffering from a particular condition). With derived level information-sharing, the ICT system can perform possibly complex computations to calculate higher-level measures and indicators based on combinations of basic data items.

This presentation will discuss how derived level information-sharing can be linked to the concept of indicators of function and basic societal functions (BSF), as defined in the Utstein Style.

Conclusions: Information and communications technology-based systems have a key role in supporting effective coordination and control in disaster response. The framework presented here can act as a common reference for the design and assessment of such systems.

Keywords: control; coordination; disaster; information and communications technology; information-sharing; response

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Disaster Triage Tools—An Evidence-Based Review

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Introduction: Triage is the key principle guiding the ethical allocation of limited healthcare personnel and resources during a disaster incident. Disaster triage is based on the utilitarian concept of producing the “greatest good for the greatest number” by ensuring that limited medical resources are expended in a way that benefits the maximum number of patients. Several tools for primary disaster triage exist. Despite broad support for these triage algorithms, little research has been done to evaluate evidence to support the validity, reliability, or accuracy of these tools.

Methods: A strategy was developed for PubMed® and modified for use in the other electronic databases. The strategy used text words such as disaster triage, emergency triage, and mass-casualty incident triage. The electronic searches were conducted in April 2004, with an updated

search of PubMed in October 2004, and no restrictions based on publication date were used. Team members also searched the literature by hand to ensure comprehensiveness and reviewed the reference lists of relevant reviews, reference papers, and eligible articles. A total of 43 articles meeting these criteria were reviewed.

Results: Through an iterative, summative process, five primary triage systems were identified in the literature: (1) North American Treaty Organization (NATO); (2) Triage Sieve; (3) Simple Triage and Rapid Transport (START) triage; (4) JumpStart; and (5) CareFlight Triage.

No standardized nomenclature or terms between triage approaches exist. All triage methods used physiological criteria. There are two papers in the peer-reviewed literature that attempt to evaluate these mass-casualty triage tools. Sensitivities and specificities of each system have been reported retrospectively under simulated disaster scenarios. No prospective study has been published in a real or simulated disaster.

Conclusion: Using an evidence-based approach, no single standard triage criteria was identified. Triage systems have not been validated for disaster/critical event use. Specific subjects from the literature such as physiological criteria likely form a basis of consensus that should be validated and polished. While there are advantages to various published triage systems, no overwhelming evidence exists to support one system over another. There is poor strength of evidence to support any triage process. Currently there are criteria being developed to study triage systems more objectively.

Keywords: approach; criteria; disaster; review; triage

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Applicability and Usefulness of Hospital Preparedness for Emergencies (HOPE) Course in Southeast Asia

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Objective: In the last several years, there has been an increased interest in disaster preparedness and response. Based on this interest, a course, Hospital Preparedness for Emergencies (HOPE), was created for five countries in Southeast Asia: Bangladesh, India, Indonesia, Nepal, and the Philippines. Initially, the course was taught to the most experienced hospital/administration personnel in their respective countries. The purpose of this study was to describe the: (1) background of participants; (2) course; and (3) applicability of the course to participants.

Methods: A team of international experts developed a four-day course covering 30 topics and exercises. Participants, who were hospital administrators and senior hospital health officials, were surveyed pre- and post-course regarding background and applicability of course to work setting. To date, the course has been held in Indonesia, Nepal, and the Philippines.

Results: Of all participants, 66% (29–71%) are part of a disaster response team for their area, and 41% (14–61%) have attended a preparedness course in the past. The num-