

distributed to the workers to assess their hazard exposures and their local experiences related to work and industrial hazards, chemical exposures, and their consequent health effects. Interviews and focus group discussions also were conducted.

Results: There was 100% use of chemicals in the industries used as raw material or solvents for processing including toluene, alcohols, lead, and trichloro- and perchloroethylene. The industries generated dust and vapours, as well as acids and caustics. The blood lead levels of the 285 subjects sampled indicated that 40.7% had blood lead levels within the 21–30 ug/dL, which is considered by the Department of Health as inimical to the health of workers. When hazards and illness were correlated with the alpha set at 0.05, radiation exposure was associated with bone pain, and dust exposure with eye strain and viral exposure. Based on the results, a proposed exposure rating instrument for chemical exposure was developed. This tool provides an easy assessment of chemical risks using factors such as contact with the body surface, generation of vapor within the breathing zone, threshold limit values (TLV), and exposure time. For example, exposure rating estimate of “0” means “no” exposure either through dermal contact or within the breathing zone of the worker. “Moderate” exposure is given an estimate of “2”, which means an exposure time of less than 50% of the total 8-hour workday. “Very high” exposure is excessive exposure above the TLV that varies by the chemical, and when the exposure time is beyond the 8-hour work duration. The interviews revealed that the terms of employment included lack of social benefits, practice of unfair labor terms like apprenticeship where workers are given only 75% of the minimum wage, forced overtime, piece-rate wage rather than daily minimum wage, and the restriction from organizing labor.

Recommendations: It is suggested that a broad front of strategies coupled by a policy framework for industrial hazard exposures be developed. To fight for social inclusion at work means more involvement of the stakeholders in the development of actions to improve their control of their work, enhanced entitlements to economic and social benefits through policy frameworks of national governments and a thorough democratic alliance of various sectors including the now, so called third sector, so that social objectives are not subjugated to pure economic considerations. Disasters from industrial hazards can be reduced or controlled through the review of labour standards and the engagement of workers themselves through active labour organization to attain levels of safety and health in the workplace.

Keywords: alliance; assessments; chemicals; economics; exposures; framework; hazards; illness; Philippines; policy
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Task Force Session: Disaster Public Health

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Disaster Health Impacts—The Gujarat Experience

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Background: On 26 January 2001 at 08:46 hours, an earthquake struck Gujarat State in the Republic of India. The earthquake magnitude was 7.9 on the Richter scale. The World Health Organization was asked to perform disaster site assessment, and to undertake coordination of external relief activities in the health sector.

Methods: (1) Rapid epidemiological and health facilities assessment; and (2) Expansion of existing polio surveillance into post-disaster syndromic surveillance system.

Results: There were approximately 20,000 deaths and >167,000 persons injured. More than 225,000 homes were destroyed and another 400,000 damaged. The geographic area most affected was Kutch District where all 884 inhabited villages were damaged, and the district hospital and 46 of 47 community and primary health centers were destroyed. Only the tented military hospital remained functional. It performed approximately 1,500 major surgeries and 7,000 minor surgeries within the first 48 hours post-event. Trauma case presentations declined sharply after 72 hours. By the second week post-event, leading causes of morbidity were undifferentiated fevers, acute respiratory infection, and simple diarrhea. Marked deficiencies occurred in solid waste disposal, standardized case management, and epidemic preparedness.

Conclusions: The Gujarat earthquake was the largest recorded in Indian history since the Calcutta earthquake of 1737. The burden of traumatic disease peaked before the arrival of international medical assistance. Locally endemic infectious diseases predominated afterward. Critical decisions in post-event health response relied upon a scaleable disease surveillance system developed from infrastructure and personnel of the existing polio surveillance system.

Keywords: clinics; deficiencies; earthquake; Gujarat, hospitals; India; infectious diseases; medical conditions; polio surveillance system; rapid epidemiological and health facilities assessment; trauma

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Evidence-Based Tool for Redefining an Approach to Severe Malnutrition in Complex Emergencies

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Introduction: Merlin, an UK Medical Charity, has successfully addressed the individual medical needs of malnourished children in nutritional crises. But, with a commitment to an evidence-based approach to humanitarian aid, Merlin needed to redefine its appropriate response to populations in complex emergencies. The aim of this unique University-non-governmental organization (NGO)

partnership is to develop an evidence-based tool, which, in conjunction with existing nutritional guidelines, will guide Merlin's strategic approach to nutritional crises.

Methodology: Specific research questions relating to vulnerable populations were developed from the systematic assessment of the perceived need of Merlin headquarters (HQ) and field staff. A robust, systematic, critical, literature review was conducted that was sensitive to the broad types of evidence in this field. An evidence-based matrix for the level of evidence that facilitated a critical review for each research question (or evidence gaps) was developed. This matrix allowed identification of the relationships between programmes and population indicators.

Results: This paper describes a proactive approach to how such a partnership works, and presents some of the findings: The evidence matrix is presented for the following research questions on a population of seriously malnourished children:

1. What is the evidence for measuring specific prognostic indicators, particularly those related to redefining care for sub-sets of this population?
2. What is the evidence for comparative programmes outcome indicators?
3. What is the evidence on the relative importance of contextual factors?

These generic and pragmatic findings will be applicable to other NGOs in this field.

Keywords: assessment; emergencies; evidence; health; matrix; needs; populations; standards; tools; vulnerability

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Symposium: Clinical Issues in Disaster Medicine

Early Laser Ablation Accelerates The Healing of Partial-thickness Sulphur Mustard Burns

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Introduction: In man, the chemical warfare agent, sulphur mustard (SM), is a potent blistering agent. Skin exposure can produce partial-thickness burns that may take six times longer to heal than the equivalent depth thermal burns, possibly as a result of residual alkylation. The aim of this study was to investigate the use of early laser ablation as a means of accelerating this exceptionally slow rate of healing.

Methods: Four circular, partial-thickness, SM burns were induced on the dorsum of nine large, white pigs (under general anaesthesia). At 72 hours post-exposure, three burns per animal were ablated with a single pass of an Ultrapulse 5000C CO₂ laser, at a fluence of 5-6 J.cm⁻². All burns were dressed with silver sulphadiazine and a semi-occlusive dressing. Three animals were culled at 1, 2, and 3 weeks post-exposure respectively, and all lesions excised for histological analysis. Burn depth was confirmed, and measurements of the radii of regenerative epithelium were made so that the area of the zone of re-epithelialisation in each lesion could be calculated.

Results: Laser-treated lesions showed a statistically significant increase (350%) in healing rates compared to controls ($p < 0.005$). At two weeks, the laser treated sites were 95% healed in comparison with control sites (28% healed).

Conclusions: These data suggest that laser ablation may be efficacious in the treatment of SM-induced skin lesions.

Keywords: chemical warfare agent; sulphur mustard; laser ablation; chemical burn

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Crush Injury and the Kidneys: What Are the Lessons to be Learnt from Recent Earthquakes?

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Many areas of the world are prone to earthquakes. In the last few decades, earthquakes have affected populations in areas such as China (1976, 200,000 deaths), Armenia (1988, 25,000 deaths), Japan (1995, 5,000 deaths), and Turkey (1999). Review of the medical literature that followed these and similar events, highlight the significance of crush injuries on renal function. The review may facilitate enables assessment of the clinical management of these patients within the cohort of a disaster. Emergency services throughout the world regularly are exposed to non-earthquake-related crush injuries. Crush injuries occur due to structural collapse or from industrial or vehicular accidents.

While focussing on the particular goal of renal resuscitation, this paper reviews the overall management of crush injury. It includes the pathophysiology and the emergency and ongoing management. It particularly examines the published literature following earthquake disasters, and how this can be translated into management of smaller incidents.

Keywords: crush injury; crush syndrome; earthquake; emergency medical services; renal failure; renal resuscitation

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Pain Relief for the Injured in Disasters

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In a disaster situation, the first need for those who potentially can be saved is the provision of basic life support. Oxygen administration, if possible, also is a high priority. Along with rescue and retrieval, an easy, inexpensive supply of medications for pain relief is the next priority, but only rarely is it included in disaster packs.

Injected agents including narcotics are not practicable, although ketamine has been mentioned through the years. Cylinder supplies of nitrous oxide/oxygen mixtures are bulky, heavy, and difficult to clean between patients.

Inhaled methoxyflurane has many characteristics suiting it for stockpiling and use in disasters. It is an inhaled analgesic. It is simple to administer, involves minimal training, and is very safe when administered correctly. Methoxyflurane is very effective in relieving suffering in most conscious, injured victims, and can be used in combination with oxygen. It can be preloaded and thrown to trapped victims. It has a three-year shelf life. The analgesic device and co-packed medication can be stockpiled as it