

with continual heavy rain from 22 October to 02 November, 1998. Although the eye of the storm did not make landfall in our territory, the huge area of rainfall included the entire country. The rains were most severe in the coastal areas. Costa Rica had developed an integral and coordinated plan to face disasters and major emergencies. This plan was activated as soon as information was available regarding the potential risk to our country by Hurricane Mitch.

Close and continual monitoring of previously identified flood-prone areas and a timely evacuation of people in those areas was coordinated through the National Emergency Commission.

#### Results:

- 1) 16,500 people had to be evacuated, 5,500 to 99 shelters and the rest to friend's or relatives homes;
- 2) Four people were reported dead and four were missing;
- 3) 10 people suffered injuries that required medical care;
- 4) 74 major roads were either blocked by landslides or damaged by flooding;
- 5) 36 bridges were destroyed;
- 6) 39 schools were damaged;
- 7) 740 houses were destroyed or damaged; and
- 8) Agricultural production was affected, particularly rice, sugar cane, bananas, coffee, corn; dairy products, and fishing.

**Conclusion:** Although Costa Rica was not directly affected by Hurricane winds, it suffered moderate to severe rains for 12 days. In spite of significant damage to crops and infrastructure, there were only minor consequences to human life and health.

We believe that emergency and disaster reduction, preparedness, and planning, as well as increasing public awareness and education must play a significant role in the end results from a phenomenon such as Hurricane Mitch; and that this accounts for the minor death and injury toll that we experienced.

**Keywords:** Costa Rica; disaster planning; Hurricane Mitch; infrastructure; preparedness; rain

#### G-41

##### Domestic Disaster Relief Activities in the Japanese Red Cross Society

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Disaster relief has been one of the Japanese Red Cross Society's (JRCS) primary activities since it first dispatched a medical relief team to assist victims of the terrible Mt. Bandai eruption in 1888. The JRCS demonstrated its strength in disaster relief after the Great Kanto (1923) and the Great Hanshin-Awaji (1995) earthquakes, the Unzen-Fugen volcanic eruption (1991), and various other natural disasters. The JRCS also is involved in rescue operations in cases of major accidents, for example, plane and train

crashes, gas explosions, and fires in public places such as hotels and department stores.

Under the Disaster Relief Law and the Disaster Countermeasures Basic Act, the JRCS is required to give medical care, manage the handling of corpses, and also to play a role as the coordinating organization to cooperate with the government and other public agencies in relief operation.

The author presents the JRCS disaster relief operations undertaken with the advanced cooperation of the other chapters in this forum during the heavy rain and flood disasters Japan encountered during the summer of 1998.

**Keywords:** accidents; cooperation; Disaster Countermeasure Basic act; disaster relief; Disaster Relief Law; Japanese Red Cross Society (JRCS); Great Hanshin-Awaji (1995) earthquake; Great Kanto (1923) earthquake; rescue

*General Session-X*  
**Prehospital Care**  
**Tuesday, 11 May, 8:00-9:00**  
**Chair: Michael Oles, Kei-ichi Tanaka**

#### G-48

##### Mobile ICU for Transport of Critically Ill — The Whangarei Experience

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**Introduction:** The transport of critically ill patients is a necessity the world over. With centralisation of Critical Care Medicine and Emergency Medicine resources, effective and quick transport of the critically ill becomes an integral part of modern medicine. Efficient transport of the critically ill and provision of ongoing transit intensive care for the critically ill are of great importance to New Zealand — a country with a land area the size of Japan and a population of 3.4 million. Northland is New Zealand's northern-most province with a population of 140,000. The density of population is 14 people per square kilometre.

**Results:** The nursing and medical staff at the Intensive Care Unit in Whangarei Hospital, New Zealand have been involved in transit care of the critically ill for 10 years. Health resources are centralised largely to the Whangarei Area Hospital, the base hospital for the region. The terrain is tough and subjected to the vagaries of weather. A mobile intensive care unit (ICU) provides transit care of the critically ill that facilitates movement of patients within the region and, in appropriate cases, transfer to a tertiary centre for cardiothoracic and neurosurgical management.

We use an effective mobile ICU — the bridge — that locks onto the patient stretcher, and is an efficient contraption for holding all the basic requirements of an ICU in a compact manner. The patient-bridge unit is

transportable, manually (retrieval of patients from difficult terrain), by surface ambulance or in a helicopter.

**Conclusion:** The bridge is an effective mobile ICU. We will discuss the evolution of the Whangarei mobile ICU bridge and highlight its user-friendly features.

**Keywords:** critical care medicine; intensive care; helicopter; surface transport; mobile intensive care unit; New Zealand

#### G-49

##### The Importance of Measurement of End-Tidal CO<sub>2</sub> in Prehospital Care

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**Introduction:** Due to the development of cardiopulmonary resuscitation (CPR) techniques, an increasing number of patients are surviving after cardiac arrest. In addition, the number of persons surviving with serious, permanent damage, and who depend upon permanent and expensive hospital care are increasing as well.

Optimum standard airways ensuring ventilation of patients during CPR include endotracheal intubation and artificial ventilation. A better solution, concerning this part of CPR, is not anticipated in the near future. The question of obtaining optimum tissue perfusion by external chest compression has been discussed several times.

Until now, there has not been a method for evaluating the efficiency of CPR. The monitoring of end-tidal CO<sub>2</sub> during CPR could be helpful, especially for beginner-rescuers. The initial use of capnometry in Emergency Prehospital Care was in the control of ventilation in patients who were being artificially ventilated during transport to the hospital. Originally, when capnometry was used during CPR, there were dramatic changes in ETCO<sub>2</sub> levels, but the artificial respiratory regime was not changed in accordance with the ETCO<sub>2</sub>.

**Method:** The study was performed on 13 patients who required CPR for non-traumatic, circulatory arrest. All of the patients were unconscious when the medical team arrived. The depth of unconsciousness signaled that pharmacological intervention was not necessary for intubation. Orotracheal intubation was accomplished within 20 seconds. The same parameters for artificial ventilation were used for each patient. A Cardiopump<sup>®</sup> was used for chest compression. An aspirating capnometer (BCI 8200) with a colorimetric detecting system was used to measure ETCO<sub>2</sub> levels. Levels of ETCO<sub>2</sub> were measured immediately after intubation and every five minutes thereafter. Measurements continued until either the CPR was stopped and the patient was pronounced "dead", or s/he was admitted to the hospital.

**Results:** *Surviving patients* — The initial level of ETCO<sub>2</sub> in the surviving patients was between 15 and 38 mmHg. All of the patients maintained a level of ETCO<sub>2</sub> between 25 and 60 mmHg during CPR and during transportation to the hospital.

*Non-surviving patients* — With one exception (18 mmHg), the initial level of ETCO<sub>2</sub> in patients that did not survive was <15 mmHg. All the patients who had an ETCO<sub>2</sub> level below 15 mmHg after 15 minutes of CPR did not survive.

*Patients that died before reaching the hospital* — ETCO<sub>2</sub> increased rapidly in two patients due to effective CPR, but the levels could not be sustained. The ETCO<sub>2</sub> levels remained low in each of the other patients.

*Patients that died in the hospital* — ETCO<sub>2</sub> levels did not rise above 30 mmHg. The ETCO<sub>2</sub> levels remained low during CPR in patients who were diagnosed as having pulmonary embolism at autopsy.

**Conclusion:** Capnometry can have wide application in prehospital care. It is important to be able to assess the efficacy of CPR:

- 1) During CPR, try to maintain a level of ETCO<sub>2</sub> over 20–25 mm Hg;
- 2) When the ETCO<sub>2</sub> level is high, the prognosis is good, even if CPR is prolonged;
- 3) Changes in the level of ETCO<sub>2</sub> can indicate the efficacy of the CPR treatment; and
- 4) The prognosis is very poor if the ETCO<sub>2</sub> level remains <15 mmHg after 15 minutes of CPR.

**Keywords:** back control; capnometry; chest compression; CPR; ETCO<sub>2</sub>; prehospital care

#### G-50

##### Pre-Hospital Care Provision by Accident and Emergency Department Teams in England

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Prehospital care in the United Kingdom is provided by the ambulance service. However, additional medical support is provided by a cadre of Immediate Care doctors and Rapid Response Units (RRUs) from Accident and Emergency Departments.

This paper will provide the results of a survey of Accident and Emergency Departments in England, showing the potential scale of this additional response, the skills the teams offer, and the team composition.

The RRU at Princess Alexandra Hospital will be described, and an audit of its work presented. The recently launched HITS (Hospital Incident Training Support) education programme for team members will be outlined.

**Keywords:** Accident and Emergency Departments; emergency medical services; immediate care doctors; prehospital care; rapid response units

#### G-51

##### Integrated Rescue System in the Czech Republic

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