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_2 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_2 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 $ETCO_2$ levels, but the artificial respiratory regime was not changed in accordance with the $ETCO_2$.
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® was used for chest compression. An aspirating capnometer (BCI 8200) with a colorimetric detecting system was used to measure $ETCO_2$ levels. Levels of $ETCO_2$ 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 $ETCO_2$ in the surviving patients was between 15 and 38 mmHg. All of the patients maintained a level of $ETCO_2$ 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 $ETCO_2$ in patients that did not survive was <15 mmHg. All the patients who had an $ETCO_2$ level below 15 mmHg after 15 minutes of CPR did not survive.
Patients that died before reaching the hospital — $ETCO_2$ increased rapidly in two patients due to effective CPR, but the levels could not be sustained. The $ETCO_2$ levels remained low in each of the other patients.
Patients that died in the hospital — $ETCO_2$ levels did not rise above 30 mmHg. The $ETCO_2$ 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 $ETCO_2$ over 20–25 mm Hg;
2) When the $ETCO_2$ level is high, the prognosis is good, even if CPR is prolonged;
3) Changes in the level of $ETCO_2$ can indicate the efficacy of the CPR treatment; and
4) The prognosis is very poor if the $ETCO_2$ level remains <15 mmHg after 15 minutes of CPR.

Keywords: back control; capnometry; chest compression; CPR; $ETCO_2$; 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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The Integrated Rescue System in the Czech Republic has been established as the system of connections that guarantees coordinated activities of all rescue services — medical services, firemen, police as the basic service, and strengthening services, particularly civil defense, armed forces, and specialized technical services. The Medical Services guarantee prehospital and hospital medical care.

The Emergency Medical Service performs prehospital care. In the case of an extraordinary situation, the service immediately is strengthened by both doctors and nurses from the hospital, and by the staff from surrounding hospitals. All possible means of transport are immediately mobilized, including the Air Rescue Service.

Hospital care is guaranteed organizationally by regional trauma centres. The centres send medical teams to the disaster site and prepare free bed capacity both in their own centre and in other regional hospitals, including the supplies of drugs and medical equipment.

Currently, communication using telephone links have been a weakness of the system. This mechanism for communication proved insufficient in actual disaster situations.

The mobile surgical team, TRAUMA TEAM, also is a part of the system that is can strengthen regional centres by providing staff and medical equipment. The Czech Ministry of Health can call this team into action.

Keywords: communications; coordination; Czech Republic; prehospital care; rescue systems; regionalization; rescue; responses; trauma centers

Tuesday, 11 May, 9:00–9:45 hours
Video Session

A-12
Comparison of the Materials Used in Chest Wall Reconstruction for Flail Chest

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Introduction: Flail chest is not uncommon following blunt chest trauma, and often it is complicated by respiratory insufficiency if it is not treated properly. Table 1 shows our strategy for the flail chest patients, which is based on the surgical intervention, according to the severity of the trauma. Our principle of surgical treatment for flail chest is to restore the continuity of fractured portions of the bony thorax, and to reconstruct the flail segment to the physiological chest wall. The comparison of the materials used in the chest wall reconstruction and the details of the operative procedures are shown in this video tape recording (VTR).

Materials and Discussion: Three kinds of materials were available: 1) Judet's titanium rib plates; 2) ceramic rib pins; and 3) titanium mini plates. These materials have been used to reconstruct the flail segments. These materials have been studied as to the easiness of operative procedure, stability, elasticity, and radioparency. The merits and demerits associated with the use of each of these materials are summarized in Table 2.

Table 1—Management of flail chest

Type	Condition	Treatment
I	Mild flail chest with mild intrathoracic injury	Conservative
II	Flail chest with mild intrathoracic injury	Chest wall reconstruction
III	Flail chest with Lung Contusion	IPPV Chest wall reconstruction at right time
IV	Flail chest with intrathoracic injury that required thoracotomy	Chest wall reconstruction IPPV, *if necessary*

Table 2—Comparison of materials

	Judet's Plate	Ceramic Pin	Titanium Plate
Surgical involvement	Large	Moderate	Least
Stability	Excellent	Moderate	Excellent
Elasticity	Moderate	Excellent	Moderate
Radioparency	Poor	Good	Relatively poor
Application	Shaft	Sternum Shaft Anywhere Cartilage	

As to the operative procedures, Ceramic rib pin and Titanium mare easy. On the other hand, about the stability of the reconstructed rib cage, Judet's plate and Titanium mini-plate are excellent with good stabilization.

For elasticity, the Ceramic rib pin seems to be the best of the three. And, it doesn't produce any detrimental effects on roentgenographic examinations.

Judet's plate and the titanium mini-plate have some effects on the x-ray findings, but it is much better than that of stainless materials.

Judet's plate can be applied only to rib shaft. The ceramic pin can be applied to sterno-costal fixation, and also can be applied to the cartilage. The titanium mini-plate can be applied to almost any place.

Conclusion: The most appropriate material should be chosen in the chest-wall reconstruction, according to the shape and the location of the fracture as shown in VTR.

Keywords: ceramin pin; chest wall reconstruction; flail chest; intrathoracic injury; Judet's plate; pulmonary contusion; titanium mini-plate; trauma

V-2
"Disaster Management" — The New US Standard

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"Experience has shown again and again, that lives can be saved, damage can be reduced by preparing for a catastrophic situation before it occurs."

In the USA, a new standard for "Disaster Management" finally is on its way. The National Fire Protection Association (NFPA) is developing Standard No. 1600 that establishes a common set of criteria for disaster manage-