# *Technological Advancements in Managing Emergencies and Disasters*

## Use of Regional Telemedicine to Provide Critical Care during the H1N1 Pandemic

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Telemedicine provides clinical and scientific expertise to rural and remote areas when subspecialists are unavailable. It also can provide technical and educational expertise across a large region in a just-in-time manner. During the H1N1 outbreak in California, telemedicine was used to provide clinical, technical, and public health expertise to a wide range of healthcare facilities. This expertise included critical ventilator management, infection control and prevention, laboratory and diagnostic support, public health support (non-pharmacologic measures), and patient consultation. The most prominent use was the respiratory care provided across the healthcare spectrum, from emergency medical services to alternate care sites to the hospital. Finally, this process of consultation was monitored and supported by regional and state public health officials, providing greater support for resource management and surge capacity planning. The infrastructure and coordination of telemedicine during the H1N1 outbreak, including how to care for patients at multiple sites, how to improve sub-specialist force multiplication (e.g., critical care), and how to link public health response with healthcare facilities will be discussed.

Objectives include:

1. Understanding the role of telemedicine in force multiplication;
2. How to distribute mass information or clinical care changes across the healthcare and public health system using telemedicine; and
3. Using case scenarios and collected data, understand how telemedicine provided real time information and patient care during the H1N1 outbreak.

**Keywords:** cooperation; H1N1; regional; pandemic; telemedicine
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## Comparison of Novel Cooling Methods for Prevention of Hyperthermia in CBR Responders in Tropical Northern Australia

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**Objectives:** The objectives of this study were to assess the physiological and perceptual responses of healthcare workers to a chemical, biological, or radiological (CBR) training exercise in tropical conditions, and to compare the effectiveness of four cooling methods on core body temperature.

**Methods:** Sixty volunteer participants, all of whom were healthcare workers (predominantly doctors and nurses) were randomized into four cohorts: (1) Shade; (2) Ice Vest; (3) Water Immersion; and (4) Crushed Ice Ingestion). The participants were matched for body mass index (BMI). The exercise consisted of triaging, resuscitating, transporting and decontaminating real weight manikins while dressed in level-3 personal protective equipment (PPE) in field conditions (mean outdoor wet-bulb globe temperature of 31.4°C) for a total of three hours, alternating work/rest phases every 30 minutes. Cohort 2 wore ice vests under their PPE during the active phase, and then rested in the shade. During the cooling phase, Cohort 1 rested quietly in the shade, Cohort 3 were immersed in large tubs of water at 25°C and Cohort 4 ingested 7.5mL.kg$^{-1}$ body mass of crushed ice. All four groups had ad libitum access to fluids. An ingestible telemetry pill permitted measurement of core temperature throughout the exercise, while tympanic temperature, heart rate, blood pressure, subjective thermal sensation, and thermal discomfort ratings were recorded periodically throughout the cooling phase.

**Results:** The peak core body temperature of 40.8°C was observed, with three participants recording temperatures above 40.4°C during the study. Overall, the participants that wore the ice vests during the active phase and those that undertook water immersion during the rest phase stored less heat during their active phases. Participants in both of these groups performed tasks more effectively and had less muscle soreness the following day.

**Conclusions:** This first-of-its-kind study was performed in tropical conditions in the field, with healthcare workers wearing impermeable PPE during a realistic CBR incident scenario. The study confirmed that CBR responders are at risk of hyperthermia in these conditions. The authors were able to extrapolate work/rest ratios in hot and humid conditions that may be used safely in healthcare workers with a wide range of BMIs and background fitness.

**Keywords:** Australia; chemical, biological, and radiological; cooling methods, core body temperature; hyperthermia
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## Science and Technology Solutions to Support Emergency and Disaster Preparedness and Response

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With society becoming ever more complex, and the ability and need to cross and transcend traditional national and international boundaries, reliance on advanced technology and a greater understanding of science is becoming more important in the preparedness for, response to, and recovery from (mitigation of) emergencies and disasters. Consequently, responders must be more educated, better prepared, more agile, and sophisticated, and so too must their support equipment and the technologies upon which they rely. To support this, many nations and agencies have various initiatives to better understand the needs of the emergency and disaster response community. Ranging from lighter, cheaper, and more effective personal protective equipment, to improved situational awareness through enhanced com-