priusmed

Chicago – Boston – January 2025

Article by Joe Hernandez, EMTP, CCP

Monitoring and Communication Capabilities in Disaster Environments

Our world is complex and at times volatile. The outlook for continuous vital sign monitoring in the healthcare community—whether prehospital, hospital, or post-care—appears promising and transformative. These technologies will continue to revolutionize patient care and offer real-time data for better decision-making, critical treatments, enhancing overall health. The continuous evolution of these *disruptive technologies* is likely to shape the future of healthcare. With wearables becoming more sophisticated and widely adopted, their role in healthcare is set to take off. This will usher in an era of connected, data-driven, and patient-centered healthcare monitoring solutions in all fields.

An ill-equipped Disaster Response Medical Team can result in delayed care for critically injured patients and ultimately contribute to preventable deaths. Currently, there is heavy reliance on subjective human judgment for injury assessment. This is due to the lack of rugged, portable, and reliable medical equipment, which is where change is needed. In collapsed or confined spaces, the early diagnosis of crush injury-rhabdomyolysis may be challenging due to the human compensatory mechanism. To address these issues, injury judgment and classification methods can be employed to identify patients with severe rhabdomyolysis, thereby improving the efficiency and efficacy of treatment, rescue operations, and survivability.

There is a potential risk during disasters where existing infrastructure(s) could be completely damaged or oversaturated. Challenges persist in austere environments such as natural, accidental, or manmade (terrorist) disasters. This is especially true for those which affect the transmission of audio, data, and video signals. In the aftermath of events involving collapsed structures made of concrete and steel, complexities such as limited access, complex materials, and voids impede communications. These impacted structures are commonly referred to as “Rubble Piles” by the Urban Search and Rescue (USAR) response community. The challenges exist in the ability for communication signals to travel through and/or around obstacles by utilizing innovative mesh networks and finally to the outside providers in a secure cloud.

Right now, as it stands with field progression, the current clinical medical equipment is unsuitable for monitoring and detecting data in certain situations. This is due to their large size and complex operations. It is anticipated that smaller and wearable devices will continue to play an increasingly integral role in early critical diagnosis and personalized care for victims of a disaster. The ability to do this would provide a

more efficient way to analyze and visualize real-time data, gather significant insights from live videos and facilitate decision-making treatments. This would be a game-changer, essential to saving lives.

Disruptive Technology in Disasters™ challenges advanced manufacturers to offer the same life-saving opportunities they have provided during our normal walks in life and provide hope for those affected by disasters and possibly buried deep within a "rubble pile". We know rapid response times and minimal latency are essential for responders arriving at the scene of a major disaster. Minimal latency and real-time applications of data and video transmission capabilities of entrapped survivors in need of advanced medical care. Monitoring vital signs along with real-time images of entrapped victims is crucial for accurate injury classification, advanced critical care including possible amputation(s), and timely rescue.

The USAR Medical Team Specialist Training Program delivered by Disaster Medical Solutions (DMS) provides the perfect training opportunity with environmental challenging conditions utilizing purposely built facilities with "rubble pile" disaster-like austere environments for participants, while opening a door for Research and Development projects. Physicians and paramedics with federal, state, and international USAR FEMA and INSARAG Task Forces test and experience first-hand this *Disruptive Technology in Disasters™* several times a year including at the Medical Special Operations Conference (MSOC) held each year during the National US&R Conference, most recently in Orlando, FL.

The new challenge we consider a priority is the **health monitoring of first responders** during a rescue mission. Historically, very limited attention has been given to disaster responders, ignoring potential risk during a disaster. Existing infrastructure could shift or completely collapse, entrapping those looking for victims. The complexities of tight, dark, hot, cold, and/or possibly contaminated environments add risk.

To bridge this gap, we envision Wearable Wireless Sensors (WWS) playing an important role in enhancing existing responder safety. Parameters needed would be flexible measurement of blood pressure, heart rate, blood oxygen saturation, respiratory rate, body temperature, levels of glucose, and hemoglobin (Hb). Combining electrocardiograph (ECG) completes the picture.

Back to the challenges and reality of transmitting all of what is captured between the patient and medical providers. It may be in a confined space of a "rubble pile", a crawl space under a home, or in an automobile roll-over, your next obstacle has an answer. Combining both vital signs data and real-time live video of this exchange directly to advanced practitioners to monitor and make critical life-changing decisions is one leap we have now experienced. The future looks promising!