Assessing Wearable Technology’s Role to Reduce HAZMAT Health Risks

TREO Talk Paper

Chaitra Venkatesan
University of Nebraska at Omaha
cvenkatesan@unomaha.edu

Sharon Medcalf
University of Nebraska Medical Center
smedcalf@unmc.edu

Ann Fruhling
University of Nebraska at Omaha
afruhling@unomaha.edu

Abstract

With the latest development in technology, wearable devices and Internet of Things (IoT) can provide new opportunities to improve human safety, human health monitoring and communicate data for effective decision making in critical time sensitive cases such as a HAZMAT situation. The Federal Hazardous Materials Regulations defines Hazardous Material (HAZMAT) as a biological, chemical, radiological, or physical substance that is capable of posing an unreasonable risk to health, safety, and property when transported in commerce. Examples of HAZMAT incidents include chemical spills on the road due to an accident, chemical leaks from a storage facility, and chemical reactions that take place during cargo transfers. The aim of this research is to identify existing gaps in the safety of commercial vehicle drivers hauling hazardous materials, where technology can be used to mitigate risks and reduce potential exposure during and after a HAZMAT incident. Our goal is to determine how the risks associated with the transportation of HAZMAT shipments can be minimized by employing reliable, secure and cost effective technological solutions such as wearable devices and sensors.

In the past few years, there has been an increase in the number of accidents during HAZMAT transportation across the U.S. highways (Office of the Federal Register National Archives and Records Administration). The safety, security and environmental concerns associated with the haulage of HAZMAT are continuously growing in number and complexity. Commercial vehicle drivers associated with private and government freight agencies specializing in HAZMAT are responsible to prevent injuries and property damages to themselves, and the public while hauling hazardous materials. During a chemical spill or a HAZMAT road transportation accident, commercial vehicle drivers are at potential risk of being exposed to dangerous materials such as explosives, flammable liquids and gases, toxic and infectious substances, and corrosives that can have an adverse effect on their health and their surroundings. Hence, it is extremely important to monitor their health and improve their safety by preventing HAZMAT related injuries and illnesses.

Recently conducted focus groups with first responders have helped identify various threats and concerns when responding to a HAZMAT incident. These concerns include Responder Safety – the safety of first responders in terms of long-term health effects when subjected to potential HAZMAT exposure, Personal Protection Equipment (PPE) – the fear of chemicals entering the PPE, Weather and Location – weather conditions would make responding to a HAZMAT incident difficult, Communication – only minimal information is provided to first responders before reaching the HAZMAT incident site. These identified concerns generated from the focus group interviews will be used to create a survey for commercial drivers.

For this study, we will be conducting focus group interviews and a needs assessment survey engaging HAZMAT transportation carriers and drivers to further identify their immediate concerns and needs in areas such as personal safety, alert notifications, safety regulations, health and wearable technology. First, our study will help us perform a gap analysis in order to assess if the concerns identified by the first responders correlate or differ from the concerns identified by commercial vehicle drivers specializing in HAZMAT transportation. Second, we will share the results with stakeholders. Third, we use the results as inputs to develop a strategic technology plan for wearable devices and sensors to build an integrated incident commander user interface for situational awareness during a HAZMAT event.

US DoT Region-VII (UTC 25-1121-0005-110) supports the funding for this study.