

The INDEMO Project – an innovation and knowledge transfer project for enhancing ambulance design

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Abstract

Optimizing ambulance safety and design has not kept pace with innovation for standard passenger vehicles. The safety of the design of an ambulance is dependent on the interplay of 3 dimensions - automotive safety, human factors and ergonomics and clinical care delivery. The Ambulance Safety INnovation DEsign MOdule (INDEMO) project was developed to integrate optimal features that reflect the interrelationship of these disciplines, and to engage the EMS community to adopt these changes. A number of interactive tools were utilized to enhance engagement, including full scale and 1/6 scale interactive models, a ceiling mounted video camera and a telepresence robot.

Background and Methods

Ambulance transport has a concerning safety history with well documented safety hazards both in the USA(1, 2, 3) and also Australia(4). In the USA ambulance vehicles have also not fundamentally changed in operational design in 30 years - despite a global environment in the transportation arena of major advancements in technology, engineering, automotive safety and human factors over that time. Ironically, most USA ambulances are designed by health care providers with no training or technical background in vehicle safety or design. The INDEMO Project is a radically new approach to operational design for ambulance vehicles - that is science and technology driven. A broad based interdisciplinary team of automotive safety expertise, human factors and ergonomics, industrial design, systems engineering, operational EMS, public health and transportation science expertise collaborated to advance ambulance design. Technical literature and design principles in the related fields(5,6,7) were searched and a design model determined by the interdisciplinary team. To enhance end users ability to appreciate the design features a transparent full scale interactive model was developed and built on a mobile platform to facilitate its use across North America. A number of approaches to enhance change adoption were also developed including 1/6 scale interactive models and use of a GoPro camera mounted in the ceiling of the module to demonstrate spatial relationships as regards clinical procedures and a QR Coded banner and pocket instruction sheets were positioned at the INDEMO displays, so that descriptive information was available instantly onsite, and could be also accessed off site. A telepresence robot which could be self driven from a cloud based platform from anywhere globally was utilized to share the INDEMO design features beyond its physical location. In addition to a focus on occupant protection design and human factors principles, cost efficient innovative design augmentation included use of LED lighting on the ambulance console and also on the stretcher, as well as voice activation of switches for these LED lights and the strobe lights. From September 2013-March 2016 the INDEMO Project was deployed at 4 USA national conferences and 3 regional events, as well as a regional event in Canada.



Figure 1. The INDEMO interactive project on display with the full scale model with QR codes, the ceiling mounted live video aerial image, the 1/6 scale models, and the telepresence robot

Results and Discussion

Beyond our research team, the INDEMO project has featured in numerous presentations by leaders in EMS as a cutting edge gold-standard, and also on twitter, instagram and periscope by end users, with numerous requests by end users and corporate industry organizations for design information. Though 2D tools are the mainstay of ambulance design education of the North American EMS community, this project uses 3D interactive tools to address this challenge. Focusing on working smarter, not harder, techniques for enhancing engagement and change in operational culture and design practice for end users included encouraging hands on experience with scale models of the current old style approach - contrasted with scale and full size models of the new innovative designs of INDEMO. The use of this interactive hands-on model and virtual access has been a most valuable tool to engage the EMS community in the USA and beyond.

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