

## DEVELOPMENT AND TESTING OF WIRELESS WEARABLE ULTRASOUND SCANNER

Peder C. Pedersen<sup>1</sup>, Philip Cordeiro<sup>1</sup>, R. James Duckworth<sup>1</sup> and Thomas L. Szabo<sup>2</sup>, <sup>1</sup>Department of Electrical and Computer Engineering, Worcester Polytechnic Institute, Worcester, MA, <sup>2</sup>Department of Biomedical Engineering, Boston University, Boston, MA.

### OBJECTIVE

The “Golden Hour” is a period of an hour or so when fairly severe injuries can still be treated and lives saved, provided that diagnosis can be made and the treatment is administered quickly. To that end, a wearable lightweight self-contained diagnostic ultrasound system has been developed and undergone preliminary testing in a clinical environment. Key features of the system are: full day battery operation, voice command control, wearable display, ability to operate in dusty or wet environment, wireless image upload and two-way radio communication.

### METHODS

A wearable ultrasound imaging system has been developed, based on the *Terason 2000* portable ultrasound scanner and an embedded computer. The keyboard is replaced by voice command control (with some mouse functionality integrated into the ultrasound transducer), with *Vocon 3200* from *Scansoft* as the speech recognition engine. A high-resolution wearable display takes the place of the conventional monitor. The complete self-contained system, with embedded XP computer, is integrated into a vest and can operate for a typical hospital day on its rechargeable batteries. This design allows the EMT or physician to move about freely and to have one hand free for supporting the injured person. It has the potential for use in combat casualty care, such as for triage, during transport and in forward echelon medical facilities.

### RESULTS

A ruggedized and improved version of the wearable ultrasound imaging system has been evaluated at the Madigan Army Medical Center (MAMC) at Ft. Lewis, WA. One system was used for validation studies in MAMC’s Emergency Department and another system was similarly used in Vascular Surgery. This paper will present preliminary data on the clinical utility of the wearable ultrasound system, and compare the experience of this system with that of conventional ultrasound imaging systems.

### CONCLUSIONS

An untethered wearable ultrasound system has been built and clinically tested. It is suitable for use in emergency medicine, can be used for demonstrating ultrasound scanning in a teaching environment, and is expected to be valuable for use at disaster sites and in military medicine at remote triage sites, during medivac transport and in field hospitals.