FIRE DEPARTMENT

Innovation in Local Government

The use of ultrasound in EMS - Prehospital Setting

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FIRE DEPARTMENT

The City of Odessa Fire Department paramedics have been utilizing portable ultrasound technology on their ambulances since May of 2000. The department has received international recognition for having the first paramedic EMS ultrasound program in the world (1.)

In the hospital setting of the emergency room, ultrasound machines have become the standard of care in rapid diagnosis of life threatening situations such as ruptured aortic aneurysms, ectopic pregnancy, traumatic internal bleeding and cardiac tamponade. In obstetrical trauma, the ultrasound allows timely determination of infant status and gestation so that the appropriate resuscitation measures are followed. The concept of utilizing ultrasound machines in prehospital setting was brought about by the Medical Director working in conjunction with the Fire Department administration and Odessa Medical Center. The Medical Director devised the training for the paramedics in order to utilize ultrasound in the field to enhance patient care. This specialized ultrasound training was conducted within in the department.

In June of 2007, the fire department received a grant to update the ultrasound units to the latest technology. This was part of a study designed to evaluate the use of ultrasound by paramedics to evaluate the impact of ultrasound use on the time needed to get patients with critical injury to the operating room. The internal review board at Odessa Medical Center hospital approved this study design to evaluate the evidence for more widespread use of ultrasound in prehosptial EMS Care.

The City of Odessa is located in the Permian Basin, which is one of the sites for the Petroplex. The Petroplex is an area, which produces one fourth of the nation's gas. Odessa is also home to the largest inland petrochemical complex in the United States. Odessa is intersected by U.S. Highway 80 and Interstate 20, which run north toward the Texas Panhandle and south to Big Bend National Park. The Pacific Railroad is located and parallels both of these two highways. The NAFTA agreement brought a major corridor from Mexico through our community. A community the same size that is Midland borders Odessa. The next major city close to Odessa is Amarillo, which is 255 miles away. The Odessa Fire Department consists of 171 personnel. Our department consists of fire suppression, EMS as well as the inspection division. As with the fire service we respond to various emergencies that include fire suppression, EMS, Hazardous Materials, WMD, confine and technical rescue. We also have a Regional Hazardous Materials Vehicle that is available for a 17 county regional response. Our organization is part of a Regional Response Plan that increases our area of response in an all hazard catastrophic event. We have eight stations with 1 rescue, 8 engines, 2 aerial quint fire engines, that are fully staffed with four personnel to provide ALS services. We have 5 full time ambulances or "medics" staffed by 2 paramedics. Our department also has support units such as a Mass Casualty Trailer with various types of equipment. There are 2 "reserve" engines and ambulances that are also capable of front line response if needed. We have a total of 156 personnel divided into 3 shifts that operate on a 24-hour shift to provide these services. Our response area covers approximately 900 square miles with 36 square miles within the city. Our total population within the city and county are about 135,000, which is why we believe our community is urban with some rural areas. The industry in this area is mainly ranching, oil/gas and manufacturing. There are several health care facilities. Our community is growing each year with new business and industry.

The Odessa Fire Department is under the direction of Fire Chief Richard Dietz. The department continues to be proactive and innovative with the Fire/EMS services it provides. For example, Odessa was the first city in Texas to use the "Jaws of Life", 911 emergency, and to have state-certified ambulances. The use of the ultrasound machine in the ambulances was another innovation that has been recognized.

Innovation's Importance

The use of ultrasound technology in a prehospital setting was unheard of in the recent past. This type of technology was previously considered an option only in the hospital emergency room after the patient's arrival there. The Medical Director for the Odessa Fire Department was the champion of this innovation and brought the technology to the prehospital EMS ambulances. The EMS call volume for the department is about 14,000 calls per year. Many of these calls include trauma, cardiac and pregnancies where the ultrasound could be used to assist the paramedics in the field enhance their patient assessments. Valuable time is saved when Paramedics are able to give a medical report to the receiving hospital. Depending on the report the receiving hospital acts upon this information and makes the necessary preparations for the patient. In the medical field a "Golden Hour" is used when a trauma patient receives advanced and definitive care within an hour's time. The mortality rate decreases if such treatment is accomplished during this first hour. This new technology has a benefit to the citizens of our community by increasing the type of assessment and patient care they receive.

Implementation and initiation

Dr. Dave Spear is the Medical Director who brought the ultrasound technology to our department. This was a new concept and current research is being conducted to find the future impact in the prehospital setting. Initially when this idea came about the ER physicians were skeptical on paramedics in the field having the knowledge and ability to perform the procedure. Dr. Spear developed a training program and aids to implement the use of the sonogram machine. Making the use of ultrasound as simple to understand as possible was a goal of the paramedic training program. For example, during the training phase Dr. Spear explained the view of the ultrasound probe, similar to a "slice of a watermelon" and to the view the body as such. The ultrasound probe would then show the inside anatomy of the body. Several pregnant volunteers were participated in the training for the obstretrics study. This provided the paramedics with a live view of a fetus and its location on the ultrasound. During the training the paramedics often assessed each other to view the hearts contractility. The main focus on the training was to identify the different anatomies of the body and the significance between viewing air versus liquid. On the ultrasound monitor, the fluid produces a black image, whereas, air or gas would be scattered. This is a critical feature when reading the image on the monitor. Trauma patients with internal bleeding can exhibit easily visible images of blood around the internal organs.

Risks associated with planning and development

The risks associated with the ultrasound unit on patients are minimal. The medical director developed a comprehensive training to get the paramedics on board with the use of the ultrasound. Continuous training is the key to keep the paramedics competent in the use of ultrasound during emergencies. The benefit of the ultrasound machine is treatment and transport is never delayed. The deployment can be accomplished in minutes and while enroute to the medical facility. Paramedics keep a log on the use of the ultrasound and it is also noted in the patient report. While the data to conclude definitively that prehospital ultrasound impacts patient outcome is under study at present, the paramedics have come to find the ultrasound machines to be an important device on evaluating patients being transported for illness and injury.

1. *Emergency Ultrasound,* Second Edition, O. Ma, J. Mateer, M. Blaivas, McGraw-Hill, 2008, p 73 – 75.