CE 1.5 ANCC Contact Hours

eFAST Simulation Training for Trauma Providers

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ABSTRACT

Current trauma recommendations include completing chest and pelvis radiographs and Focused Abdominal Sonography in Trauma (FAST) examination in the trauma bay; however, expanding literature indicates that thoracic ultrasound scans are more sensitive than chest radiography in the detection of pneumothorax. In an urban, Level II trauma center in central Ohio, the author implemented an evidence-based practice project. This project focused on a lack of provider knowledge of the expanded Focused Abdominal Sonography in Trauma (eFAST) examination. The training consisted of a lecture and a simulation training session. To monitor the success of the implementation, pre- and postimplementation testing of the provider's competence with the eFAST technique using the Objective Structured Assessment of Ultrasound Skills (OSAUS) was completed. The pre- and posttest implementation showed an increase of the OSAUS score by 16.9%. The author also reviewed charts pre- and postimplementation to demonstrate the utilization rates of eFAST. After training, the utilization rates increased by 66% ($p < .05$). Overall, the project implementation was a success and demonstrated the importance of frequent literature review and implementation of this literature into practice.

Key Words

eFAST, Evidence-based practice, OSAUS, Simulation, Trauma, Ultrasound

Completing a primary, secondary, and tertiary survey is part of the basic management of initial trauma evaluation (American College of Surgeons [ACS], 2012). The ACS recommends that trauma patients undergo chest and pelvis radiography and a Focused Abdominal Sonography in Trauma (FAST) examination during the primary and secondary evaluations. The goal of the initial imaging includes the detection of life-threatening injuries such as a pneumothorax, hemothorax, open pelvic fracture, or intra-abdominal hemorrhage. However, new literature is suggesting that expanded Focused Abdominal Sonography in Trauma (eFAST) examination may be more sensitive for the detection of pneumothorax than the use of a FAST examination and chest radiography (Soult et al., 2015). The purpose of this article is to review an evidence-based practice (EBP) implementation to train trauma providers in the technique of eFAST.

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BACKGROUND

Trauma is one of the only disease processes that affects people of all ages and social backgrounds. Unintentional trauma is the leading cause of death from ages 1 to 44 years and ranks in the top 10 causes of death for the remainder of the age categories. Overall, trauma ranks as the fourth leading cause of death, behind heart disease, malignant neoplasm, and chronic lower respiratory disease. Trauma claims more than 130,557 lives per year, which is 5% of the overall national death rate (Centers for Disease Control and Prevention, 2013).

Advanced Trauma Life Support (ATLS) is a foundational course for trauma providers. The ATLS algorithm includes chest and pelvis radiographs on each trauma patient (ACS, 2012). If each trauma patient were treated according to the current ATLS protocol, thousands of chest radiographs would be obtained annually. Several studies are now suggesting that the chest radiographs do not carry the same sensitivity and specificity for pneumothorax as ultrasound scans do. In one recent study from Soult et al. (2015), the sensitivity of ultrasound scans in detecting pneumothorax was 93.8% and specificity was 98%. The negative predictive value was more than 99.9% when compared with chest radiography (Soult et al., 2015). Although ATLS curriculum covers FAST for the detection of intra-abdominal injuries, it does not include eFAST ultrasound training for the detection of pneumothorax.

eFAST is a broadened version of the originally suggested FAST examination. The FAST examination looks at the heart, liver, kidneys, spleen, and bladder or pelvic cul de sac, whereas the eFAST examination also includes pulmonary windows to evaluate for pneumothorax. This technique could help identify more pneumothoraces, leading to earlier intervention for this life-threatening injury (ACS, 2012). Because of the direct availability of ultrasound equipment and immediate interpretation, in combination with appropriate sensitivity and specificity, one could see how this would be an easily adopted change to minimize radiation exposure to patients.

PURPOSE

The purpose of this initiative was to implement a simulation training program for the eFAST technique. The

implementation was an EBP project to meet current literature recommendations. The overall goal or purpose of eFAST training was identifying life-threatening injuries earlier during trauma care. The population for implementation included trauma advanced practice providers and surgical residents. The objectives of this project and education course were to increase provider competence and utilization of the eFAST technique.

METHODS

Literature Review Methodology

Sampling Strategies

The literature search strategy used the PICO (Problem Intervention Comparison Outcome) format to create a literature research question. The PICO question asked: "After a formal simulation training program on eFAST, would trauma providers have an increased competence with eFAST technology and an increased utilization during initial trauma evaluation?" This review of the literature focused on the intervention, a simulation-training program on eFAST. The databases searched were Cochrane, MEDLINE, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and PubMed. The search terms used included "thoracic," "trauma," "ultrasound," "simulation," "training," and "pneumothorax." Literature searches were expanded to include synonyms for these words. The Boolean operator "AND" was used to combine key terms together in multiple ways to increase evidence yield. When able, limits on year of publication from 2006 to 2016 were used to narrow search results to within the last 10 years. No other limits were applied in the search process.

Literature Review Findings

Simulation Training

During an extensive review of the literature, there were no articles specifically related to simulation training for eFAST. However, the review of literature revealed that simulation training was an effective method of training for several ultrasound techniques. Monti, Younggren, and Blankenship (2009) and Krishnan, Kuhl, Ahmed, Togashi, and Ueda (2013) each utilized ultrasound simulation training and found the method to be an effective way to educate providers how to detect pneumothoraces. Chung, Gyllenhammer, Baker, and Savitsky (2013) found that ultrasound simulation was an effective method of training for FAST examinations. Other studies found that simulation training was useful for education in different ultrasound modalities, not limited to abdominal, pulmonary, obstetric, and thyroid (Dinh, Dukes, Prigge, & Avila, 2015; Henderson, Ahern, Williams, Mailhot, & Mandavia, 2010; Keddis et al., 2011; Stather, Maceachern, Rimmer, Hergott, & Trimblay, 2011). Gasko et al. (2012) and Chung et al. (2013) compared the use of ultrasound simulation training alone with ultrasound training in combination with a lecture and found the combination to be superior.

EBP Approval

This project implementation was reviewed by the manager of nursing research and determined to fit standards of EBP. Therefore, it was determined that this project did not need institutional review board (IRB) approval prior to implementation. Prior to publication, the manuscript was reviewed by the IRB committee to ensure that no protected health information was disclosed.

Project Implementation

Design

This EBP project used a pre-/posttest design to evaluate provider competence with and utilization of eFAST following literature review recommendations. This implementation utilized prospective data collection for both pre- and postimplementation. The project reviewed both utilization rates and competence with the eFAST technique.

Inclusion Criteria

The population of interest was trauma residents and interns, as well as trauma nurse practitioners and physician assistants. The inclusion criteria consisted of professional adults with a minimum of graduate-level education. All participants had received education on trauma evaluation through a standardized ATLS course. Participants were employed by the trauma center where the project was implemented. There were no exclusions based on age, gender, race, or ethnicity. Formal consent was not required for this EBP project but was implied on the basis of voluntary participation in pre- and postimplementation testing. There was minimal to no risk imposed to the participants in this training.

Implementation Steps

Planning and creation of the lecture for the simulation training took place over the course of several months prior to implementation. Preimplementation data collection to assess utilization rates of eFAST began 4 weeks prior to simulation training. One week prior to the eFAST training, participants underwent preimplementation testing. Preimplementation testing consisted of providers demonstrating an eFAST examination on a simulation model, followed by a rating given by a reviewer using the Objective Structured Assessment of Ultrasound Skills (OSAUS) tool (Tolsgaard et al., 2012).

The interventions, including lecture and simulation laboratory, took place on the same day. The first portion of training consisted of a 45-min lecture that included ultrasound terminology and function, methodology for examination, examples of ultrasound scans, a brief overview of literature, and a short demonstration of the examination. Following the lecture, the participants completed eFAST examinations on four live models to demonstrate normal anatomy. To demonstrate positive, or abnormal examinations, participants completed eFAST examinations on two simulation models. Participants were given up to 3 hr for the simulation portion of training.

Postimplementation data collection for utilization rates took place for 4 weeks following the simulation training. In concordance with preimplementation testing, postimplementation testing took place using a simulation model. Again, participants were rated using the OSAUS tool. Because of scheduling issues, postimplementation testing for participants was completed over 2 weeks instead of 1 week.

Demographics of Participants

A total of 19 participants took place in this EBP implementation. All participants completed a voluntary demographic form. Ages ranged from 20–29 to 40–49 years, with the mean age range being 20–29 years. A total of 74% ($n = 14$) of participants were men and 26% ($n = 5$) were female. Most (74%; $n = 14$) had more than 1 year of experience in trauma. Most (84%; $n = 16$) had completed medical school as their highest level of education, whereas 16% ($n = 3$) had completed graduate school and were functioning as advanced practice providers. When asked about previous experience with ultrasound technique, 84% ($n = 16$) replied yes, although 16% ($n = 3$) had experience only with models and not live patients. When asked about experience with eFAST, 37% ($n = 7$) replied yes but only 21% ($n = 4$) replied that they had used this technique in a trauma bay evaluation.

Outcome Measurement

The first desired outcome of this project was improved competence of the eFAST technique. Improved competence was evaluated using the OSAUS evaluation tool (Tolsgaard et al., 2012). This tool is publicly available at www.osaus.org, and the originator granted permission for utilization of the tool for this project. The OSAUS rated the learner on a Likert scale from 1 to 5. The scoring tool included the following seven areas of competence: indication for the examination; applied knowledge of ultrasound equipment; image optimization; systematic examination; interpretation of images; documentation of examination; and medical decision making. The tool was determined to have a reliability of 0.81 and a strong construct validity based on the Mann–Whitney test evaluating the difference in scores from beginners to experts (Todsen et al., 2016). A second study by Tolsgaard et al. (2014) found the reliability to be 0.89. Based on these studies, the benchmark for determining competence with this tool was a score of 3 or better.

The second desired outcome was increased utilization of eFAST. Utilization was defined as performing an eFAST examination on a trauma patient within the trauma bay. There is no specific national benchmark for the rate of utilization of the eFAST technique. The goal was to show improved utilization of this technique, with at least a 50% increase in use from pre- to postintervention within the facility.

RESULTS

A total of 19 trauma providers participated in the eFAST simulation training. The first measured objective was improvement of trauma provider competence with the eFAST skill. The participants were given a pre- and postimplementation test using the OSAUS tool, which had seven items for grading. The overall score increased by 16.9%. Each category of the OSAUS tool showed significant improvement: (1) Applied knowledge of ultrasound equipment increased from 4.32 to 5 ($p < .005$); (2) applied knowledge of ultrasound equipment increased from 3.37 to 4.87 ($p < .005$); (3) image optimization increased from 2.68 to 4.53 ($p < .005$); (4) systematic examination increased from 3 to 4.47 ($p < .005$); (5) interpretation of images increased from 3.58 to 4.8 ($p < .005$); (6) documentation of examination increased from 3.95 to 5 ($p < .005$); and (7) medical decision making increased from 3.95 to 5 ($p < .005$) (Figure 1).

The second objective was improved utilization of eFAST in the trauma bay. The preimplementation utilization rate of eFAST was 0% over the course of a 4-week evaluation period. The postimplementation rate was also evaluated for 4 weeks following the simulation training. The postimplementation utilization rate improved to 66% ($p < .05$) (Figure 2).

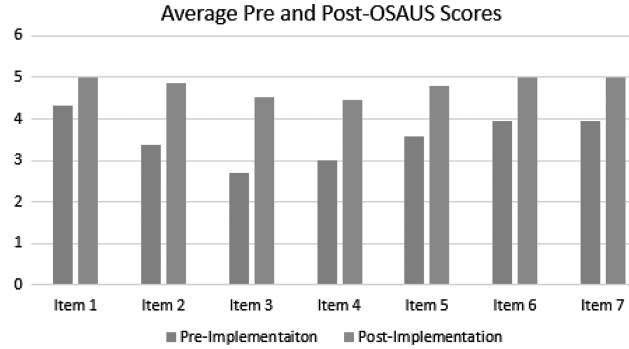

Figure 1. Pre- and post-OSAUS implementation scores. OSAUS = Objective Structured Assessment of Ultrasound Skills.

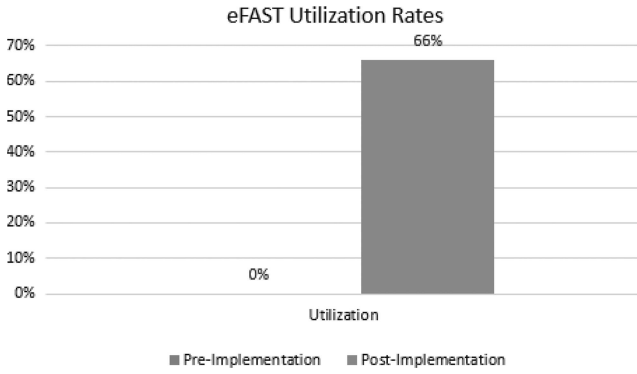

Figure 2. Pre- and postimplementation utilization rates of eFAST. eFAST = expanded Focused Abdominal Sonography in Trauma.

DISCUSSION

As the literature indicated, ultrasound simulation training was an effective method for education in the eFAST technique (Dinh et al., 2015; Henderson et al., 2010; Keddis et al., 2011; Stather et al., 2011). The combination of a lecture and a hands-on simulation helped learners improve in each area of testing, from knowledge of the machine to image optimization to clinical decision making, and others. Most importantly, there was an increase in the utilization rate of the eFAST technique in the trauma bay. This outcome meant trauma providers were utilizing techniques matching literature recommendations (Soult et al., 2015).

Limitations

Limitations of the implementation included lack of training for some residents and advanced practice providers secondary to scheduling conflicts. The providers who were unable to attend the training received the lecture in a PowerPoint format but did not receive a formal hands-on training experience. This likely still limited their knowledge of this technique, but these providers were not included in testing. Another limitation, which was also noted in the literature, was the lack of translation from simulation training to accuracy in the eFAST technique. For this EBP implementation, accuracy of the eFAST technique on patients before and after simulation was not analyzed.

Implications for the Future

In the future, studies on the use of ultrasound simulation training, or even eFAST specifically, should look at the accuracy of the diagnostic technique before and after simulation implementation. Because of the success of this EBP implementation, simulation training should be considered in the future for education in other ultrasound techniques or even other clinical procedures. Reeducation will likely need to be implemented at least on an annual basis, due to new residents beginning their training and hiring of new advanced practice providers.

CONCLUSION

Evidence-based practice is increasingly common in practice and is used to provide patients with the most up-to-date and effective care possible. This EBP implementation was based on the literature indicating that ultrasound examination is more sensitive than chest radiography in the detection of pneumothorax. Using simulation training, providers were educated on the technique of eFAST, which increased their competence with the procedure and their utilization of the technique in the trauma bay. The success of this indicates that simulation training should be utilized in the future for training.

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KEY POINTS

- The eFAST is an effective way to detect pneumothoraces that may otherwise not be detected by chest radiography. Current literature suggests utilizing this technique during initial trauma evaluation.
- Simulation training is an effective way to provide education on ultrasound techniques, specifically eFAST. This includes training for a variety of providers.
- Providing simulation training is an effective way to increase the utilization of the eFAST technique in the trauma bay. Simulation training should include indication for the examination, applied knowledge of ultrasound equipment, image optimization, systematic examination, interpretation of images, documentation of examination, and medical decision making.

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