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A Fast Course to Teach FAST (Focused Assessment with Sonography for Trauma): A Short, Simulator-Based Training for Pediatric Residents

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Abstract

Background: Focused assessment with sonography for trauma (FAST) has been integrated into the primary assessment of pediatric trauma patients in the emergency department. Most pediatric patients are evaluated and treated primarily by pediatric emergency medicine physicians or pediatric residents. Thus, the ability to perform FAST is a required skill, although it is not included in the pediatric residency curriculum.

Objectives: This study assessed the ability of pediatric residents to become competent at performing FAST following a short, simulator-based training program.

Methods: Nineteen pediatric residents without previous knowledge of FAST participated in the study in 2018. The training program consisted of a lecture, hands-on training, high- fidelity simulator training, and 5 FAST examinations performed independently during the following month. Competence was evaluated a month later by a simulator-based test. Participants completed a questionnaire regarding their sense of confidence in performing FAST examinations.

Results: 277 of 285 views performed were technically acceptable sonographic images (97%). Of 57 simulator tests performed, 56 (98.2%) were interpreted correctly. Participants' confidence in performing FAST was significantly increased following the training program.

Conclusions: A short, simulator-based training program provides pediatric residents the required proficiency to perform and interpret the FAST examination.

Abbreviations: POCUS- Point-of-Care Ultrasound; FAST- Focused Assessment with Sonography for Trauma

Introduction

The use of Point of Care Ultrasound (POCUS) has increased significantly in recent years and it has become an important clinical tool for assessing a variety of medical conditions [1]. POCUS is a quick, easily available, painless, radiation-free, bedside examination that has become a standard of care in several fields of medicine.

In emergency medicine, POCUS provides the clinician with a rapid anatomical and physiological assessment; thus, contributing to accurate, personalized treatment [2]. Ultrasonographic evaluation using Focused Assessment with Sonography for Trauma (FAST) has become a routine part of evaluating adult trauma patients [3]. The FAST exam enables identification of free fluid in the peritoneal or thoracic cavity. The discovery of these findings at the initial assessment of a trauma patient affects immediate therapeutic decisions [4]. Various studies show that the skills of using POCUS and FAST in particular, can be acquired after a short training period in populations such as interns and medical students. In these studies, training usually consisted of a didactic lecture or videos and hands-on practice in small groups [5-7]. Medical training using a simulator has become widespread practice in recent years. The use of a simulator makes it possible to learn and practice repetitively a variety of different scenarios without compromising patient safety until the level of knowledge and skill required is attained. Simulator-based POCUS training has been found effective in various applications such as practicing

central line placement and for local anesthesia [8]. Simulator are also an effective tool for assessing the quality of the image obtained by POCUS, as well as accuracy of interpreting the image and the resulting medical decisions [9]. Previous studies have evaluated POCUS training for medical students with no background in ultrasonography, but, to the best of our knowledge, there is no information about FAST training among pediatric residents. The current study evaluated whether pediatric residents with no prior experience in sonography, can achieve proficiency in performing FAST after a short training course. The primary outcome was the results of a practical examination of pediatric residents performing a FAST exam on a high-fidelity simulator one month after undergoing targeted FAST training. The secondary outcome was a questionnaire-based evaluation of confidence in performing FAST and readiness to use the examination routinely.

Materials and Methods

Participants

This prospective study included 19 pediatric residents at a secondary care medical center, with no prior experience in performing sonography. Residents who had previous experience conducting sonography exams of any type and residents who do not work in the emergency department (ED) were not included in the study. Written informed consent was obtained before participation from all participants.

Study Procedures

The residents participating in the study underwent a training program on July 2018 that included:

1. A total of 2.5 hours didactic lectures concerning the principles and operation of the ultrasound equipment used in the ED at our facility (Zonare One Pro, Mindray, Shenzhen, China), performing the FAST examination, identifying positive findings, limitations and integrating the findings into clinical decisions.
2. Three hours of hands-on training. This included performing a FAST examination for normal anatomy on a healthy child and practice sessions for a variety of pathologies using a high fidelity simulator (Simbionix u/ s mentor).
3. During the following month, participants were required to perform five FAST examinations independently, during routine work in the ED, according to the clinical indication.
4. At the end of the month, the participants underwent a simulator-based evaluation that included 3 scenarios with FAST-diagnosed pathologies. The test examined their technical ability to perform the examination and accurate interpretation of the results.

The performance of the tests was evaluated based on the following parameters:

Image Acquisition

Technically acceptable sonographic image as interpreted by the simulator's built-in test.

Image Interpretation

Correct interpretation of the sonographic image obtained.

Time Required to Complete the FAST Exam

The times to complete the first, second and third tests were measured. After completing the test, each participant completed an anonymous, validated questionnaire that examined their confidence in their ability to perform the FAST exam based on a scale from 1-5 [10]. The study was approved by the Meir Medical Center Institutional Review Board.

Statistical Methods

The basic data are described in numbers and percentages. The measured results are presented as averages ± standard deviations. The results were compared using repeated measures analysis. Statistical significance was set at $P<0.05$. Data were analyzed using SPSS, version 25.

Results

A total of 19 pediatric residents (2 men and 17 women) began and completed the entire study (response rate of 100%). Most (68%) were in the second or third year of their 4.5-year residency program and had worked regular shifts in the ED for less than a year.

A total of 57 simulator tests were completed (3 scenarios per participant), that included 285 views (5 views per test). The results of the quality tests are presented in Table 1.

Quality Test	Test No.	Average	SD	P-Value
Image Acquisition (%)	1	93.7	11.6	0.04*
	2	97.9	6.3	
	3	100.0	0.0	
Interpretation (%)	1	100.0	0.0	1
	2	94.7	22.9	
	3	100.0	0.0	
Time (Minutes) To Complete The FAST Exam	1	5.6	1.3	0.009*
	2	4.9	1.8	
	3	4.4	1.4	

Table 1: Image acquisition, correct interpretation and time to complete the FAST exam by study participants (n=19). P values are for the difference between the 1st and 3rd test.

SD- standard deviation.

Image Acquisition

277/285 (97%) were technically acceptable sonographic image. The average success rate in acquiring an acceptable image was significantly higher in the third compared to the first test (100% vs. 93.7%, p=0.04).

Image Interpretation

In 56 of the 57 simulator tests, participants correctly interpreted the sonographic image obtained (98.2%). One test was interpreted as false negative.

Time Required Completing the FAST Exam

The average time to perform a FAST exam on the simulator was 5.0±1.53 (range 2.1-7.9) minutes. The mean times for the first, second and third tests were 5.6 minutes, 4.8 minutes, and 4.3 minutes, respectively. The time required to complete the third test was significantly shorter than for the first attempt (P = 0.04; Figure 1).

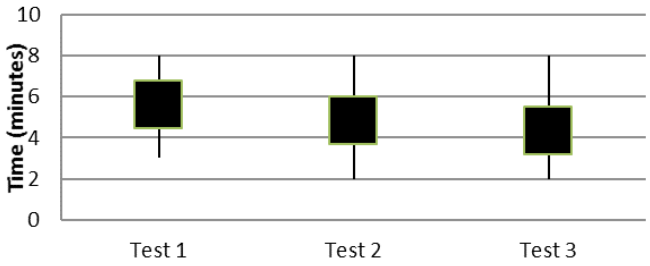

Figure 1: Average time for FAST exam.

*The third test was performed more quickly than the first test (p=0.04).

Questionnaires

An analysis of the questionnaires showed that the average confidence level in performing FAST increased from 1.1 before the training program to 3.9 after completion of the training program (P<0.0001). Most participants thought that the ability to perform the FAST examination is relevant for pediatric patients (4.95/5). Most participants indicated that following the course they understand the indications for FAST examination (4.3/5) and the limitations of it. (4.3/5). Participants felt that the short course they underwent provided sufficient practice. 14 of 19 participants (75%) assessed they will perform more than 3 FAST examinations per month.

Discussion

This prospective study demonstrates that pediatric residents who completed a short, simulator-based FAST training program achieved a 97% success rate in acquiring the sonographic image and 98% success in interpreting it. These results highlight the importance and ease of teaching the FAST technique to pediatric residents who evaluate trauma patients in the ED. Studies by Parks(9) and Paraskeva (12) demonstrated similar success rates in medical students undergoing a short POCUS training (99% image acquisition and 93% correct interruption, 86% success rate, respectively).

There are no formal recommendations regarding the length and type of POCUS training in general and FAST training in particular, or regarding assessing the acquired skill of the trainee [11]. Existing research in the field of training students and physicians in the FAST application uses various study programs and different teaching methods and therefore, are difficult to compare.

The current study used a simulator as part of the training program, as it has been shown to be an effective and efficient training modality. Participants used a high-fidelity simulator on which their performance using pathological scenarios was evaluated (10,11,12). We found that residents were able to achieve a good level of performance in acquiring and interpreting the required images (97% and 98%, respectively) after a short practice session. All tests except one were correctly interpreted by the participants and the time to complete the test was significantly shorter between the first and third tests, suggesting an improvement in technique, even after minimal training.

A similar improvement in image acquisition success rate was observed between the first and third tests. The ability to acquire the image is a technical skill, and the improvement in this study was achieved after minimal training. This indicates that relatively little practice was required (only 2 more tests) to significantly improve technical FAST examination skills. FAST is conducted during the preliminary assessment of trauma. Therefore, in addition to the physician's ability to perform it accurately and correctly, it must be performed quickly.

Gogalniceanu, et al. examined test duration in addition to quality. They found that 85% of participants were able to complete a quality test in less than 6 minutes after a short training program. In the current study, 70% of the tests were performed in less than 6 minutes. This may be because there was no time limit for the test [12].

The questionnaires collected at the end of the final test provided information on participants' experience with simulator training and their confidence in performing FAST exams in the framework of their future activity in the pediatric emergency department. Kotagal et al. evaluated confidence level of surgical interns before and after a training program in which they learned the use of various POCUS applications, including FAST. Participants' confidence level significantly increased from 1.5 (out

of 6) before the training program to 5 [7]. In the current study, confidence in performing FAST increased significantly. Most participants reporting that they understood the indications for FAST examination.

There are various POCUS training courses for medical students [13,14]. However, POCUS training in general and FAST training in particular are not part of the pediatric residency program in Israel, nor are there currently accepted guidelines for a POCUS training program. Yamada et al. found that POCUS training resulted in similar outcomes among senior physicians and medical students who lack clinical experience. This is consistent with the findings in the current study that a short, simple session is adequate for training physicians with no experience performing ultrasonography examinations [15]. Our results suggest that adding a short, simulator-based training to the pediatric residency program could be relatively easy to implement.

Limitations of the Study

The study participants had no formal prior experience performing ultrasonography. However, their level of knowledge and skill prior to the training program was not formally assessed. This study examined the technical ability to obtain a correct sonographic picture (image acquisition) and the ability to accurately interpret the findings, but the ability to integrate the findings into the clinical decision was not examined. Participants were asked about their sense of understanding of the indications and limitations of the FAST exam, but this was not tested objectively.

In addition, the extent of the use of the FAST exam was not examined over time after the completion of the training program. A follow-up study on larger groups of participants is needed to monitor participants and assess whether the ability to perform FAST exams is maintained over time.

Conclusions

Following a short, intensive training program using a simulator, pediatric residents displayed sufficient performance and interpretation skills of the FAST exam. The program significantly increased their confidence in the ability to perform the examination as part of their work in the pediatric ED.

Declarations

Ethics Approval and Consent to Participate

The study was approved by the Meir Medical Center Ethics Institutional Review Board and further need for ethics approval was waived.

Consent for Publication

Consent for publication was obtained from all participants before beginning the training program.

Availability of Data and Materials

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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