



## Research Article

## Long Term Retention of FAST (Focused Assessment with Sonography for Trauma) Skills and Knowledge after a Short Training Program

Katz-Dana Hadas\*, Rosenblum Ehud, Takagi Dania, Yehiam Hadas, Friedman Nir and Shles Ayelet

Pediatric Emergency Department, Meir Medical Center, Kfar Saba, Israel

\*Corresponding author: Hadas Katz-Dana, Pediatric Emergency Department, Meir Medical Center, Kfar-Saba, Israel

**Citation:** Hadas KD, Ehud R, Dania T, Hadas Y, Nir F, et al. (2020) Long Term Retention of FAST (Focused Assessment with Sonography for Trauma) Skills and Knowledge after a Short Training Program. Adv Pediatr Neonatol care: APNC-112. DOI: 10.29011/APNC-112.100012**Received Date:** 25 May, 2020; **Accepted Date:** 01 June, 2020; **Published Date:** 05 June, 2020

## Abstract

**Objectives:** Focused assessment with sonography for trauma (FAST) has been integrated into the primary assessment of pediatric trauma patients in the emergency department. Various studies show that the FAST skills can be acquired after a short training period in populations such as interns and medical students. however, few data exist on the retention of ultrasound skills over time. This study evaluated the retention of FAST skills and knowledge of pediatric residents 6 months after completing a simulator based training program.**Methods:** This is a prospective cohort study. subjects completed successfully a short simulator based training program of FAST examination. Skills were retested 6 months and compared with previous results to assess skill retention. Competence was evaluated by a simulator-based test. Integration of knowledge was evaluated by a written multiple-choice test.**Results:** 16 of 19 (84.2%) subjects completed follow-up testing. Although Performance declined in image acquisition, still 91% of trainees maintained their skill 6 months after training. Interpretation skills declined more severely from 98.2% to 78.9% after 6 months. 25% of Participants stated that they are using FAST regularly.**Conclusions:** retention of FAST skills are partially sustained after 6 months of non-routine use. A short training program is sufficient for gaining the skills but a routine use is needed to ensure competence**Keywords:** POCUS; point-of-care ultrasound; Focused Abdominal Sonography in Trauma; FAST, medical education

## Background

The use of Point of Care Ultrasound (POCUS) has increased significantly in recent years and has become an important clinical tool for assessing a variety of medical conditions [1,2]. Many POCUS training programs exist for medical students and postgraduates worldwide [3,4]. However, these training programs vary greatly across training environments, programs and specialties without standardized curriculums or assessment of skills [5].

The focused assessment with sonography for trauma (FAST) is an essential POCUS scan, easy to learn and provides an initial assessment of a trauma patient that can affect immediate therapeutic decisions [6].

Various studies show that FAST performing skills can be acquired after a short training period in populations such as interns and medical students. In these studies, training usually consisted of a short frontal lecture or videos and hands-on practice in small groups [7].

A previous study on FAST training has shown that following a short simulator based training program, pediatric residents with no prior experience in performing sonography displayed sufficient performance and interpretation skills of the FAST test, and has also significantly increased the residents' confidence in the ability to perform the examination as part of their work in the pediatric ED [8].

The attainment and maintenance of proficiency in POCUS requires practice, especially among physicians who do not perform POCUS frequently.

However, limited data exist on the retention of POCUS performance skills [9,10]. In the current study we evaluated the retention of FAST performance skills and the knowledge of pediatric residents 6 months after completion of a training program. The primary criteria were a practical examination based on a high fidelity simulator (Simbionix u/s mentor) and a written knowledge exam.

## Methods

### Study Population

This prospective study included pediatric residents at a secondary care medical center, with no prior experience in performing sonography, who participated in a short, simulator based FAST training program during July 2018.

### Study Design

Six months after completion of a FAST training program, pediatric residents were tested on their ultrasound skills and knowledge levels. The residents enrolled in the present study had no ultrasound experience prior to the FAST training program. Hands-on supervision continued during the residents' ED shifts and following their initial training, as part of the routine POCUS QA process.

The FAST skill test was performed using the same simulator-based evaluation used in the initial training program, and included 3 scenarios for the evaluation of image acquisition and interpretation skills.

The participants also underwent a written multiple-choice test that assessed their ability to integrate FAST findings into the clinical decision process. The test included 10 multiple-choice questions on different trauma related clinical scenarios, and was reviewed and approved independently by two PEM POCUS leading physicians. Test performance scores were also compared with the results of the prior study.

A validated survey assessing confidence level, attitude toward bedside ultrasound and individual usage was administered (Appendix 1).

### Appendix 1. Questionnaire

I agree that the information from this questionnaire will be used for research purposes.

Gender: M/F

Year of residency: 1 2 3 4 5

ED shifts: less than 6 months \ 6-12 months \ more than 12 months

Since completing the FAST training program, how often do

you use it as part of your daily work at the ED?

Not at all \ 1-3 times per month \ more than 3 times per month.

For the following questions, please select the most appropriate answer. 1 - to a small extent, 5 - to a great extent.

1. To what extent do you feel confident to be the team member entrusted with the FAST test in a trauma case?

1 2 3 4 5

2. To what extent do you control the indications for FAST testing?

1 2 3 4 5

3. To what extent do you feel confident in performing FAST examinations?

1 2 3 4 5

4. To what extent do you understand the limitations of the test and the types of injuries that will not be diagnosed in the FAST test?

1 2 3 4 5

5. To what extent are you able to identify free fluid in the peritoneal space?

1 2 3 4 5

6. To what extent can you identify free pericardial fluid?

1 2 3 4 5

7. Have you learned to use POCUS for other applications? If so, what applications?

### Statistical Analysis

The basic data are described in numbers and percentages. The measured results are presented as averages  $\pm$  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

Sixteen of 19 (84%) pediatric residents consented to participate in the study.

(3 were not available for the follow up evaluation).

Ten of the 16 residents (62%) were in their fourth or fifth year of the 4.5-year residency program and had worked regular shifts in the ED for more than a year.

A total of 48 tests were completed (3 scenarios per participant). Each test consisted of 240 views (5 views per test). The results are presented in Table 1.

	Test no.	Average score	p
image acquisition (%)	1	87.5	0.09
	2	92.5	
	3	93.7	
Interpretation (%)	1	68	0.021
	2	87.5	
	3	81.2	
Time required to complete the FAST test (min)	1	5.67	<0.0001
	2	3.73	
	3	3.76	

**Table 1:** Image acquisition ability, correct Interpretation and time required to complete the FAST test (n=16). P values are for the difference between the 1<sup>st</sup> and 3<sup>rd</sup> test.

P	study test**(n=16)	Test A*(n=19)	
0.02	91.2	97.2	image acquisition (%)
>0.0001	78.9	98.2	Interpretation (%)
0.139	4.4	4.9	Time required (minutes) to complete the FAST test

**Table 2:** comparison of: Image acquisition ability, correct Interpretation and time required to complete the FAST between two tests.

\*Test A – performed at the end of the original training program

\*\*Study test – current study, (6 months after the training program)

### Image Acquisition

219/240 (91.2%) of the simulator views were technically acceptable sonographic images. There was a significant difference between image acquisition scores at the end of the training program (test A) and at 6 months follow up. (97.2%, 91.2%, p=0.02)

### Image Interpretation

Only 78% of the FAST tests performed were correctly interpreted. There was a significant difference between image interpretation scores at the end of the training program (test A) and at 6 months follow up. (98.2%, 78.9%, p<0.0001).

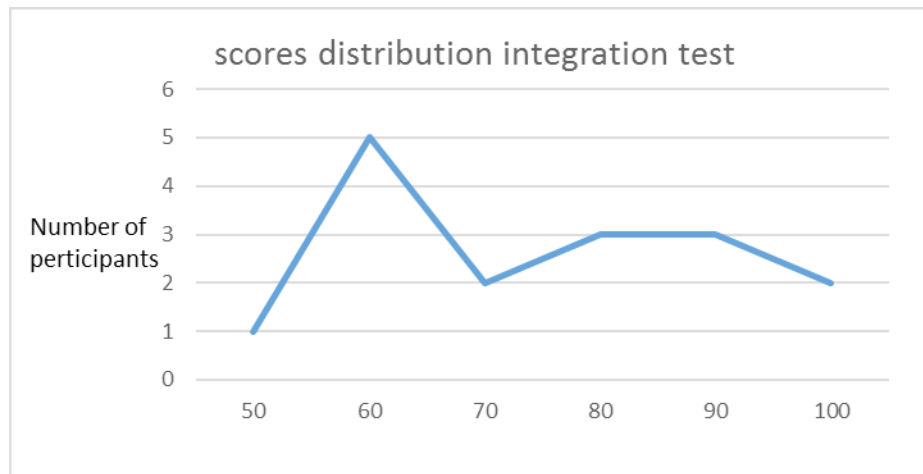
### Time required to Complete the FAST Test

The average time required to complete a FAST simulator test was 4.4 minutes. The time required to complete the third test was significantly shorter than the first one (3.7, 5.6 respectively, p<0.001)

There was no difference between the time required to complete the FAST examination between test A and the follow up test. (4.9, 4.4 minutes, respectively p=0.139).

### Knowledge (Integration)

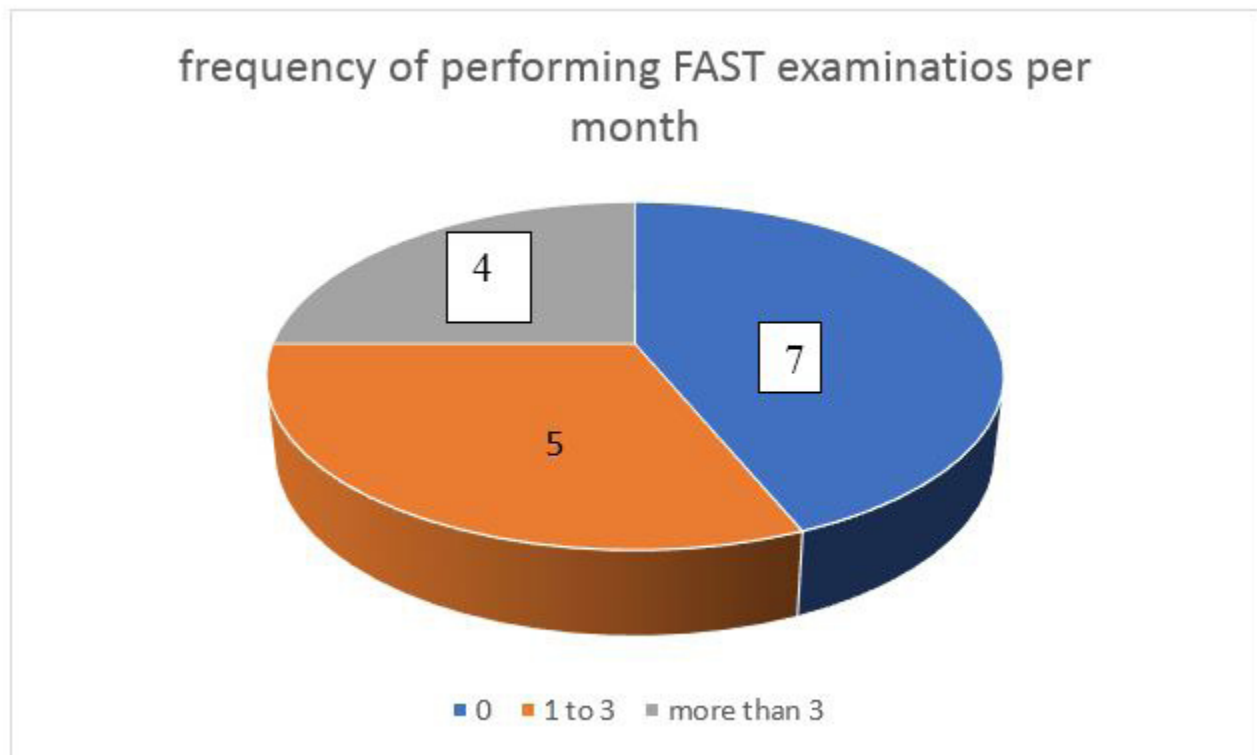
The average score for the written test was 75%. The distribution of the scores is presented below (Figure 1).



Test scores.

#### Questionnaires – (Appendix 2)

7 of 16 participants (44%) stated that they are not performing FAST examinations as part of their clinical work at the ED. 5 residents (31%) stated that they are performing 1-3 FAST examinations a month, and 4 (25%) are performing more than 3 examinations per month. Residents who reported performing more than 3 FAST exams per month were considered “high utilizers”.

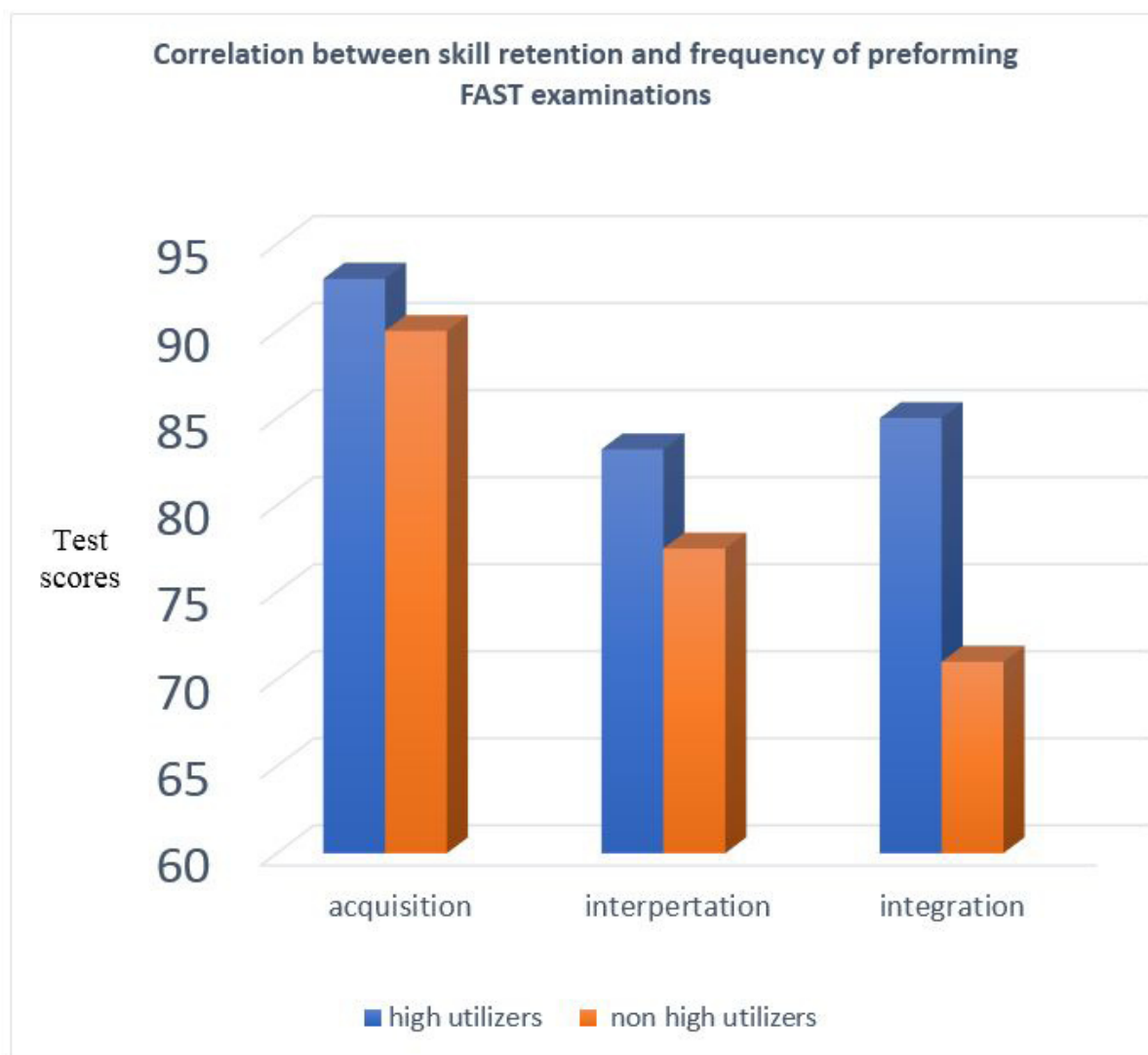


Most participants indicated that 6 months following the training program they still understand the indications for FAST testing (9\16 residents ,55%) and the limitations of the test (10\16, 62.5%).

6 of 16 participants (37%) stated that since the training program they have expanded their use of POCUS for various applications other than FAST, including lung, cardiac, soft tissue and hip.

	high utilizers	non high utilizers	p
acquisition	93	90	0.61
interpretation	83.2	77.5	0.728
integration	85	71	0.153

**Table 3:** Correlation between the frequency of performing FAST examinations and the retention of ultrasound skills.



**Figure 1:** Correlation between the frequency of performing FAST examinations and the retention of ultrasound skills.

## Discussion

The current study demonstrates that sonography skills of image acquisition and interpretation wanes substantially six months after completion of a short training program for FAST among pediatric residents.

### Skill Retention

Our previous study findings showed that pediatric residents with no prior sonography experience who underwent a short simulator based training for FAST test performance demonstrated proficiency in image acquisition and interpretation (97%, 98% success rate respectively) upon completion of their training program. However, the current study found that after 6 months their performance declined significantly (97% vs 91%,  $p=0.02$  and 98% vs 78%  $p<0.001$ , respectively).

Several studies have discussed the presence of a learning curve for novice physicians performing FAST examinations. One example is a study by Shackford and colleagues who found that the error rates of novice FAST examination operators declined significantly after the initial set of 10 FAST examinations [11]. However, JANG, Timothy, et al. found that 10 FAST examinations are not sufficient to retain good proficiency [12]. GRACIAS, Vicente H., et al, suggested that 30–100 examinations are required for sufficient FAST skills [13].

The residents who participated in the current study performed between 1-20 FAST examinations on average by the 6 months' evaluation. Even the "high utilizers" participants performed no more than 30 exams. FIGURE 1 demonstrates the observed difference in performance between the "high" and "low" utilizers, although not statistically significant, because of the limited number of study participants.

MA, O. John, et al. examined FAST test performance accuracy of EM residents following a training program: residents performed an average of 70 examinations after 6 months and, FAST interpretation accuracy steadily increased [14]. One explanation for the decrease in POCUS skills in the current study is the lack of practice, as expressed in the low performance rate of performed examinations following the training program. Kimura et al. [10] examined the performance of cardiac ultrasound among 30 internal medicine physicians after 2 years of nonuse and demonstrated a notable decline in skill.

The process of learning diagnostic ultrasound requires the blending of both procedural and declarative memories [15,16], manifest as imaging skills and diagnostic knowledge. It is likely that most skills that have been taught are rapidly lost without further clinical practice.

### Knowledge Retention

The average knowledge test score performed 6 months following the training program was 75%.

MITCHELL, John D., et al showed that anesthesia interns' scores at a knowledge test 90 days following an ultrasound training course were similar to their end-of-course scores [12]. The mean score at the follow up test was 67%.

In a similar study by NOBLE, Vicki E., et al., there was a significant improvement in knowledge that continued six months after a standard introductory bedside ultrasound course for ED residents [17].

TOWN, James A., et al. showed that when evaluating internal medicine residents 12 months after completing a bedside ultrasound course, the mean knowledge score fell significantly [18].

Existing data concerning knowledge retention varies.

### Limitations

The current study consisted of a small number of participants. Moreover, not all eligible subjects participated.

Increasing the study size would provide a better understanding of accuracy trends noted in our 6-month evaluation.

There was no assessment of baseline knowledge after the training program. Although average knowledge test scores correlated to similar studies, we have no previous data for comparison. Therefore, we were unable to assess knowledge retention.

### Conclusion

Retention of FAST skills are partially sustained after 6 months of non-routine use among pediatric residents. A short training program is sufficient for gaining the skills however, regular practice is needed to ensure competence retention.

### References

1. Cormack CJ, Coombs PR, Guskich KE, Blecher GE, Goldie N, et al. (2018) Collaborative model for training and credentialing point-of-care ultrasound: 6-year experience and quality outcomes. *J. Med. Imaging Radiat. Oncol* 62: 330-336.
2. Gillman LM, Kirkpatrick AW (2012) Portable bedside ultrasound: the visual stethoscope of the 21 st century. *Scandinavian journal of trauma, resuscitation and emergency medicine* 20: 18.
3. Bellamkonda VR, Shokoohi H, Alsaawi A, Ding R, Campbell RL, et al. (2015) Ultrasound credentialing in North American emergency department systems with ultrasound fellowships: a cross-sectional survey. *Emerg Med J* 32: 804-808.



4. Kanji HD, McCallum JL, Bhagirath KM, Neitzel AS (2016) Curriculum Development and Evaluation of a Hemodynamic Critical Care Ultrasound: A Systematic Review of the Literature. *Critical care medicine* 44: e742-e750.]
5. Ahern M, Mallin MP, Weitzel S, Madsen T, Hunt P (2010) Variability in ultrasound education among emergency medicine residencies. *Western Journal of Emergency Medicine* 11: 314.]
6. Stawicki SP, Evans DC, Bahner DP, Sparks S, et al. (2016) From FAST to E-FAST: an overview of the evolution of ultrasound-based traumatic injury assessment. *European journal of trauma and emergency surgery* 42: 119-126.
7. Adelman MH, Patrawalla P, Lee MH, Barnett MP, Vorsanger MH, et al. (2017) A 23 emerging strategies to train medical professionals: Impact Of A Brief, Blended Curriculum On Point-Of-Care Echocardiography For Internal Medicine Residents. *American Journal of Respiratory and Critical Care Medicine* 195: A1107.
8. Katz-Dana H, Rosenblum E, Takagi D, Nemet D, Shles A (2020) A Fast Course to Teach FAST (Focused Assessment with Sonography for Trauma): A Short, Simulator-Based Training for Pediatric Residents. *Adv Pediatr Neonatol care: APNC-108*.
9. Mitchell JD, Montealegre-Gallegos M, Mahmood F, Owais K, Wong V, et al. (2015) Multimodal perioperative ultrasound course for interns allows for enhanced acquisition and retention of skills and knowledge. A & A case reports 5: 119-123.]
10. Kimura BJ, Sliman SM, Waalen J, Amundson SA, Shaw DJ (2016) Retention of ultrasound skills and training in "point-of-care" cardiac ultrasound. *Journal of the American Society of Echocardiography* 29: 992-997.]
11. Shackford SR, Rogers FB, Osler TM, Trabulsy ME, Clauss DW, et al. (1999) Focused abdominal sonogram for trauma: the learning curve of nonradiologist clinicians in detecting hemoperitoneum. *Journal of Trauma and Acute Care Surgery* 46: 553-564.]
12. Jang T, Sineff S, Naunheim R, Aubin C (2004) Residents should not independently perform focused abdominal sonography for trauma after 10 training examinations. *Journal of ultrasound in medicine* 23: 793-797.]
13. Gracias VH, Franke HL, Gupta R, Malcynski J, Gandhi R, et al. (2001) Defining the learning curve for the Focused Abdominal Sonogram for Trauma (FAST) examination: implications for credentialing. *The American Surgeon* 67: 364.]
14. John Ma O, Gaddis G, Norvell JG, Subramanian S (2008) How fast is the focused assessment with sonography for trauma examination learning curve?. *Emergency Medicine Australasia* 20: 32-37.]
15. Matthew PW, Robert S (2008) Sleep, memory, and plasticity. *Annu. Rev. Psychol* 57: 139-166.]
16. James LM (2000) Memory--a century of consolidation. *Science* 287: 248-251.]
17. Noble VE, Nelson BP, Sutingco AN, Marill KA, Cranmer H (2007) Assessment of knowledge retention and the value of proctored ultrasound exams after the introduction of an emergency ultrasound curriculum. *BMC medical education* 7: 40.]
18. Town JA, Berg PA, Narang A, McConville JF (2016) Internal medicine residents' retention of knowledge and skills in bedside ultrasound. *Journal of graduate medical education* 8: 553-557.]