Effectiveness of written instruction for completing the Focused Assessment with Sonography for Trauma (FAST) in a wilderness setting

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Abstract

Point of Care Ultrasound (PoCUS) has gained traction in its application in under-resourced and remote settings due to ease of use, portability, and ability to integrate with telemedicine modalities. Previous research has shown that an eighth grade education is adequate to obtain PoCUS images with some training. The Focused Assessment with Sonography for Trauma (FAST) is a common PoCUS exam which can be performed in an out-of-hospital setting to evaluate the need for further medical care. We hypothesize that a layperson with no advanced medical training in a wilderness setting can obtain adequate ultrasound images while performing a with a handheld ultrasound device, using only pre-written instructions. Participants will follow a typed set of instructions and an accompanying set of representative ultrasound images to obtain the four views used most commonly in FAST. While no results have been collected as of yet, the possibility of deploying PoCUS technology for layperson use in the wilderness setting presents a promising avenue for the expansion of medical access and care in remote and under-resourced settings.

Introduction

Point-of-care ultrasound (PoCUS) has recently undergone a rapid expansion in its use in clinical settings, due to to its accessibility, broad range of applications, and ease of use. PoCUS has also gained traction in its application in under-resourced and remote settings as it is relatively inexpensive, extremely portable, and able to easily integrate with telemedicine modalities for remote communications. Several previous studies have investigated the use of PoCUS out in remote or austere settings and shown that use of this technology has a wide array of uses and can provide a direct benefit when other imaging modalities such as CT or MRI are unavailable[1,2].

Additionally, it must be considered that in many remote areas, individuals with a high level of medical training are less likely to be available to perform assessments with PoCUS. One study addressed the possibility of training laypeople with less than a high school education to use PoCUS, finding that the majority of the twenty eighth graders enrolled were able to obtain adequate ultrasound images after only a 2 hour training session[3].

Our purpose is to determine if layperson use of PoCUS in the wilderness setting to assess trauma is a feasible avenue for expanding the use of POCUS in remote areas. We hypothesize that a layperson with no advanced medical training in a wilderness setting can obtain adequate ultrasound images while performing a Focused Assessment with Sonography for Trauma (FAST) with a handheld ultrasound device, using only pre-written instructions.

Methods

An Emergency Medicine physician with training in ultrasound developed a single page of typed instructions on how to conduct a FAST exam, and a separate page with images depicting correct probe position and representative ultrasound still images from each view to be obtained. These instructions are given to healthy volunteers who are identified on the basis of their regular involvement in outdoor activities in remote settings.

View Evaluation Scale	
1	Unable to visualize target structures
2	Some visualization of target structures
3	Target structures mostly visualized
4	Target structures entirely visualized
5	Fine details of target structures are visible

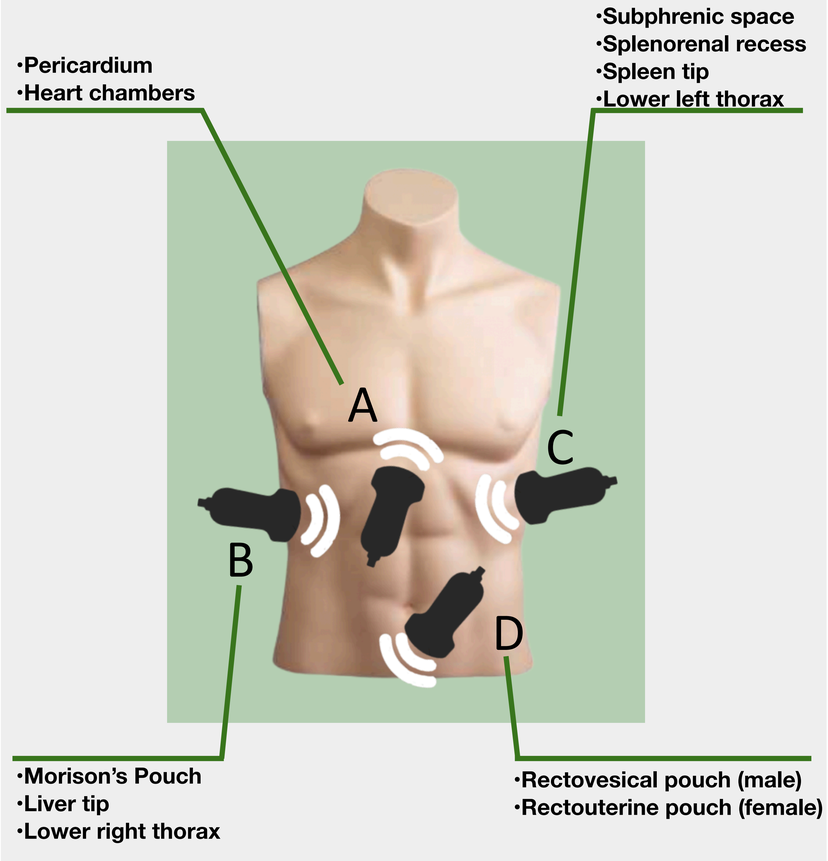
Inclusion criteria require at least an eighth grade education, no advanced medical or ultrasound training beyond a BLS certification, and the ability to read and communicate in American English. Each participant will conduct a FAST exam using a Butterfly iQ+ handheld ultrasound on a separate volunteer. Images and video clips from each view will be viewed and recorded on an attached iPad.

Following the data collection, the views will be evaluated by an Emergency Medicine physician and graded on a 5 point scale for clarity and adequacy. Views graded with a 4 or 5 are considered adequate for assessment of traumatic findings. A Kappa coefficient will be calculated to determine the interrater reliability for each individual view obtained, as well as the overall adequacy of the exam across all views. Demographic information on the volunteers performing the exam will also be collected in order to evaluate possible factors that may contribute to high quality image collection.

FAST Exam

The Focused Assessment with Sonography for Trauma is indicated in cases of penetrating or blunt trauma, and typically consists of four views (Figure 1) obtained while the patient is supine. There are several optional additional views, including apical and parasternal cardiac, inferior vena cava/cavoatrial junction, and the pleural lines. Views of pleural lines to evaluate pneumothorax are part of the extended FAST (eFAST) exam.

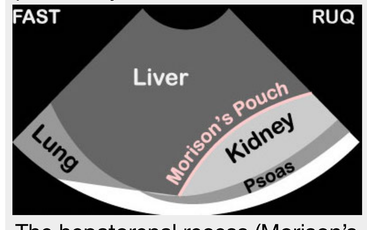
The FAST exam primarily seeks to identify inappropriate accumulations of fluid in the chest and abdomen due to trauma. Additionally, the loss of normal findings can also indicate pathology (e.g. loss of the spine sign in the thoracic views indicating possible pneumothorax).



Results

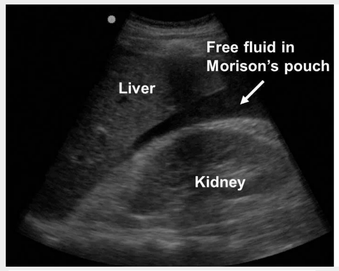
Unfortunately no direct results from this study have been obtained and analyzed as of yet. Below are some representative images demonstrating the obtainment of the Right Upper Quadrant (RUQ) View during a FAST exam.

The transducer is placed along the mid-axillary line, at approximately the level of the 10th rib, with the probe indicator pointing to the patient's head. For better visualization, it can be useful to rotate the probe so the the probe indicator is pointed more posteriorly.



The hepatorenal recess (Morison's Pouch) is the deepest space in a supine patient, and a common area for fluid accumulation.

Courtesy of Dr David Carroll, radiopaedia.org, rID: 64279



Free Fluid in Morrison's Pouch (AHC Media)

By comparing the above images of the RUQ, the inappropriate presence of hypoechoic fluid in Morison's Pouch in the latter image is clear. This constitutes a positive FAST exam.

It is important to note that it is also very common for only a small volume of fluid to collect in this space, resulting a more subtle FAST exam finding. An earlier finding may only show fluid present at the inferior tip of the liver, prior to collecting in Morison's pouch[4].

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