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Improving Military Provider Confidence in Basic Ultrasound Skills

MAJ Regina Thorp & CPT Matthew Watson

Uniformed Services University

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(student signature)- digitally signed

Regina Thorp, MSN, RN, MAJ, CEN

Family Nurse Practitioner/ Women's Health Nurse Practitioner Program

Daniel K. Inouye Graduate School of Nursing

Uniformed Services University

Date

(student signature)- digitally signed

Matthew Watson, BSN, RN, CPT

Family Nurse Practitioner Program

Daniel K. Inouye Graduate School of Nursing

Uniformed Services University

Date

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Abstract

Background

Within the military, primary care providers may have to assume roles outside of the civilian scope of practice. Military providers must utilize readily available resources to determine the best care of the injured soldier in resource-limited environments. Despite ultrasound machines becoming a standard asset of deployed military personnel, some military primary care providers are ill-equipped and unfamiliar with the capabilities of ultrasound. This lack of familiarization leads to delays on the battlefield in the stratification of treatment, evacuation, and management. Improving military provider confidence in ultrasound techniques and skills can improve the quality and delivery of patient care.

Clinical Question

Will military providers, after a two-hour ultrasound course, increase their confidence in delivering point of care ultrasound skills?

Project Design

The authors' intent of this project was to increase military provider confidence in a two-hour Point of Care in Ultrasound (POCUS) course with a focus on the Extended Focused Assessment of Sonography for Trauma (E-FAST). While POCUS encompasses a large variety of techniques, the authors chose the E-FAST to reflect a military annual skill requirement. The two-hour training consisted of a 30-minute didactic presentation with the remainder of time dedicated to hands-on utilization of the ultrasound machine. Local Emergency Department ultrasound fellows were on hand to provide guidance and familiarization with techniques.

Analysis of the Results

Providers took a pre and post-Likert survey to assess their confidence with the E-FAST. One iteration at a military health clinic (n=10) indicated an improvement in military primary care provider confidence after the two-hour course.

Organizational Impact/Implications for Practice

A short familiarization with ultrasound increases providers' confidence to utilize ultrasound. With an increase in provider confidence, providers are more likely to seek out opportunities for ultrasound skill advancement. A recommendation for future studies includes more ultrasound education to improve provider competency before deploying.

Key Words

Ultrasound, readiness, confidence, military providers

Introduction

Since 2001, the United States military has sustained over 50,000 wounded in action as a result of trauma-related injuries during Operation Iraqi Freedom and Operation Enduring Freedom (United States Department of Defense, 2020). Advances in modern military medicine improve survivability rates in deployed settings to over 90% (West, 2018). One advance in military medicine is the inclusion of ultrasound machines in forward deployed military operations. Basic bedside ultrasound skills, otherwise known as Point of Care Ultrasound (POCUS), encompass skills throughout the whole spectrum of healthcare, from inpatient, outpatient, to austere environments such as deployments and humanitarian assistance missions.

The potential benefits of using ultrasound include improved patient safety, diagnostic precision, time effectiveness, and cost savings. Ultrasound is relatively safe in routine diagnostic procedures, is not invasive, requires no intravenous contrast, or radiation exposure compared to the computer tomography scan (CT) (Moore & Copel, 2011; Montoya et al., 2016). Eliminating the need for contrast decreases the additional risk posed to the patient, including patients with potential iodine allergies and additional load and demand on the patient's kidneys.

Ultrasound is an accurate and diagnostically precise tool when performed and analyzed correctly. Ultrasound machines transmit high-frequency sound waves, via a handheld transducer, through the soft tissue of a human body. The transmitted sound wave creates an echo in relation to the density of tissue below the transducer, reverberating sound waves back to the transducer, resulting in an image. This image provides the viewer with the condition of structures below the transducer and allows a medical provider to make a clinical decision based on findings.

Ultrasound works well to identify fluid and aqueous structures within the body, to include blood, urine, and internal organs (Moore & Copel, 2011).

The strengths of ultrasound include the world-wide accepted POCUS tool of the Extended Focused Assessment of Sonography for Trauma (E-FAST). The E-FAST is a rapid evaluation tool for detecting the presence or absence of internal bleeding, used most often on trauma patients. Undetected internal bleeding can lead to vascular compromise or death, and the E-FAST has shown to be a useful tool in early identification, leading to quicker surgical intervention and decreasing chances of death. E-FAST is an appropriate tool for triage in mass casualty (MASCAL) situations, assisting in the identification of hemodynamically stable patients or those that may become unstable. The E-FAST exam has demonstrated 83.3% sensitivity and 99.7% specificity for identifying internal hemorrhage (Russell & Crawford, 2013). With such high accuracy, military providers must become proficient with ultrasound and tests such as the FAST to take care of patients in the deployed environment adequately.

Significance of the Problem

Within the military provider population, resources and capabilities can be limited within the deployed environment. Providers have a finite level of supplies and must consider timing of the next medical resupply. Providers are required to understand the resources involved in the treatment of each patient and consider the potential impact on future patients. Furthermore, access to advanced radiological studies, such as CT scans or X-Ray, may be limited. With the consideration of resources, providers must use highly accurate yet low-risk diagnostic tests to stratify their decision making in the delivery of care.

Military providers should strive to eliminate unnecessary, high-risk evacuations from combat environments for patients with non-life-threatening injuries. During situations that overwhelm medical capabilities such as a mass casualty situation (MASCAL), providers need a quick and efficient way to stratify immediate patients. The versatility and continually improving portability of ultrasound has cemented it as a mainstay on many deployments at all the various echelons of care.

Becoming proficient in ultrasound adds an essential skill for the triage of critically injured patients, enhancing the military provider role. Improving and expanding skills is especially crucial in the deployed environment when providers may be evaluating and treating trauma patients (Lewis et al., 2012). Ultrasound tools, such as the E-FAST, allow military family nurse practitioners (FNP) to bridge the gap between clinical settings to austere, deployed environments, so that they can make an impact on patient outcomes.

Clinical Question

Will military providers, after a two-hour ultrasound course, increase their confidence in delivering point of care ultrasound skills?

Focus Areas

This project had three focus areas: exercising the full extent of education and training for military providers, creating a basic ultrasound course with a focus on the E-FAST exam, and implementation of the course. The first focus was on educating military providers on becoming comfortable with using ultrasound as well as increasing their confidence. The second focus area is an evidence-based curriculum centered on the familiarization of the ultrasound equipment, enhancing the understanding of human anatomy, identifying internal abdominal organs and abnormalities, and performing a E-FAST exam. The third focus area was engaging key

stakeholders to ensure full support of implementing an ultrasound course with the participation of the military providers.

Relevance to Military Nursing

Within the past few years, the Army, Navy, and Air Force hospital and clinic services have started the transition to the Defense Health Agency (DHA) to streamline military medicine, reduce redundancy, and increase collaborative efforts between the services. With this shift, the impetus for increasing military readiness is at an all-time high (Suits, 2018). Under DHA guidance, military medicine must focus on operational readiness to support the warfighter (Suits, 2018).

Therefore, military providers must be familiar and confident with the skills necessary to perform their role as a provider in a deployed setting. For all military providers, including Nurse Practitioners (NP), Physician Assistants (PA), or Physicians, the Army has outlined individual critical task lists (ICTLs). These tasks are education and training required for each military provider, often annually, with skill development as a focus. These skills are required for military providers to ensure their military readiness and effectiveness in their assigned roles.

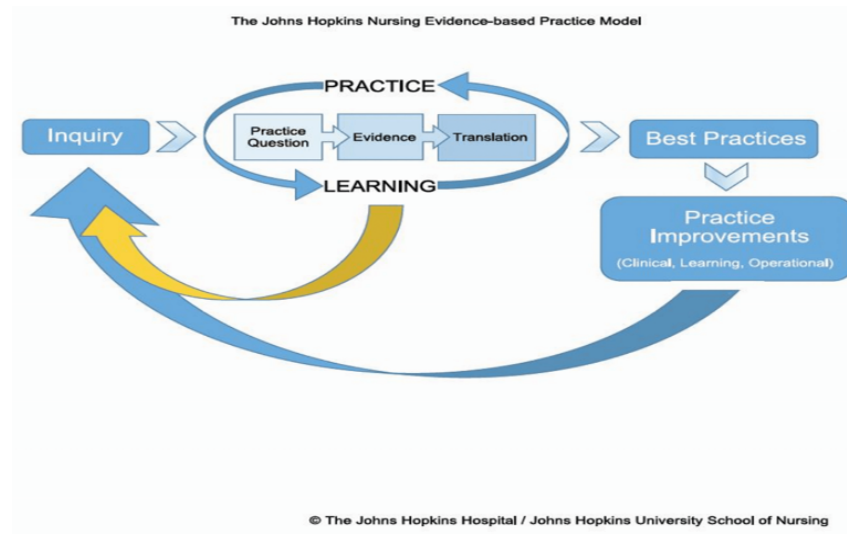
One skill listed throughout all three military providers' ICTLs is the inclusion of the E-FAST. Despite this inclusion, those that receive training on the E-FAST are significantly limited in the clinic or hospital setting due to the demands placed upon military providers to see active duty personnel and their dependents. These providers are not afforded much time away from their clinical duties to participate in training, resulting in many not meeting this critical annual task. In a 2019 unpublished survey on military nurse practitioners, only 8.33% (n=7) of the 93 NPs that responded conducted an E-FAST within the past year (L. Magyar, personal communication, November 5, 2019). By expanding the primary care provider role through

higher education and skills training, patients experience greater access to health care with better outcomes and, consequently, positively influence the readiness of the military force.

Organizing Framework

The 2017 Johns Hopkins Nursing Evidence-Based Practice Model is the foundation for the organizing framework. The authors chose this model due to its ease and simplicity associated with the framework. It starts with a question or a problem a nurse practitioner or clinical provider may have regarding the care of a patient or best practice in the clinic setting. This question leads to an inquiry into evidence-based nursing and medical literature, finding literature that answers the question, analyzing the literature, and developing an application to patients or practice. The Practice Question, Evidence, and Translation (PET) steps set the foundation and basis from which to work. This framework allowed the authors to analyze existing studies on E-FAST scans using this knowledge to develop the overall structure of the ultrasound training program at the clinical site of this project.

Figure 1

The Johns Hopkins Nursing Evidence-based Practice Model

From: “The John Hopkins Nursing Evidence-based Practice Model”, by Johns Hopkins University, 2017 (https://www.hopkinsmedicine.org/evidence-based-practice/ijhn_2017_ebp.html)

After developing the clinical question (PICO), and analyzing the literature, the authors found that the portability of ultrasound has led to increased use within the military, especially in resource-limited environments (Morgan, Vasios, & Hubler, 2010). POCUS skills, including the E-FAST, can be taught to a variety of medical health professionals, including military providers as well as combat medics (Morgan, Vasios, & Hubler, 2010; Hile, Morgan, Laselle, & Bothwell, 2012). Military providers have the unique opportunity to transition from the bedside to the battlefield, and ultrasound is a skill that can easily translate to both settings.

Project Design

General Approach

The structure of the ultrasound course relied heavily on the course guidelines outlined in the 2016 American College of Emergency Physicians Policy (ACEP) on Ultrasound in Medicine. The objectives for teaching the E-FAST scan fulfilled most of the designated ACEP learning objectives and recommendations. See Table 1 for the objectives and recommendations.

Table 1

2016 ACEP Policy on Ultrasound in Medicine

2016 ACEP Policy on Ultrasound in Medicine

1. Utilizing emergency ultrasound fellowship trained providers to teach the course.
2. Instructor to student ratio no larger than 5 to 1 to ensure full participation of all participants.
3. If using live models, having images of abnormal findings to facilitate learning.
4. Providing pre and post course education material or resources.
5. Introduction to basic ultrasound physics and machine operation

From American College of Emergency Physicians Board of Directors Policy Statement on Ultrasound in Medicine (2016) ([https://www.annemergmed.com/article/S0196-0644\(08\)02087-8/abstract](https://www.annemergmed.com/article/S0196-0644(08)02087-8/abstract))

While the ACEP guidelines recommend a half-day for the training of the E-FAST, although it does not explicitly state the number of hours. Some authors postulate that competency cannot be established with a single course alone, but with repeated exposure (Arnold, McCommonmy & Rappaport, 2019). However, confidence can be quickly established

in ultrasound-novice learners after a two-hour course (Crouch et al., 2010). With the consideration of time constraints and provider availability, the authors determined that the goal of this course would not be competency, but instead establishing a level of confidence.

Setting

The project took place at a military medical facility in Washington states. The participants of this project were all Army providers within that practice in the military healthcare system and included Nurse Practitioners (NPs), Physicians, and Physician Assistants (PAs). See Table below for a list of the jobs of the participants. The participants were a mix of Active Duty and National Guard providers. With this inclusion of both Active Duty and National Guard, the authors feel it is best to use the terminology "military providers" to ensure full inclusion of all services and branches.

The military medical facility is the largest military treatment facility on the west coast and houses several different types of residency programs for PAs, physicians, and NP students. This large medical facility houses the Emergency Department ultrasound fellowship program, a two-year program that allows PAs and physicians a more in-depth experience with point of care ultrasound skills (POCUS). These fellows assisted with this project.

In addition to highly trained subject matter experts in ultrasound, the local medical institution houses a world-class medical simulation center, one of only fifty simulation centers across the United States recognized by the American College of Surgeons. This simulation center contains multiple examination rooms, capability for audiovisual presentations, and much of the equipment or supplies necessary for medical training. The resources and support available at this simulation center provided the incentive and the tools necessary to complete this project, including multiple ultrasound machines.

Figure 2

Participants by Military Specialty

Military Operating Specialty (MOS)	Percentage (n)
65D (PA)	60% (6)
66P (NP)	10% (1)
62B (MD)	20% (2)
68W (medic)	10% (1)

Procedural Steps

The design and intent of this ultrasound course minimized the amount of time away from patient care. Before the course, the providers received a five-minute ultrasound video to familiarize themselves with basic ultrasound concepts and understanding of the various knobs, otherwise known as knobology. This step ensured everyone had baseline knowledge of ultrasound before the block of instruction so they could get the most out of the course.

Before the two-hour block of instruction, participants received a Likert based survey evaluating their confidence from one (not confident at all) to five (extremely confident) in using ultrasound and identifying essential parts of the E-FAST exam. This 13-question survey was a conglomeration of a survey developed by the International Journal of Emergency Medicine (Crouch, Dawson, Long, Allerd, & Madsen, 2010) in addition to a survey from Dr. James Palma's, Uniformed Services University, Integrated Ultrasound Curriculum of 2017.

With the desired intent of evaluating the participant's level of confidence, the authors of this project adapted the survey by adding four additional questions to fully ascertain the participants' confidence in ultrasound knowledge and skill. See Figure 3 for these questions. The

authors chose a Likert scale because it allows self-reported evaluation and best captures self-perception of confidence. See Appendix E & F for a copy of the pre and post-survey questions.

After the pre-survey, an emergency department ultrasound fellow led the 30-minute didactic class. The remaining hour and a half included hands-on training, with specific emphasis on the E-FAST. Upon completion of the two hours, participants received another Likert survey to assess their overall confidence in ultrasound skills.

Figure 3

Example of comments from pre and post confidence survey

1. How confident are you in your knowledge of ultrasound?
2. How beneficial do you believe ultrasound skills will be the health of your patients?
3. How confident do you feel in performing procedures under the guidance of the ultrasound?
4. How often do you currently/intend to incorporate ultrasound into your practice?

The authors consolidated the responses from the participants onto an Excel spreadsheet for organization purposes. A statistician at a local military treatment facility assisted in analyzing the raw data, and the findings will be discussed in the analysis of the results. The intent for the dissemination of these results includes sharing the results with the local hospital leadership. Since the E-FAST is already an ICTL for military medical providers, leadership buy-in is already established. The authors intend to share the results as well with the ultrasound fellows. Ideally, the ultrasound fellows could continue to hold annual, if not biannual, ultrasound classes to military providers. The fellows can use the resource-heavy local simulation center to maintain

the integrity of this project. Furthermore, the results of this project can be generalized and applied to other military medical facilities throughout the DHA and military healthcare system.

HIPAA Concerns

The military treatment facility's senior clinical nurse scientist reviewed the intended project plan in depth before execution. They classified this project as “not research”. (See Appendix B). No actual patients were involved with this project. In eliminating PII, the only personal information requested by the participants included their experience level of ultrasound and their job specialty (See Figure 2). These surveys were secure when not in use behind a locked door.

For the hands-on portion of the class, the authors had E-FAST scan mannikins on hand but offered the opportunity for participants to be live volunteers. Before participating, the authors counseled the participants on the risks and instructed that ultrasound scans were not a substitute for medically diagnostic advice. After counseling and discussion, all participants desired to be live volunteers.

Literature Review Methods

The initial gathering of evidence began with a generalized literature search on internet search engines and multiple databases to gauge the scope of evidence and information on the topic. This search yielded high numbers of articles, research, and training programs, but with unreliable evidence and low-quality research. The authors then focused their search in the medical databases CINAHL, EMBASE, and PubMed to narrow the search criteria, using the terms "'Nurse Practitioner' OR 'FNP' OR 'Physician' "combined with "ultrasound." This search yielded 265 studies. After compiling the articles in Endnote, all of the duplicate articles were eliminated, and 95 articles remained.

Regarding the inclusion and exclusion criteria, the articles had to be in English, peer-reviewed, and published less than ten years ago. Other inclusion criteria included ultrasound training programs, knowledge retention after training, and competencies among various levels of providers. As of January 31, 2018, 35 studies fulfilled the initial search criteria. An additional 18 articles were removed after further review due to the overall topic pertinency with a total result of 17 total articles. See Appendix D for a copy of the PRISMA.

To evaluate the 17 articles level of evidence, the authors utilized the John Hopkins Modified Evidence appraisal tool. Of the 17 articles deemed pertinent to the PICOT question, the evidence was evaluated with a series of questions: study question, design type, sample/size, outcome and variables, measures used, analytical approach, findings, and limitations. The hierarchy of evidence was rated from I to VII, and the level of quality was measured A, B, or C. The lower the number, the higher the hierarchy of evidence. The level of quality was categorized as "high" with the letter A, "good" as the letter B, and "low/major flaw" as the letter C (see Figure 4).

Evaluating the Evidence: Quality, Quantity, and Consistency of Results

The overall scope of the studies within the range of the search did not illustrate top quality studies. After imposing the limitations as mentioned above, 17 is the number of studies included in the qualitative synthesis. The search yielded only one systematic review with a "Good" rating on a level of quality. The second highest evaluated study was classified as a "Good" rating and was a well-designed randomized control trial. The remainder of the articles were Level III or lower, with good to "low/major flaw" in quality assessment.

Figure 4

Evidence Appraisal Synthesis Table

	A	B	C
I	0	1	0
II	0	0	0
III	0	4	1
IV	0	0	0
V	1	1	0
VI	0	3	1
VII	0	0	5

While the consistency in quality varied, several underlying themes emerged from the literature review. One emerging idea was that any ultrasound training was better than no ultrasound training. With as little as 16 training hours, ultrasound trainees showed improvement in diagnostic capabilities (Henderson, Ahern, Williams, Mailhot, & Mandavia, 2009). All students that attended ultrasound training demonstrated an increase in their sensitivity and specificity as a clinician and their ability to establish accurate diagnoses (Herbst et al., 2014). Even though introductory courses will not make any student an expert, it sets a solid foundation for further training to occur.

Another trend and an underlying theme were that over 25% of the studies reviewed had military authors. This trend may reflect the increased use of ultrasound within the military compared to the civilian sector. While a theory, it may indicate that military providers may operate beyond the scope of their civilian counterparts.

The authors modified this project due to a lack of buy-in and support from the initial clinic. As a result, a second lit search was needed to adjust the PICO. Aligned with the two-hours guidance provided by clinic leadership, the authors did a second literature search within that specific timeframe. Search key terms for this second search included "ultrasound," "sonography," "training," "education," "confidence," "point of care," "FAST" and "2 hours or less". This search yielded 11 articles, with seven of those articles were relevant to the intended topic.

Limitations

Initially, the scope of this project involved only military FNPs. However, there was a limited number of military FNP providers at the predetermined clinical sites. The total number of military FNPs equaled four, two in non-clinical roles, making the total population size small and statistically insignificant for the project. The authors felt that the need for training in ultrasound transcends military specialties requiring an expansion of the participants to capture all military primary care providers. After careful consideration, the population within the PICO question included all military providers.

Two separate military clinics received this block on instruction. The first clinic had a lack of buy-in and an inconsistent number of providers willing to participate. The participants included a mix of physicians, nurse practitioners, physician assistants, nurses, and medics (both

civilian and military), skewing the population of the original intent for the project. Before the instruction, the participants were asked to watch a 5-minute video on ultrasound basics and knobology. None of the participants watched the video, and most did not know the instruction was even taking place until the scheduled morning. The authors attribute this mishap to a lack of communication between the leadership of the clinic with the providers projected to participate. The class had been set for two hours, only for didactic and hands-on ultrasound using the E-FAST, but the participants voiced little buy-in for the E-FAST since it would not apply to primary care. Therefore, musculoskeletal exams with joint injections were introduced along with the E-FAST. With these limitations regarding the first clinic, this population of participants were not included in the project. Therefore, the final results only included military primary care providers from the second clinic.

Project Results

Each provider shared their experience with ultrasound before the start of the ultrasound course. Some of the responses from the providers included that they only had "five hours of [ultrasound] instruction in school," "a little [ultrasound experience] while deployed," and "a few hours during school," and "trained in school, no practical experience." Collectively the providers stated they did not use ultrasound regularly and cited lack of available ultrasounds and training as a reason for limited use.

Each of the ten providers in this project correctly demonstrated the E-FAST exam on live volunteers and verbally identified a positive versus a negative E-FAST exam after the block of instruction. Each provider had an increase in confidence in their personal ability to use ultrasound and conduct the E-FAST exam, as reported on the surveys. On the questions "How confident are you in your knowledge of ultrasound?" and "How confident would you feel doing

the FAST exam on a trauma patient?" all participants had an increase of at least one confidence level. Refer to Appendix G for a copy of all of the results.

Analysis of the Results

The authors used related-Samples Wilcoxon Signed Rank test to analyze the results. A local military treatment facility statistician assisted with this process. In fully answering the PICO question, the authors examined the responses from question #1: "How confident are you in your knowledge of ultrasound?". The results indicated that a short, two-hour ultrasound course increased providers' confidence ($p\text{-value} = 0.006$) with a significance of 0.05. See Appendix H for the computation of the results.

The subsequent questions on the survey provided additional context to the project but the authors felt it did not fully capture the full intent of the PICO question. On questions #2-13, the participants rated an increase in self-perceived levels of confidence while conducting an E-FAST in a trauma situation. These results align with the literature that E-FAST and ultrasound courses in less than two hours can still increase confidence, the ability to analyze and conduct an E-FAST exam (Krause et al., 2017; Kwon, Lahham, & Fox, 2019; Gracias et al., 2002). On question 13, two participants did not have an increase in perceived confidence levels making a clinical decision after personally conducting an E-FAST exam. See Appendix G for a copy of the responses. The authors acknowledge that more training would be desirable to establish competency.

The ER ultrasound fellows offered participants the opportunity to shadow in the Emergency Department upon completion of this study. To the authors' knowledge, no providers have taken advantage of this opportunity, but it opens the door for future participants to continue

to hone their ultrasound skills in the future. With the ER ultrasound fellows leading the course, there is a bridge established between military providers and ER providers that use POCUS daily.

Organizational Impact/ Implications for Practice

By allowing military providers to practice to the full extent of their education and training, they can contribute more effectively to wartime missions and deployments (Lewis et al., 2012). The potential benefits of military providers being proficient in ultrasound include improved service member safety, diagnostic precision, time effectiveness, and cost savings. With such high accuracy, military providers must become proficient with ultrasound to care for patients in the deployed environment. Early detection and identification of intra-abdominal injuries and internal hemorrhage in trauma patients can aid in the triage of deteriorating critical health conditions and improve the subsequent high costs of medical care. Further cost implications include eliminating unnecessary and high-risk evacuations from austere or combat environments for patients with non-life-threatening injuries.

The authors recommend annual ultrasound training on the E-FAST exam for all military primary care providers, aligning with the annual requirement of the E-FAST ICTLs. The importance of repeated exposure to ultrasound for proper and repeated image acquisition degrades as quickly as eight weeks post-training for ultrasound novice learners according to a small study conducted by Arnold, McComnomy, & Rappaport (2019). A skill can only improve with repeated and early exposure post the initial training (Arnold et al., 2019). Complete degradation of the ultrasound skill can occur, without any use of the skill, as early as one-year post skill acquisition (Kimura, Sliman, Waalen, Amundson, & Shaw, 2016). Extrapolating between Arnold et al. (2019) and Kimura et al. (2016), an annual ultrasound course seems to be a reasonable recommendation for minimal skill retention.

Future Directions for Research and Practice

For future practice, it would be beneficial for primary care providers to incorporate ultrasound into their everyday practice to exercise newly found skills, ultrasound physics, and knobology to decrease the degradation of skills and knowledge. The ability to operate the machine effectively seems to be a perishable skill voiced by participants of this project. The E-FAST is a worthwhile skill for military providers to recognize internal bleeding from trauma, and for learning abdominal anatomy, but rarely used in the primary care setting. Adding new exam techniques beyond the E-FAST could increase provider utilization of ultrasound and assist in maintaining learned skills. For future courses, musculoskeletal (MSK) scans seemed to be a requested course, specifically ultrasound-guided joint injections. Although MSK scans are not an essential task required by the Army, this skill would allow providers in the primary care setting to utilize basic ultrasound techniques on a more frequent basis, increasing ultrasound utilization.

Despite the effectiveness of the E-FAST as a life-saving skill, ultrasound training is lacking. None of the military providers that participated in this course used ultrasound daily. If the providers reported any training in ultrasound, before the block of instruction, it was while they were in school but reported little exposure after their initial education. The majority of the participants desired even more training after this project block of instruction. Training opportunities in ultrasound must increase to increase military provider readiness and meet their required skills acquisition outlined in the Army ICTLs.

Conclusion

Military primary care providers are required to determine the best delivery of care for injured soldiers in resource-limited environments, such as those experienced while deployed in

armed conflict (Lewis, Stewart, & Brown, 2012). Due to its durability, affordability, and portability, ultrasound machines are part of a standard set for combat support hospitals (otherwise known as field hospitals) and forward resuscitative surgical teams (Russell & Crawford, 2013). Military primary care providers must have the skills required to perform basic ultrasound exams such as the E-FAST for increased survivability and health outcomes of soldiers in trauma situations.

The E-FAST scan can be taught quickly to participants of various education and experience levels with high retention and identification of negative and positive E-FAST scans (Krause et al., 2017; Kwon, Lahham, & Fox, 2019; Gracias et al., 2002). As demonstrated in this evidence-based project, a short five-minute video and a two-hour block of instruction can increase primary care providers' confidence in performing a simple E-FAST exam to identify internal bleeding quickly.

The overarching result of this project is showing the ease at which primary care providers can increase confidence in ultrasound using the E-FAST exam with minimal training and minimal previous experience in ultrasound skills. Such as in this project, five minutes of basic ultrasound familiarization and knobology, plus two-hours of mixed didactic/hands-on instruction, primary care providers increased their confidence in executing a valuable life-saving skill through the E-FAST exam.

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Appendix A: CITI Certificates

 	Completion Date 24-Aug-2017 Expiration Date 23-Aug-2020 Record ID [REDACTED]
This is to certify that:	
Regina Thorp	
Has completed the following CITI Program course:	
OU5D P&R Human Research Biomedical Investigators and Research Study Team 1 - Basic Course	(Curriculum Group) (Course Learner Group) (Stage)
Under requirements set by:	
Office of the Under Secretary of Defense (Personnel and Readiness)	
	
Verify at www.citiprogram.org/verify/7w72810dcf-e533-4fb5-aa9a-d56ef09f0f31-24295345	

 	Completion Date 31-Aug-2017 Expiration Date 30-Aug-2020 Record ID [REDACTED]
This is to certify that:	
Matthew Watson	
Has completed the following CITI Program course:	
OU5D P&R Human Research Biomedical Investigators and Research Study Team 1 - Biomedical Investigators	(Curriculum Group) (Course Learner Group) (Stage)
Under requirements set by:	
Office of the Under Secretary of Defense (Personnel and Readiness)	
	
Verify at www.citiprogram.org/verify/7wb9521022-dfa3-4dd4-8ff3-66910a0ed3ca-24390081	

Appendix B: USU Notice of Project Approval



OFFICE OF RESEARCH
4301 JONES BRIDGE ROAD
BETHESDA, MARYLAND 20814
PHONE: (301) 295-3303; FAX: (301) 295-6771

NOTICE OF PROJECT APPROVAL

Change Number: Original

VPR Site Number: GSN-61-10896
Principal Investigator: Watson, Matthew
Department: Graduate School of Nursing
Project Type: Student
Project Title: Standardized Ultrasound Training for Family Nurse Practitioners
Project Period: 10/8/2019 to 2/15/2020

Assurance and Progress Report Information:

<u>Name</u>	<u>Sup</u>	<u>Approval Type</u>	<u>Status</u>	<u>Approved On</u>	<u>Forms Received</u>
Progress Report	0			To be Submitted	N/A

Remarks:

This Notice of Project Approval has been reviewed and approved. Please remember that you must submit a final Progress Report (Form 3210) upon completion of this project.

Questions regarding this approval should be directed to the following person in the Office of Research:
Sharon McIver, (301) 295-9814.



Tyronne L. Maddox, Ph.D.

Vice President for Research

Uniformed Services University of the Health Sciences

8 Oct 2019
Date**cc:**

File
CDR Kenneth Radford, PhD, CRNA
Taylor, Laura
CAPT Angelyn Brown
MAJ Regina Thorp

Appendix C: MTF IRB



MCHJ-ISN

DEPARTMENT OF THE ARMY
MADIGAN ARMY MEDICAL CENTER
JACKSON AVENUE
TACOMA, WASHINGTON 98431-1100

DATE: 1 JAN 20

TO: MAJ Regina Thorp & CPT(P) Matthew Watson
FROM: Exempt Determination Official

SUBJECT: Not Research Determination
STUDY TITLE: Implementing a standardized ultrasound training program for military providers

REFERENCE #: 019A
ACTION: Determination Letter
REVIEW TYPE: Not Research

1. This project has been reviewed and determined to be exempt from the regulatory requirements of 32 CFR 219.
2. This opinion is based on federal regulation 32 CFR 219 and associated OHRP (Office of Human Research Protection) guidance. The following is the basis for this opinion.

Federal regulation at 32 CFR 219.102(d) defines research as a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy, whether or not they are conducted or supported under a program which is considered research for other purposes. For example, some demonstration and service programs may include research activities.

3. **This determination should not be construed as approval to conduct this project.** It is your responsibility to identify and obtain any necessary permissions or approvals to conduct the project prior to initiation, including academic or department level approvals. This activity may proceed with no further requirement for review by the Madigan Army Medical Center Human Research Protections Office.
4. This project does not constitute research because the activity is a systematic investigation but is not designed to develop or contribute to generalizable knowledge (draw inferences or a general conclusion from). This project aims to develop a basic evidence-based ultrasound course for Family Nurse Practitioners (FNP) using the American College of Emergency Physicians curriculum for introductory training in ultrasound skills. This project implementation will satisfy one of the tasks on the Army FNP critical task list standard of "familiarization with the FAST exam." You have described a plan that includes a block of

instruction regarding basic anatomy, ultrasound device operation, and FAST exam demonstration followed by a block of hands-on training with blue phantom simulation models. Participants will be FNPs and other interested providers from the Family Medicine (FM) service and instructors will be FM Fellows with ultrasound expertise. To evaluate the success of the training, participants will undergo instructor evaluation of skills and will complete a survey related to confidence in performing an ultrasound exam before and after the training.

You have requested consideration of an

MCHJ-ISN

SUBJECT: Not Research Determination

additional survey to evaluate confidence in performing the FAST exam by participants. The survey has been used in another military forum and has been published for use by others. The survey appears valid and useful for this project and may be incorporated into data collection activities. There is no change to the prior determination; this project is determined to be Not Research, and no further action regarding regulatory guidance is necessary.

5. You are not authorized to take project data away from the institution.
6. Please note that any future changes to the project, such as extension of data collection activities to include the use of additional surveys, or acquiring PHI, may affect its exempt status. In the event that the project undergoes any change, you are required to resubmit the project to the undersigned for another review in order to determine its exempt status.
7. The Department of Clinical Investigation (DCI) reminds you that a publication clearance is required for all written materials (i.e. manuscript or abstract) being submitted for publication and /or presentation.
8. If you have any questions, or need further assistance, the point of contact for this review is Dr. Mary McCarthy, Center for Nursing Science and Clinical Inquiry at 253-968-3695, or e-mail at mary.s.mccarthy1.civ@mail.mil.



Mary S. McCarthy, PhD, RN, FAAN

Exempt Determination Official

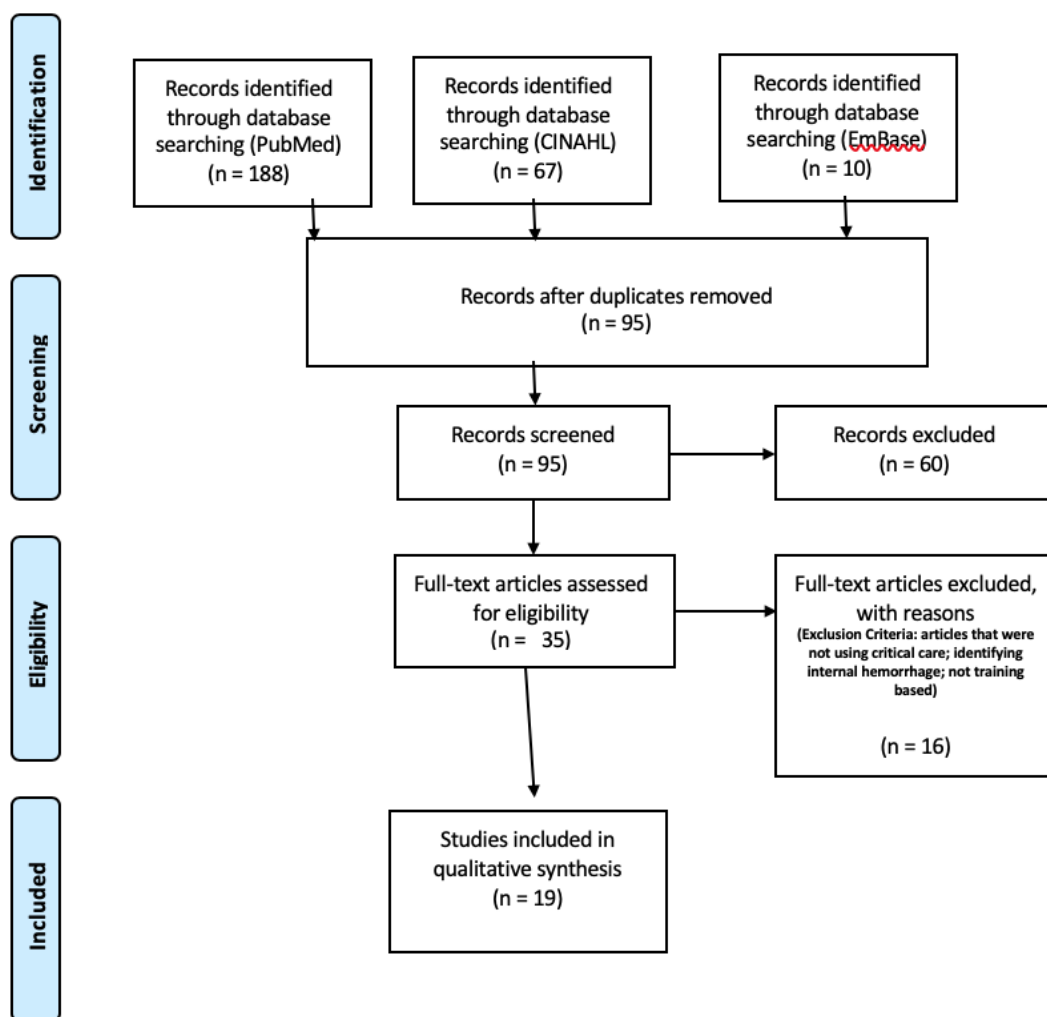
Madigan Army Medical Center

Center for Nursing Science & Clinical Inquiry

Appendix D: PRISMA



PRISMA 2009 Flow Diagram



Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. doi:10.1371/journal.pmed.1000097

For more information, visit www.prisma-statement.org.

Appendix E: Pre-Survey Questions

Ultrasound Training Survey Pre-Test

Please complete the following survey on a scale of 1-5. 1 being “not at all confident” and 5 being “extremely confident”.

1. How confident are you in your knowledge of ultrasound?

1 2 3 4 5

2. How beneficial do you believe ultrasound skills will be for the health of your patients?

1 2 3 4 5

3. How confident do you feel performing procedures under the guidance of ultrasound?

1 2 3 4 5

4. How often do you currently/intend to incorporate the use of ultrasound into your practice?

1 2 3 4 5

5. Do you feel comfortable choosing the correct probe for the FAST exam?

1 2 3 4 5

6. Do you feel you can choose the correct orientation of the probe?

1 2 3 4 5

7. Do you feel comfortable adjusting the gain and depth to maximize picture quality?

1 2 3 4 5

8. How do you feel visualizing the subcostal view?

1 2 3 4 5

9. How do you feel visualizing the right upper quadrant view?

1 2 3 4 5

10. How do you feel visualizing the left upper quadrant view?

1 2 3 4 5

11. How do you feel visualizing the pelvic view?

1 2 3 4 5

12. How confident would you feel doing a FAST exam on a trauma patient?

1 2 3 4 5

13. How comfortable would feel making clinical decisions based on the results of your FAST exam?

1 2 3 4 5

Note. Adapted from *International Journal of Emergency Medicine*. Source: (Crouch, Dawson, Long, Allred, & Madsen, 2010) and Mellor, et al. (2019) “Implementation of a point of care ultrasound curriculum for internal medicine trainees at a large residency program.”

Appendix F: Post-Survey Questions

Ultrasound Training Survey Post-Test

Please complete the following survey on a scale of 1-5. 1 being “not at all confident” and 5 being “extremely confident”.

1. How confident are you in your knowledge of ultrasound?

1 2 3 4 5

2. How beneficial do you believe ultrasound skills will be for the health of your patients?

1 2 3 4 5

3. How confident do you feel performing procedures under the guidance of ultrasound?

1 2 3 4 5

4. How often do you currently/intend to incorporate the use of ultrasound into your practice?

1 2 3 4 5

5. Do you feel comfortable choosing the correct probe for the FAST exam?

1 2 3 4 5

6. Do you feel you can choose the correct orientation of the probe?

1 2 3 4 5

7. Do you feel comfortable adjusting the gain and depth to maximize picture quality?

1 2 3 4 5

8. How do you feel visualizing the subcostal view?

1 2 3 4 5

9. How do you feel visualizing the right upper quadrant view?

1 2 3 4 5

10. How do you feel visualizing the left upper quadrant view?

1 2 3 4 5

11. How do you feel visualizing the pelvic view?

1 2 3 4 5

12. How confident would you feel doing a FAST exam on a trauma patient?

1 2 3 4 5

13. How comfortable would feel making clinical decisions based on the results of your FAST exam?

1 2 3 4 5

Note. Adapted from *International Journal of Emergency Medicine*. Source: (Crouch, Dawson, Long, Allred, & Madsen, 2010) and Mellor, et al. (2019) "Implementation of a point of care ultrasound curriculum for internal medicine trainees at a large residency program."

Appendix G: Survey Results

	Pre													Post												
Person ID	Pre													Post												
	1. How confident are you in your knowledge of US?													1. How confident are you in your knowledge of US?												
1	2. How beneficial do you believe US skill will be for the health of your patients?													2. How beneficial do you believe US skill will be for the health of your patients?												
2	3. How confident do you feel performing procedures under the guidance of US?													3. How confident do you feel performing procedures under the guidance of US?												
3	4. How often do you currently/intend to incorporate US into your practice?													4. How often do you currently/intend to incorporate US into your practice?												
4	5. Do you feel comfortable choosing the correct probe for the FAST exam?													5. Do you feel comfortable choosing the correct probe for the FAST exam?												
5	6. Do you feel you can choose the correct orientation of the probe?													6. Do you feel you can choose the correct orientation of the probe?												
6	7. Do you feel comfortable adjusting the gain and depth to maximize picture quality?													7. Do you feel comfortable adjusting the gain and depth to maximize picture quality?												
7	8. How do you feel visualizing the subcostal view?													8. How do you feel visualizing the subcostal view?												
8	9. How do you feel visualizing the right upper quadrant view?													9. How do you feel visualizing the right upper quadrant view?												
9	10. How do you feel visualizing the left upper quadrant view?													10. How do you feel visualizing the left upper quadrant view?												
10	11. How do you feel visualizing the pelvic view?													11. How do you feel visualizing the pelvic view?												
11	12. How confident would you feel doing the FAST exam on a trauma patient?													12. How confident would you feel doing the FAST exam on a trauma patient?												
12	13. How comfortable would you feel making clinical decisions based on the results of your FAST exam?													13. How comfortable would you feel making clinical decisions based on the results of your FAST exam?												

Appendix H: Statistical Analysis of Results

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The median of differences between 1. How confident are you in your knowledge of US? and 1. How confident are you in your knowledge of US? equals 0.	Related-Samples Sign Test	.004 ¹	Reject the null hypothesis.
2	The median of differences between 1. How confident are you in your knowledge of US? and 1. How confident are you in your knowledge of US? equals 0.	Related-Samples Wilcoxon Signed Rank Test	.006	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

¹ Exact significance is displayed for this test.

Appendix I: DNP Project Completion Verification Form



Appendix G: Daniel K. Inouye Graduate School of Nursing
DNP Project Completion Verification Form

**DOCTOR OF NURSING PRACTICE PROJECT
Completion Verification Form**

The DNP Project titled: Improving Military Provider Confidence in Basic Ultrasound Skills was completed at Joint Base Lewis-McChord by the following student(s):

<i>(type student name)</i>	<i>(signature)</i>	<i>(date)</i>
MAJ Regina Thorp		28MAR2020
CPT Matthew Watson		28MAR2020
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

The DNP Practice Project Team verifies that the following components of the DNP project, accomplished by the above students, is of sufficient rigor and demonstrates doctoral level scholarship to meet the requirements for USUHS GSN graduation:

- Presentation of DNP project to the leadership/stakeholders at the Phase II Site,
- Abstract/Impact Statement (*Appendix F*), and
- DNP Project written report.

Verified by:

<i>(type name)</i>	<i>(signature)</i>	<i>(date)</i>
Dr. Jill Schramm, DNP		
_____	_____	Senior Mentor
_____	_____	Team Mentor
_____		Team Mentor
Tommy Thompson, LTC		Team Mentor & Phase II Site Director

For RNA Students only - add the following additional signature for final verification of project completion:

<i>(type name)</i>	<i>(Signature)</i>	<i>(Date)</i>
RNA Project Director	_____	_____