

UC San Diego

Independent Study Projects

Title

Implementation and analysis of an ultrasound training program into the third year Medicine Clerkship curriculum

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Table of Contents:

Title, Abstract, Background Page 1

Methods Page 4

Learning Objectives Page 5

Key Contacts Page 7

References Page 8

Title:

Implementation and analysis of an ultrasound training program into the third year Medicine Clerkship curriculum

Abstract:

Although the use of ultrasound in medical education has risen in recent years, there are still many barriers to developing a cohesive curriculum spanning all four years. At UCSD, there has been a concerted effort to incorporate ultrasound into the first and second year, but there is little opportunity to practice these skills in the clinical context of third year. Through coordination with both the internal medicine faculty and the emergency medicine faculty at UCSD, our aim was to create a curriculum consisting of ultrasound didactic sessions. By doing so, we hope to bridge the gap between the ultrasound skills learned during MS1/2 and the third year of medical school, providing a more cohesive curriculum that better equips students to utilize this widely accessible imaging modality clinically.

Background:

Focused Point-of-Care Ultrasound (POCUS) has numerous clinical applications across many specialties in medicine and has been demonstrated to improve rapid diagnosis, clinical management, and procedural performance. However, despite significant advances in the technology, it remains highly user-dependent and many clinicians lack the training to effectively utilize ultrasound in their practice¹. Recently, however, many medical schools across the United States have begun implementing an ultrasound curriculum for medical students. In a study published in 2014, 62.2% of deans for education and curriculum design or equivalent faculty members reported having some form of ultrasound training in their curriculum, with a slight majority (46.3%) reporting the third year of medical school being the most common level when this teaching was done². However, given the infancy of incorporating ultrasound training into the medical curriculum, the ideal timing for this training remains to be determined³. Some institutions, such as the University of South Carolina School of Medicine, have demonstrated that it is feasible to instate a 'vertical-curriculum' that spans all four years of medical school⁴. At the UCSD School of Medicine, an ultrasound curriculum has been successfully implemented as an adjunct to the traditional anatomy curriculum into the first and second year medical education, but there is a distinct diminution of ultrasound training through the third and fourth years. The objective of this project is to expand the current curriculum to include a more clinically-focused ultrasound training and exposure for third year medical students.

Definition:

What are the goals of the project?

1. To develop four one-hour ultrasound training sessions to be incorporated into the third year Medicine Clerkship.

In order to best accommodate faculty and clerkship time constraints, we have decided to consolidate the didactic sessions into a single 2-hour session that covers 4 modules. The modules will be modeled after the RUSH exam covering the heart, IVC, and pleura exams⁵.

2. To act as a liaison and coordinator between emergency medicine ultrasound-trained faculty and internal medicine faculty in order to effectively implement this curriculum into the Medicine

Clerkship.

I was able to identify several key faculty within the Medicine department to assist with the curriculum. Dr. Timothy Dresselhaus (Timothy.Dresselhaus@va.gov) is the medicine clerkship director and has helped present our proposal to the medicine clerkship faculty.

In addition, Dr. Brian Kwan (bkkwan@ucsd.edu) has provided guidance with regards to what tasks need to be completed in order to best accomplish our goal. He is accessible for mentoring purposes, and has expressed enthusiasm in seeing our proposal come to fruition.

Dr. Reid Sasaki (rasasaki@ucsd.edu) is also a member of the medicine faculty who has expressed interest in helping champion the course, and may serve as a resource to recruit further members of the Internal Medicine faculty interested in providing ultrasound training during the clerkship. Dr. Sasaki has already received basic formal training at the Point of Care Ultrasound for Hospital-Based Physicians course (October, 2015).

Other faculty members that I have corresponded with regarding the curriculum:

- *Dr. Meghan Sebasky (mmsebasky@ucsd.edu)*
- *Dr. Ben Hulley (bhulley@ucsd.edu)*
- *Dr. Blaine Lovetro (Blaine.Lovetro@va.gov) - has some ultrasound training and has expressed that he could commit to teaching some sessions*
- *Dr. Perrie Pardee (ppardee@ucsd.edu)*
- *Dr. Kevin Krcmarik (kevin.krcmarik@va.gov)*

3. Qualitatively measure the difference, if any, in level-of-comfort in using POCUS in a clinical context through a survey administered to students before and after the ultrasound course.

I developed two qualitative surveys (attached below)- one to be administered to faculty and the other to students. Both surveys utilize the Likert scale to qualitatively measure the perceived value and efficacy of the course. Because the nature of the course changed from a month-long endeavor to a single session, it is of less utility to administer a pre- and post-survey. However, I hope that the survey will be of utility to the administration in assessing the value of the curriculum (and potential for expansion in the future). In addition, I have completed the paperwork for an IRB exemption so that they results of the survey may be used in a future publication, should the need arise.

What is innovative about this project?

Currently, the UCSD School of Medicine does not have an ultrasound curriculum that includes training during the third year of medical school. This project will not only promote familiarity with this highly user-dependent technology, but will also help to demonstrate the utility of ultrasound in multiple clinical contexts. In addition, it will help identify motivated faculty within Internal Medicine who can further help to promote the curriculum in the future.

How is the project relevant to a career in medicine?

Ultrasonography is increasingly becoming a widely available tool for bedside diagnosis and has been shown to improve clinical management and procedural performance in many areas of medicine, including emergency medicine, internal medicine, pediatrics and surgery². However, bedside diagnosis requires that the clinician performing the study be well versed in the technical aspects required to utilize various modes of ultrasound, the ability to acquire optimal images at the bedside, as well as the ability to properly interpret the imaged results. By extending the current ultrasound curriculum at UCSD to include third year medical students, we hope to see improvements in all of these areas as well as expand upon core clinical concepts within the established third year medical student curriculum.

What is the student's role in and time commitment to the project?

The student will develop learning objectives for four one-hour ultrasound sessions, with the assistance and coordination of both internal medicine and emergency medicine faculty. In addition, the student will develop a survey to be administered to students at both the start and the conclusion of the four weeks in order to assess the utility and efficacy of the course overall. The student will begin working on this project as of June 2016 and will complete the project by May of 2017.

Methods:

In order to develop a curriculum appropriate for third year medical students, we will explore the literature to inventory established ultrasound curricula from other institutions for medical education. In addition, we will consult with faculty from both internal medicine and emergency

medicine in order to determine what topics and learning objectives would be of greatest utility to future clinicians. In order to assess the efficacy of the course, we will develop a questionnaire to be completed by third year medical students before and after the four-week course.

After investigation of current literature on various ultrasound curricula for medical students as well as discussion with both internal medicine faculty and ultrasound trained faculty, it was concluded that a modified RUSH exam would be the best fit and of highest yield for a single 2-hour teaching session. Other topics that were considered include paracentesis, DVT/peripheral line placement, pneumothorax investigation, the FAST exam, and a complete echocardiogram.

I developed a set of learning objectives for the RUSH exam module based on the learning objectives utilized in the MS1 and MS2 ultrasound course as well as investigation of the current ultrasound medical education literature (see Learning Objectives below).

Evaluation:

This project will be completed when each of the aforementioned goals have been met, and the student summarizes the final findings in written form. The student proposes an intervention at the clerkship level, followed by an analysis & evaluation of this implemented change. The emphasis will be placed on the student's development of detailed learning objectives for each separate one-hour session that will be integrated in the Medicine Clerkship, as well as ultimately analyzing the impact of such an intervention through a survey administered to the rotating students.

The ISP Chair and committee members will evaluate every step of this project, and the student will act as a liaison between committee members and Internal Medicine faculty involved in clerkship integration. Final findings will be summarized in a paper with future recommendations, which potentially may be implemented based on student feedback.

The ISP Chair and committee will closely evaluate the student's proposed learning objectives for each session, and the student will present these objectives to clerkship faculty. Learning objectives may be revised by the student, based on feedback from ISP committee members or clerkship faculty. Once the sessions are implemented, student feedback will be assessed using a survey developed by the student with close guidance from the ISP chair and committee (to ensure appropriate questions are generated). The project's success will be determined by the effective integration of an ultrasound training program in the clinical setting for third-year medical students, and survey analysis of this intervention.

Learning Objectives:

PUMP: CARDIAC EVALUATION

1. **Identify** the phased-array probe used for cardiac ultrasound and **demonstrate** how to set the machine to cardiac mode.
2. **Demonstrate** probe orientation and position for the 4 main views: subcostal, parasternal

long axis, parasternal short axis, and apical 4 chamber.

3. **Identify** the left atrium, mitral valve, left ventricle, left ventricular outflow tract, right ventricle and descending aorta in the parasternal long axis.
4. **Identify** the presence of pericardial effusion
 - a. **Differentiate** fat pad from fluid
 - b. **Differentiate** pleural effusion from pericardial effusion based on the position relative to the descending aorta
5. **Identify** the presence of cardiac tamponade
6. **Assess** LV contractility
 - a. **Demonstrate** the technique for determining left ventricular ejection fraction in the parasternal long axis, including: LV septal and inferior wall contractility, myocardial thickening during systole, and movement of the anterior leaflet of the mitral valve during systole.
7. **Assess** RV strain
 - a. **Demonstrate** the technique for determining right ventricular size in the parasternal long axis, the parasternal short axis, and the apical 4 chamber view including determining the RV/LV ratio
 - b. **Identify** the “D sign” and the **discuss** the pathology implicated by this sign
 - c. **Discuss** the clinical significance of an increased RV/LV ratio
8. **Identify** RV enlargement and **discuss** the clinical significance.

TANK: IVC, THORACIC, AND ABDOMINAL EVALUATION

IVC

1. **Identify** the phased-array probe used for cardiac ultrasound and demonstrate how to set the machine to cardiac mode.
2. **Demonstrate** proper probe orientation and position for the subxiphoid view
3. **Demonstrate** the technique for assessing IVC diameter.
4. **Discuss** how the diameter IVC relates to fluid responsiveness and how this correlates to CVP.

FAST exam

1. **Identify** the phased-array probe and set the machine to abdominal mode.
2. **Demonstrate** proper probe orientation and position to **identify** the hepatorenal recess, splenorenal recess, and bladder
3. **Demonstrate** the technique for assessing the presence of fluid in/around the hepatorenal recess, splenorenal recess, and bladder.
4. **Demonstrate** the technique for assessing for pleural effusion

Pneumothorax & Evaluation of the Lungs

1. **Identify** the linear probe.
2. **Demonstrate** how to scan longitudinally in the anterior midclavicular line in the 3rd-5th intercostal space on both thoraces.
3. **Demonstrate** how to use M-mode to determine the presence/absence of pleural sliding.
4. **Identify** the presence of A-lines and **discuss** the clinical significance.
5. **Identify** the presence of B-lines and **discuss** the clinical significance.

PIPES: AORTA EVALUATION

1. **Identify** the phased-array probe used for cardiac ultrasound and **demonstrate** how to set the machine to cardiac mode.
2. **Demonstrate** proper probe orientation and position for the longitudinal and transverse views of the aorta at 4 levels: infracardiac, suprarenal, infrarenal, and iliac bifurcation
3. **Discuss** the measurements for a normal compared to a ruptured AAA.

Contacts:

- *Dr. Timothy Dresselhaus (Timothy.Dresselhaus@va.gov)*
- *Dr. Reid Sasaki*
- *Dr. Brian Kwan (bkkwan@ucsd.edu)*
- *Dr. Meghan Sebasky (mmsebasky@ucsd.edu)*
- *Dr. Ben Hulley (bhulley@ucsd.edu)*
- *Dr. Blaine Lovetro (Blaine.Lovetro@va.gov) - has some ultrasound training and has expressed that he could commit to teaching some sessions*
- *Dr. Perrie Pardee (ppardee@ucsd.edu)*
- *Dr. Kevin Krmarik (kevin.krmarik@va.gov)*

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