The Impact of a Novel Ultrasound Curriculum on Pre-Clinical Medical Students at University of California San Diego, School of Medicine

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ABSTRACT

While a formal ultrasound education has proven beneficial, its integration into undergraduate medical school curricula is still in its infancy. Many medical schools are still modifying their ultrasound curricula based on student feedback and their own assessment of the effectiveness of the course.[16] At University of California San Diego (UCSD), School of Medicine, the ultrasound curriculum has been in existence since 2014, with the first class set to graduate this summer in 2017. As such, this is a pivotal time to assess its strengths and weaknesses and make adjustments to the ultrasound curriculum for medical students in the years to come.

This project sought to investigate the impact of the ultrasound curriculum on pre-clinical medical students at UCSD SOM. An anonymous survey was administered to medical students in their third and fourth years of medical school. These were the first two classes who had participated in the ultrasound course during their pre-clinical years. The goal was to assess the students' overall experience with the ultrasound curriculum. Based on the responses obtained, the course met its stated objective of introducing students to the principles of ultrasound. Respondents were enthusiastically positive about the ultrasound course and many intended to use ultrasound in their future clinical practice. Overall, participants felt that ultrasound enhanced understanding of anatomy, increased clinical correlation with basic science, and improved understanding and skills of the physical exam. An overwhelming majority of students thought that ultrasound enhanced their medical education, that ultrasound should be incorporated throughout all four years, and that all medical schools should provide students with an ultrasound education.

BACKGROUND

Ultrasound has become an important diagnostic tool that is rapidly being adopted by physicians in nearly every clinical specialty.[1,2] There is an increasing role for point-of-care ultrasound to help guide clinical decision making—making it an invaluable tool with proven benefit to patient safety and quality of care.[1,3] With the widespread awareness of its clinical utility, ultrasound has increasingly become a focus of medical education with the goal of adequately training users. Historically, medical students have had little to no ultrasound training in their medical school education. However, with advancements in technology, ultrasound devices have become more portable, easy-to-use, and cost-effective. Over the past several years, an increased proportion of medical schools have begun introducing ultrasound into their curricula.[4-9] Subsequently, medical educators have identified benefits associated with ultrasound training in undergraduate medical education, including

improvements in knowledge of anatomy,[4-9,11] physiology,[4,10] physical exam skills,[4,11,13] and course satisfaction.[4,5,11]

METHODS

At the UCSD SOM, ultrasound education was first introduced in 2014-2015 to the second year medical students, expected to graduate as the class of 2017. The goal of the ultrasound sessions was to introduce the principles of ultrasound, especially with regard to the understanding of anatomy, physiology, and pathology during pre-clinical years. In addition, the course directors sought to prepare students for their clinical clerkships and future practice.

Basic ultrasound techniques were taught to second year medical students in six mandatory, two-hour sessions with modules specific to: ultrasound physics and basic operation, the gastrointestinal system (liver, gallbladder, spleen), echocardiography, neck vasculature, aorta and IVC, and the renal system. Groups of five to six students worked with a single faculty member (from various medical specialties) skilled in the use of ultrasound. Each group was provided their own ultrasound system such that every student had adequate opportunity to practice hands-on scanning techniques. Prior to each small group session, students reviewed an online learning module with a narrated lecture that delivered the key concepts and relevant anatomy for each ultrasound session. During the hands-on session, approximately 10-20 minutes of lecture started each meeting before breaking up into practicing bedside ultrasound on one another.

Participants

This evaluation was a survey of medical students in their third (class of 2016) and fourth year (class of 2017) of medical school at University of California, San Diego, School of Medicine. These represent the first two classes of students who took part in the pre-clinical ultrasound curriculum. The study was reviewed and approved by the UCSD Human Research Protections Program and was certified as exempt from IRB review under 45 CFR 46.101(b), categories 2 and 4. Students were contacted via email through the UCSD SOM listserv for the classes of 2017 and 2016. Students were also encouraged to participate through word-of-mouth on campus and through the use of social media.

Questionnaire Design and Implementation

A 74-item electronic questionnaire was designed using Google Forms to assess the pre-clinical ultrasound curriculum experience (Appendix I). Survey development involved question generation and expert panel review by the directors of the ultrasound curriculum. The survey was piloted to a small group of fourth year medical students (n = 3). The pilot group yielded minor modifications to the questionnaire. Survey questions were designed to assess students' impressions of their own ultrasound knowledge and skill, overall confidence in using ultrasound in a clinical setting, and perception of the efficacy of the course in enhancing their understanding of anatomy, physiology, and pathology.

To assess the efficacy of the curriculum, students were asked about their overall experience and satisfaction with the ultrasound curriculum. This was assessed via a Likert-type response set. The scale ranged from 1 – 5, where 1 indicated strongly disagree; 2 disagree; 3 neither agree nor disagree; 4 agree; and 5 strongly agree. Outcomes are reported here as group mean, standard deviation, and percentage agreeing and strongly agreeing with the survey questions.

Survey respondents were also asked to self-assess their ultrasound proficiency. Questions regarding students' confidence in specific ultrasound skills used a Likert-type response set with a scale from 1 - 5 (Figure 1). Outcomes are reported as group mean, standard deviation, and the percentage stating that they were an intermediate performer, skilled performer, or very skilled performer. Specifically, the students were asked to assess their proficiency with basic ultrasound use, image acquisition and identification of organ systems (cardiac, abdomen, genitourinary, vascular, musculoskeletal), and use of ultrasound in clinical practice.

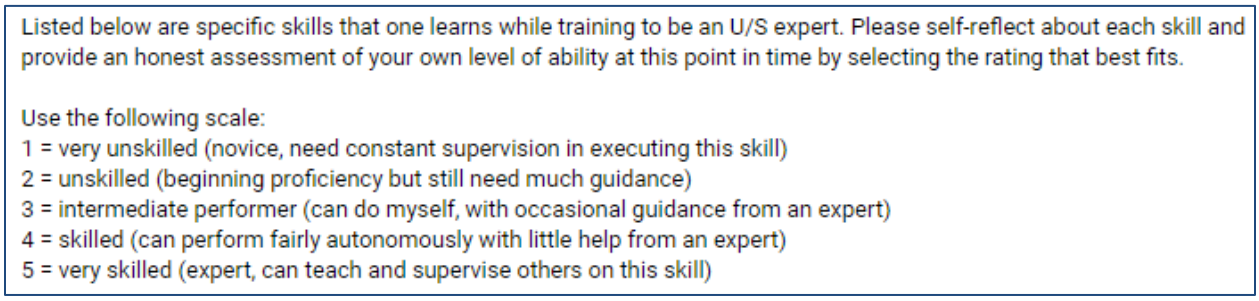

Figure 1. Likert-type response set for survey question regarding students' confidence in U/S skills

The electronic questionnaire was distributed to participants in February 2017 using a Google Forms spreadsheet.

Data Analyses

All data were obtained either through the electronic questionnaire or online course evaluations. All statistical analyses were performed with Microsoft Excel 2010 to calculate mean, standard deviation, and percentages.

Furthermore, a thorough review of the post-course evaluations completed by students at the time of participation in the ultrasound sessions was completed. Analysis of the free-text comments was used to lend insight into how to improve the course for future classes.

RESULTS

Surveys were sent to the email list for the classes of 2017 and 2016. A total of 60 completed surveys were received, 39 (65%) from class of 2017, 21 (35%) from class of 2016, 33 (55%) total female, 27 (45%) total male.

Demographics

Respondents were third and fourth year medical students applying into over 17 different specialties. The respondents were most represented by those going into emergency medicine (n = 6 [10%]), family medicine (n = 8 [13%]), internal medicine (n = 8 [13%]), surgery (n = 11 [18%]), and pediatrics (n = 6 [10%]) (Table 1). Of those who responded, 5 (8%) reported taking a fourth year ultrasound elective. One student who responded indicated not having taken part in pre-clinical ultrasound sessions, so responses from this student were removed from analyses specific to the ultrasound curriculum.

Table 1. Specialty Selection by 60 Third- and Fourth-Year UCSD Medical Students

Specialty	**Respondents (n = 60)**
Anesthesiology	3 (5%)
Dermatology	1 (2%)
Emergency Medicine	6 (10%)
ENT	1 (2%)
Family Medicine	8 (13%)
Internal Medicine	8 (13%)
Obstetrics and Gynecology	2 (3%)
Ophthalmology	4 (7%)
Surgery: General and Subspecialty	11 (18%)
Pediatrics	6 (10%)
Physical Medicine and Rehabilitation	2 (3%)
Psychiatry	4 (7%)
Radiology	2 (3%)
Unknown	3 (5%)

Assessment of Ultrasound Skills

Students were asked to assess their overall experience and satisfaction with the pre-clinical ultrasound curriculum (Table 2). The mean Likert scores for these questions ranged from 3.19 (The use of ultrasound has enhanced my ability to learn basic physiology) to 4.78 (All medical schools should provide students with ultrasound education). Eighty-three percent of students agreed or strongly agreed that they plan to use ultrasound in their future clinical practice. Ninety-three percent of students agreed or strongly agreed that the overall educational experience in ultrasound enhanced their medical education, that they would benefit from continued ultrasound education throughout 4 years of medical school, and that their experience with the UCSD ultrasound curriculum was positive. Ninety-five percent of students agreed or strongly agreed that all medical schools should provide students with ultrasound education.

Table 2. Summary of Students' Overall Assessment of the Ultrasound Curriculum (n = 59)

Survey Item	Mean (SD)	% Agree/ Strongly Agree
The use of U/S has enhanced my ability to learn basic anatomy	3.85 (0.91)	73
The use of U/S has enhanced my ability to learn basic physiology	3.19 (1.11)	39
The use of U/S has allowed for increased clinical correlation with basic science instruction	3.76 (0.97)	75
U/S has enhanced my understanding and skills of the physical exam	3.92 (0.99)	71
I found the U/S videos helpful in learning ultrasonography	3.93 (0.83)	73
I found the scheduled hands-on sessions used to practice scanning each other helpful in learning ultrasonography	4.61 (0.70)	95
I found the overall educational experience in U/S enhanced my medical education	4.46 (0.79)	93
I plan to use U/S in my future clinical practice	4.36 (1.05)	83
I will benefit from continued U/S education throughout my 4 years of medical school	4.64 (0.66)	93
All medical schools should provide students with U/S education	4.78 (0.53)	95
My experience with the UCSD U/S curriculum was positive	4.54 (0.73)	93
I would like to see more U/S in the UCSD curriculum	4.47 (0.86)	85

Survey respondents were also asked to self-assess their ultrasound proficiency. The assessment of ultrasound skills and proficiency included statements regarding basic use of the machine, image acquisition and identification of organ systems (cardiac, abdomen, genitourinary, vascular, musculoskeletal), and use in clinical practice. The mean Likert score ranged from 2.86 (measurements: length, volume, rate) to 3.97 (advantages of ultrasound) for the basic use of ultrasound (Table 3). Of note, 80% of students felt they were intermediate, skilled, or very skilled with basic terminology. Ninety-seven percent and ninety-three percent of students felt that they were intermediate, skilled, or very skilled with advantages of ultrasound and limitations of ultrasound, respectively.

Table 3. Proficiency in Basic Use of Ultrasound (n = 59)

Survey Item	Mean (SD)	Intermediate/Skilled/ Very Skilled, %
Basic terminology (echogenic, hyperechoic, hypoechoic, anechoic, isoechoic)	3.61 (1.08)	80
Basic knobology (power button, gain, depth)	3.17 (1.04)	76
Using M-mode, color flow, doppler	2.92 (1.04)	63
Using freeze, image save	3.46 (0.99)	80
Understanding artifacts (shadowing, posterior acoustic enhancement, reverberation, comet tails, mirror image)	2.88 (1.10)	59
Measurements (length, volume, rate)	2.86 (0.97)	66
Probe selection	3.12 (1.18)	66
Transducers (linear, phased array, curvilinear)	2.90 (1.17)	63
Transducer orientation on patient	3.47 (0.90)	90
Machine/transducer care (cleaning)	2.92 (1.37)	63
Advantages of U/S	3.97 (0.83)	97
Limitations of U/S	3.63 (0.89)	93

The mean scores for proficiency in cardiac ultrasound ranged from 2.44 (global left ventricular function) to 2.98 (identification of heart chambers). Forty-six to sixty-six percent of students felt that they were at least intermediate performers or better at cardiac ultrasound (Table 4).

Table 4. Proficiency in Image Acquisition and Identification of Cardiac Ultrasound (n = 59)

Survey Item	Mean (SD)	Intermediate/Skilled/ Very Skilled, %
Parasternal long-axis view	2.51 (1.09)	49
Parasternal short-axis view	2.47 (1.12)	46
Apical 4-chamber view	2.51 (1.14)	49
Subxiphoid view	2.64 (1.21)	49
Identification of valves	2.69 (1.16)	56
Identification of heart chambers	2.98 (1.14)	66
Left ventricular outflow tract	2.66 (1.06)	56
Pericardial sac	2.73 (1.20)	58
Descending aorta	2.63 (1.11)	61
Global left ventricular function	2.44 (1.13)	49
Pericardial effusion	2.59 (1.23)	49

For abdominal ultrasound, mean scores ranged from 2.56 (peritoneal free fluid assessment) to 3.34 (liver). Nearly 80% of students felt that they were intermediate, skilled, or very skilled performers in the image acquisition and identification of liver on a bedside ultrasound (Table 5).

Table 5. Proficiency in Image Acquisition and Identification of Abdominal Ultrasound (n = 59)

Survey Item	Mean (SD)	Intermediate/Skilled/ Very Skilled, %
Liver	3.34 (1.20)	80
Gallbladder	3.12 (1.22)	69
Spleen	2.90 (1.16)	66
Cholelithiasis	2.78 (1.30)	54
Peritoneal free fluid assessment	2.56 (1.37)	53

Scores ranged from 2.58 (qualitative bladder volume assessment) to 3.37 (bladder) for ultrasound of the genitourinary system. Seventy one percent of students felt that they were at least intermediate or better at the image acquisition and identification of the kidneys on ultrasound. Eighty percent of students felt that they were intermediate, skilled, or very skilled performers of a bladder ultrasound (Table 6).

Table 6. Proficiency in Image Acquisition and Identification of Genitourinary Ultrasound (n = 59)

Survey Item	Mean (SD)	Intermediate/Skilled/ Very Skilled, %
Kidneys	3.14 (1.24)	71
Bladder	3.37 (1.24)	80
Uterus	3.02 (1.15)	68
Hydronephrosis	2.66 (1.37)	49
Qualitative bladder volume assessment	2.58 (1.39)	47

In vascular ultrasound, mean scores ranged from 2.47 (abdominal aortic aneurysm) to 3.56 (differentiation of vein versus artery). Of note, 80% of students felt that they were at least intermediately skilled or better in the differentiation of vein versus artery on ultrasound (Table 7).

Table 7. Proficiency in Image Acquisition and Identification of Vascular Ultrasound (n = 59)

Survey Item	Mean (SD)	Intermediate/Skilled/ Very Skilled, %
Internal jugular vein	3.07 (1.14)	64
Common carotid artery	3.08 (1.16)	63
Abdominal aorta	2.90 (1.23)	59
Inferior vena cava	2.83 (1.25)	56
Differentiation of vein versus artery	3.56 (1.26)	80
Abdominal aortic aneurysm	2.47 (1.28)	47

Scores ranged from 2.10 (nerve) to 2.92 (skin) for the image acquisition and identification of the musculoskeletal system on ultrasound (Table 8).

Table 8. Proficiency in Image Acquisition and Identification of Musculoskeletal Ultrasound (n = 59)

Survey Item	Mean (SD)	Intermediate/Skilled/ Very Skilled, %
Skin	2.92 (1.41)	61
Muscle	2.81 (1.32)	58
Bone	2.81 (1.33)	58
Nerve	2.10 (1.26)	32
Joint effusion	2.49 (1.29)	41

Students were also asked to assess their proficiency of using ultrasound in practice: as a general tool for clinical reasoning, in an emergency setting, and for teaching ultrasound to others (Table 9).

Table 9. Self-Ratings of Proficiency of Use in Practice (n = 59)

Survey Item	Mean (SD)	Intermediate/Skilled/ Very Skilled, %
As a general tool for clinical decision making	2.86 (1.11)	66
In an emergency setting	2.56 (1.22)	53
For teaching U/S to others	2.27 (1.17)	47

Overall, students felt they were most proficient in the basic use of ultrasound, with an overall mean Likert score of 3.24 and with 75% of students answering that they felt they were intermediate, skilled, or very skilled. Students also gave an average rating of approximately 3 (intermediate) for abdominal, genitourinary, and vascular ultrasound.

Table 10. Summary of Self-Ratings (n = 59)

Survey Item	Mean (SD)	Intermediate/Skilled/ Very Skilled, %
Overall Proficiency in Basic Use of Ultrasound	3.24 (1.11)	75
Overall Proficiency in Cardiac Ultrasound	2.62 (1.15)	54
Overall Proficiency in Abdominal Ultrasound	2.94 (1.27)	64
Overall Proficiency in Genitourinary Ultrasound	2.95 (1.31)	63
Overall Proficiency in Vascular Ultrasound	2.99 (1.26)	62
Overall Proficiency in Musculoskeletal Ultrasound	2.63 (1.35)	50
Overall Proficiency of Use in Practice Ultrasound	2.56 (1.19)	55

In the free-text response section of the survey, students were encouraged to provide thoughts, comments, or suggestions for the ultrasound curriculum. Multiple participants suggested having actors and/or volunteers with pathology that could be detected by ultrasound. Many students also expressed a desire to have more ultrasound in their pre-clinical years, more hands-on training, more exposure throughout all four years of medical school, and better integration with anatomy lab. Some also expressed interest in wanting to integrate procedures with ultrasound.

DISCUSSION

The survey revealed that only 39% of students agree or strongly agree that the use of ultrasound enhances their understanding of physiology. The pre-clinical curriculum at UCSD is organ-system based, with first year medical students learning normal physiology, and second year medical students repeating the organ systems with a focus on pathology. Because participants of the survey represented the first two classes, with ultrasound being introduced only during the second year of medical school during which the curriculum focus was pathology rather than physiology, it is possible that this finding is a reflection of sampling bias. Since 2016, the ultrasound curriculum has been introduced to first year medical students as well with three sessions that cover introduction to ultrasound, musculoskeletal system, and pelvic anatomy.

This study has shown that over 70% of students agree or strongly agree that ultrasound enhances their understanding of anatomy, allows for increased clinical correlation with basic science, and enhances their understanding and skills of the physical exam. Overall, students are enthusiastically positive about ultrasound and plan on using it in their future clinical practice. Over 90% of students agreed or strongly agreed that the ultrasound experience enhanced their medical education, that they would benefit from having ultrasound throughout all 4 years of medical school, and that all medical schools should provide students with an ultrasound education.

Overall, students felt they were between an unskilled performer with beginning proficiency and an intermediate performer for image acquisition and identification of cardiac, abdominal, genitourinary, vascular, and musculoskeletal ultrasound. Students felt most skilled in the basic use of ultrasound, particularly in understanding its advantages and limitations. This is in line with the goals of the course to introduce the principles of ultrasound rather than to teach students to be expert diagnostic sonographers.

The ultrasound curriculum as it stands currently at UCSD is effective in introducing the principles of ultrasound to pre-clinical medical students. For the future development of the course, many participants expressed interest in wanting additional ultrasound material integrated throughout all four years of medical school. In particular, participants expressed a desire for more hands-on training sessions. Multiple students suggested having ultrasound sessions with volunteer patients who have pathology, such that ultrasound can be better understood as an adjunct to the physical exam. The second year medical school curriculum already includes physical exam sessions involving system-specific pathology, such as performing neurologic exams on patients who have baseline neurologic deficits from an ischemic stroke, listening to murmurs on patients with cardiac pathology, or examining specific skin and joint findings in patients with dermatologic or rheumatologic diseases. In these instances, faculty members with long-term relationships with patients in their specialty clinics have been able to recruit volunteers for students to practice physical exam skills. In the case of ultrasound, it may be difficult to recruit patients with pathology that is detectable by ultrasound, but not in need of immediate intervention. Some possible pathologies that

may be amenable to hands-on sessions include patients with cholelithiasis, small stable abdominal aortic aneurysms, or pregnancy. Another way to integrate more pathology into the ultrasound curriculum would be to include videos of abnormal findings alongside the hands-on session. In this way, comparisons can be made between the normal gallbladder or kidney on the live ultrasound and saved images of acute cholecystitis or hydronephrosis. This may also be a way to incorporate emergent pathologies into the curriculum, such as pericardial effusion, pneumothorax, aortic dissection, and ectopic pregnancies. Entering third year medical students also have an orientation week prior to starting clerkships where they review more clinically-relevant material. If the resources are available, it may be useful to integrate one session on procedures into this week, where students can practice using ultrasound to help with central lines, paracenteses, difficult IVs, etc. This could also be combined with a session teaching students the basics of doing an eFAST exam. A long term goal may be to incorporate ultrasound sessions throughout third and fourth year as well.

Many of the respondents of this study also stated that they would have liked to have been introduced to ultrasound in their first year, with better integration into anatomy lab. Ultrasound has since been added to the first year medical student curriculum. Future studies should include students who participated in both first- and second-year ultrasound sessions to assess the impact of ultrasound on anatomy and physiology education.

Many physicians have adopted the use of point-of-care ultrasound into their clinical practice. The Accreditation Council for Graduate Medical Education has implemented required ultrasound competencies for graduate medical education programs in the field of emergency medicine, critical care medicine, obstetrics and gynecology, radiology, internal medicine, and surgical critical care.[12] Studies in the past have shown that medical students can be taught to effectively learn and use ultrasound through focused training sessions.[4-11] Early ultrasound training in undergraduate medical education may serve as an effective link between basic science and clinical knowledge.[4,5,7] Given that the utility of ultrasound is widely applicable across almost every specialty, an argument may be made for ultrasound to be considered a core competency for medical students.[6] Here at UCSD, our curriculum has been well-received by students and has proven effective at introducing the basic principles of ultrasound. We will continue to elicit feedback from students for future development of the course.

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APPENDIX I

Ultrasound Pre-Clinical Education Survey

This survey is part of an ISP project that has been given an IRB exemption. All answers are anonymous. Please complete survey in one sitting, it should take no more than 5 – 10 minutes.

Demographics

1. Age?
2. Gender?
3. What year are you in medical school?
4. What year is your expected graduation date?
5. What medical specialty are you considering at this time?

Ultrasound Education

1. Did you participate in the UCSD U/S curriculum in your first year of medical school?
2. Did you participate in the UCSD U/S curriculum in your second year of medical school?
3. Did you complete an U/S rotation as an elective in your fourth year of medical school?
    a. If so, which elective? (provide course number or description if possible)
    b. How valuable was the elective in increasing your U/S skills?
4. Please estimate the number of hours spent in each category while a medical student. Include hands-on skills training in your estimates
    a. Number of hours of formal U/S didactics (videos included)
    b. Number of hours of hands-on U/S training
    c. Number of hours of clinical or bedside scanning
5. On your most ultrasound-heavy clinical rotation within third or fourth year of medical school, how often do you personally perform diagnostic U/S examinations? (almost never, rarely, once or twice a month, weekly, daily)

Overall Evaluation

For the following statements, use this scale:
1 = Strong disagree
2 = Disagree
3 = Neither agree nor disagree
4 = Agree
5 = Strongly Agree

A. The use of U/S has enhanced my ability to learn basic anatomy
B. The use of U/S has enhanced my ability to learn basic physiology
C. The use of U/S has allowed for increased clinical correlation with basic science instruction
D. U/S has enhanced my understanding and skills of the physical exam

E. I found the U/S videos helpful in learning ultrasonography
F. I found the scheduled hands-on sessions used to practice scanning each other helpful in learning ultrasonography
G. I found the overall educational experience in U/S enhanced my medical education
H. I plan to use U/S in my future clinical practice
I. I will benefit from continued U/S education throughout my 4 years of medial school
J. All medical schools should provide students with U/S education
K. My experience with the UCSD U/S curriculum was positive
L. I would like to see more U/S in the UCSD SOM curriculum

Ultrasound Evaluation

Listed below are specific skills that one learns while training to be an U/S expert. Please self-reflect about each skill and provide an honest assessment of your own level of ability at this point in time by selecting the rating that best fit. Use the following scale:

1 = very unskilled (novice, need constant supervision in executing this skill)
2 = unskilled (beginning proficiency but still need much guidance)
3 = intermediate performer (can do myself, with occasional guidance from an expert)
4 = skilled (can perform fairly autonomously with little help from an expert)
5 = very skilled (expert, can teach and supervise others on this skill)

Ultrasound Skill

How confident are you in the following skills?

A. Basic terminology (echogenic, hyperechoic, hypoechoic, anechoic, isoechoic)
B. Basic knobology (power button, gain, depth)
C. Using M-mode, color flow, doppler
D. Using freeze, image save
E. Understanding artifacts (shadowing, posterior acoustic enhancement, reverberation, comet tail, mirror image)
F. Measurements (length, volume, rate)
G. Probe selection
H. Transducers (linear, phased array, curvilinear)
I. Transducer orientation on patient
J. Machine/transducer care (cleaning)
K. Advantages of ultrasound
L. Limitations of ultrasound

Cardiac Ultasound

How confident are you in the following cardiac U/S skills (image acquisition and identification)?

A. Parasternal long-axis view
B. Parasternal short-axis view
C. Apical 4-chamber view

D. Subxiphoid view
E. Identification of valves
F. Identification of heart chambers
G. Left ventricular outflow tract
H. Pericardial sac
I. Descending aorta
J. Global left ventricular function
K. Pericardial effusion

How confident are you in the following abdominal U/S skills (image acquisition and identification)?
A. Liver
B. Gallbladder
C. Spleen
D. Cholelithiasis
E. Peritoneal free fluid assessment

How confident are you in the following genitourinary U/S skills (image acquisition and identification)?
A. Kidneys
B. Bladder
C. Uterus
D. Hydronephrosis
E. Qualitative bladder volume assessment

How confident are you in the following vascular U/S skills (image acquisition and identification)?
A. Internal jugular vein
B. Common carotid artery
C. Abdominal aorta
D. Inferior vena cava
E. Differentiation of vein versus artery
F. Abdominal aortic aneurysm

How confident are you in the following musculoskeletal U/S skills (image acquisition and identification)?
A. Skin
B. Muscle
C. Bone
D. Nerve
E. Joint effusion

Practical Ultrasound Skills

How confident are you in the following practical U/S skills?

A. As a general tool for clinical decision making
B. In an emergency setting
C. For teaching U/S to others

Free Text

Please let us know if you have any additional thoughts, comments, or suggestions for our ultrasound curriculum in the first two years of UCSD SOM.

This completes the survey. Thank you!