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Table of Contents

Oral Abstract Sessions

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Taking Ultrasound Education Outdoors – Multicenter Resident Response to the "Ultrasound Wilderness Adventure Race"

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Introduction: Over two and a half millenia ago, Aristotle famously delivered education outdoors while walking.1,2 In addition, multiple studies have found that outdoor recreation can enhance well-being, happiness, and quality of life.3 There is scant medical literature regarding the delivery of medical education in an outdoor format, particularly related to ultrasound education. Recent advancements in technology and the availability of ultra-portable handheld point-of-care ultrasound devices has made outdoor ultrasound education possible. The objective of this study was to determine the benefit perceived by emergency medicine residents of a half-day outdoor educational event that combined emergency ultrasound and wilderness medicine objectives. **Methods**: In June of 2021 a 3 hour event was held which included 10 stations hidden around a 6-mile course on an island. Each team was given a pack containing a scalpel, roll of tape, hemostats, string, and handheld point of care ultrasound device. Teams of up to 10 participants were given a map and coordinates and had to navigate to 10 hidden stations. Each station was staffed by an ultrasound fellowship trained emergency medicine attending physician and featured 10 questions, which were a combination of wilderness medicine questions and emergency ultrasound questions and scanning objectives. After the event, residents completed a 16 questions survey using Google Forms (Google Inc.) **Results**: 95 learners participated in this event, ranging from medical students to PGY-4 Emergency Medicine residents from 9 Emergency Medicine residencies and two medical schools. 65 responses were obtained. In response to the question, "SonoW.A.R. 2021 was more educationally effective than typical POCUS didactics/courses,"49 (76.6%) responded 5 (strongly agree), 11 (17%) responded 4 (agree), 2 (3.1%) responded 3 (neutral), 1 (1.6%) responded 2 (disagree), and 1 (1.6%) responded 1 (strongly disagree). This heavily positive-skewed pattern was observed for all additional questions. Handwritten feedback was also positive. **Conclusions**: Our data supports that medical students and Emergency Medicine residents from multiple institutions and years of training find this novel approach to outdoor ultrasound education to be useful and to be preferable over traditional lectures. Further research is needed to determine if the ultrasound scanning skills and wilderness medicine skills obtained outdoors translate into improved in-hospital ultrasound skills. **References**: 1. Furley, D. Peripatetic School. The Oxford Classical Dictionary, 2nd edition. Oxford University Press, 1970. 2. Stoddard, H et al. Would Socrates Have Actually Used the "Socratic Method" for Clinical Teaching? Journal of General Internal Medicine, 2016. 3. Meyer, C. Wilderness is Medicine: On Advocating for the Role of Outdoor Recreation in Public Health. Wilderness Medical Society, 2020. 4. Irons, et al. Medical Wilderness Adventure Race (MedWAR): A Novel and Effective Teaching Platform for Wilderness Medicine Knowledge and Skills. Wilderness and Environmental Medicine, 2012.

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Medical Education Teaching Sonographer Support for Basic Science Research: A Case Series

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Introduction: Introduction: Point of Care Ultrasound is an important skill for clinicians accross specialties. Several medical schools employ sonographers to support undergraduate, graduate, and continuing medical education curricula. Ultrasound has also become a staple in basic science research involving animal disease models but standardization of technique remains challenging (1). We present a collaborative research support program between our ultrasound education team and basic science investigators. **Methods**: Methods: The Center for Experiential and Applied Learning is a department of the Wake Forest School of Medicine and supports hands on skill development for learners across our enterprise. The Center employs two full time sonographers to support ultrasound educational activities including collaborations with basic science faculty using a Assess, Plan, Do, Review model for ultrasound educational needs assessment. **Results**: Results: All studies are approved by the institutional review board of Wake Forest University School of Medicine as well as the institutional animal welfare review board. Case 1) Researchers investigating hypertension in a rat model requested ultrasound vascular imaging support. The needs assessment identified a lack of basic ultrasound knowledge in the domains of machine controls and technique as well as lack of a scanning protocol to provide reproducible data. Multiple educational sessions were held in our teaching lab as well as on site using lab equipment until staff could demonstrate competency via direct observation. The sonographer collaborated with study staff to develop a scanning protocol for animal subjects. The study protocol was subsequently completed successfully. Case 2) Fetal development researchers utilizing primate models requested assistance with fetal imaging, fetal dating, and liver visualization. The teaching sonographers identified a primary need for hands on technical scanning skill development. Educational sessions were held on site with study subjects utilizing a coaching model with observed competency. The intervention allowed the study to progress as planned. Case 3) Researchers investigating hepatic steatosis in a primate model requested assistance with performance of ultrasound guided liver biopsy. We identified a lack of knowledge in the domains of machine controls and technique. Several educational scanning sessions were held on site teaching machine use, hepatic imaging, and ultrasound procedural guidance. An observed competency model was used to assess proficiency. The study is ongoing with continued sonography support. Case 4) Investigators examining fetal biometry in a vervet monkey model requested ultrasound support for fetal imaging. Planned clinician support was inconsistent due to limited availability of the subspecialty physician staff. We identified a need for education in basic fetal imaging and biometry. Multiple scanning sessions were held on site with the primary investigator during subject assessments to practice imaging and measurements under direct observation. This project is ongoing and will be complete when the study staff demonstrate competency based on direct observation of skills. **Conclusions**: Conclusion: Medical School based ultrasound educators can be an effective resource for basic science investigators using ultrasound assessments. Collaborations with basic science investigators extends the utility and value of sonographer instructors. **References**: 1. Tavares AAS, Mezzanotte L, McDougald W, et al. Community Survey Results Show that Standardisation of Preclinical Imaging Techniques Remains a Challenge. Mol Imaging Biol. 2023;25(3):560-568. doi:10.1007/s11307-022-01790-6

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Using Visual Thinking Strategies to Enhance Ultrasound Observation Skills

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Introduction: Art therapy and medical students (N=45) participated in a Visual Thinking Strategies (VTS) session to: 1) enhance observation skills, 2) examine interdisciplinary approaches to assessment, 3) determine its impact on awareness of implicit bias. This interdisciplinary study was designed to use art to stimulate growth in observation skills for diagnosis of ultrasound images and patient art assessments. **Methods**: VTS uses art works and a three-question protocol by trained facilitators to stimulate growth in observation skills and understanding imagery. 1. What do you see; 2. What is your rationale for saying that; 3. What else do you see. Quantitative and qualitative questionnaires and a post-procedure reflective focus group evaluated participants' baseline experiences and the perceived usefulness of VTS to influence observation and bias awareness. Two paintings: Barcelona was selected as a work that dealt overtly with race, culture and social status, as well as opportunities to look carefully to see what is there and consider the meaning of the imagery. Seawall by Hughie Lee Smith was selected since it was more ambiguous. There is not of lot of detail in this work, participants were forced to look closer and to explore meaning in a different way, such as how formal elements were important to interpretation. **Results**: Qualitative data indicated VTS improved observation skills and enhanced awareness of implicit biases. Although the one statistically significant questioned student's continued interest in VTS, 3 non-significant items on quantitative measures reflected gains regarding VTS to improve communication with patients, and to aid in determining implicit biases within health fields. The medical students noticed a range of aspects about the ultrasound image with pathology, alongside a healthy reference ultrasound image. Some saw three; some saw four chambers; a discussion ensued about why it appeared way, or what they saw that made them say that. In contrast to the medical students who noticed distinct details, the art therapy students tended to notice the whole image, its texture and values. Students developed acute visual and critical thinking skills, awareness of implicit bias when interacting with other practitioners, and gained partnership and interpretational skill through this interprofessional collaboration. **Conclusions**: Findings suggest implications for medical education in translating and interpreting images to understanding a patient's perspective in relationship to their health. Students' knowledge and appreciation of the visual arts in diagnosing and assessment; developing better communication skills and addressing student biases when interacting with other practitioners and patients. Consideration of the cultural lens through which we view our interactions and work (e.g., health assessments). **References**: Housen, A. & Yenawine, P. (2001). Understanding the basics. Visual Understanding in Education (VUE). Retrieved June 29, 2022, from www.vtshome.org
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Zoom Fatigue vs Virtual Gamification: Resident Response to a Novel Form of Emergency Ultrasound Education

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Introduction: The 2019 Sars-CoV-2 pandemic created many changes to the delivery of medical education. Virtual education has proliferated and persisted even after the end of quarantine precautions, due to the many logistical advantages of virtual education. However, multiple psychiatric studies have demonstrated burnout with standard videoconferencing ("Zoom fatigue") in the general population. Additionally, gamification in medical education has gained traction as a pedagogical tool over the last decade. The objective of our study was to determine if a gamified virtual educational event featuring novel use of commercially available remote collaboration tools could improve Emergency Medicine residents' engagement towards learning core concepts in emergency ultrasound (EUS). A secondary objective was to determine if virtual gamification was preferred over traditional didactics three years after the onset of the Sars-CoV-2 pandemic. **Methods**: A four-hour event was held which studied the response of residents from four EM residencies as they competed in a series of unique virtual challenges designed to promote discussion of EUS topics through friendly competition. The events included: interactive multiple-choice question leaderboards using Kahoot (Kahoot! Inc.); a collaborative whiteboard measurement challenge using MURAL (Tactivos Inc.); and group crossword challenges and a literature debate challenge using Zoom (Zoom Video Communications, Inc.). Residents then completed a 24-question survey using Google Forms (Google Inc.) comparing this experience to more traditional methods of ultrasound education. A follow up one question survey was sent 3 years later comparing virtual gamification to traditional virtual lectures. **Results**: 73 residents participated in the virtual event and 21 completed the survey. Survey questions were scored 1 (strongly disagree) to 5 (strongly agree). In response to "This was a useful learning experience", one resident (4.8%) scored a 1, 4 (19%) responded 3 (neutral), and 16 (76.2%) reported a 4 or 5. The statement "I prefer US-based games to US-based traditional lectures" garnered one resident (4.8%) scoring 1 or 2, four (19%) scoring 3, and sixteen (75.2%) scoring 4 or 5. The statement "I actively participated in all of the events" resulted in no residents scoring 1 or 2, four (20%) scoring 3, and sixteen residents (80%) scoring 4 or 5. The follow up survey produced 29 results with responses from 4 emergency medicine residencies and two medical schools, with 23 (79%) responding they preferred virtual gamification over traditional virtual education. **Conclusions**: Our data supports that EM residents felt that this novel approach to EUS education was a useful learning experience that maintained active participation in a virtual session and was preferred over traditional virtual education even after several years of "Zoom fatigue". Further research is needed to determine if the information obtained virtually translates into improved real world ultrasound skills. **References**: 1. Elbogen, E at al. A National Study of Zoom Fatigue and Mental Health During the COVID-19 Pandemic: Implications for Future Remote Work. Cyberpsychology, Behavior, and Social Networking, EPub 2022. 2. Samara, O et al. Zoom Burnout Amidst a Pandemic: Perspective from a Medical Student and Learner. Therapeutic Advances in Infectious Disease, 2021. 3. Gue, S et al. Gamification of Graduate Medical Education in an Emergency Medicine Residency Program. Educational Advances in Emergency Medicine, 2022. 4. Krishnamurthy, K et al. Benefits of Gamification in Medical Education. Clinical Anatomy, 2022. 5. Kirsch, J et al. Caution With Competitive Gamification in Medical Education. BMC Medical Education, 2023.

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Utilization of 3D-printed technologies to assist anatomic and clinical understanding of cardiac sonography in medical students.

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Introduction: Three-Dimensional (3D) printing is an emerging technology utilized in various areas of healthcare. Several studies have analyzed the implementation of 3D-printed models as supplemental resources in teaching anatomy to medical students, and many have reported favorable results (1–3). In the present study, we investigated the use of anatomical 3D heart models as a learning aid for first-year medical students in understanding cardiac sonography. Specifically, we compared the use of 3D-printed models to that of digital 3D PDFs using qualitative and quantitative endpoints. **Methods**: Open-source 3D STL files (4) derived from computed tomography imaging data of a healthy human adult heart were utilized to print 5 cross-sections corresponding to basic echocardiographic views using a Polyjet printer: parasternal long axis, parasternal short axis, apical 4-chamber, apical long axis, and subcostal. The cross-sections were also reproduced as digital 3D PDFs accessible on tablets. 148 medical students were randomly assigned to the digital 3D PDF (control) or 3D-printed model (experimental) groups. Teams of four students were instructed to utilize their assigned 3D technology during four class sessions while performing basic transthoracic echocardiograms on standardized patients. Each group was given immediate (after one session) and delayed (after four sessions) post-tests with qualitative and quantitative sections. The qualitative portion assessed student satisfaction and learning quality with their assigned 3D technology using modified Likert scales. The quantitative portion assessed for understanding of cardiac sonogram anatomy. Statistical analysis was conducted using unpaired 2-sample t-tests, and statistical significance was set at a P value ≤ 0.05. **Results**: Qualitatively, students in the experimental group reported greater degrees of satisfaction and learning quality with their assigned 3D technology relative to those of the control group for both the immediate and delayed periods (p<0.01). Satisfaction and learning quality decreased in the control group from the immediate to the delayed period (p<0.01), whereas no significant difference was found for the experimental group . Quantitative assessment scores were higher for the experimental group relative to the control group in the immediate period (p=0.019). However, no significant difference was found in quantitative scores between groups in the delayed period (p=0.498). The control group's average quantitative score increased from the immediate to the delayed period (p<0.001), whereas no significant difference was found for the experimental group (p=0.238). **Conclusions**: Findings of the present study suggest that various implementations of 3D-printed technologies help facilitate medical student understanding of anatomically complex and clinically relevant applications such as cardiac sonography. Additionally, students may have greater satisfaction and learning quality when using 3D-printed heart models compared to using 3D PDFs. **References**: 1. Ye, Z. et al. Meta-analyzing the efficacy of 3D printed models in anatomy education. Front Bioeng Biotechnol 11, 1117555 (2023). 2. Ye, Z. et al. The role of 3D printed models in the teaching of human anatomy: a systematic review and meta-analysis. BMC Medical Education 20, 335 (2020). 3. Lane, J. C. & Black, J. S. Modeling Medical Education: The Impact of Three-Dimensional Printed Models on Medical Student Education in Plastic Surgery. Journal of Craniofacial Surgery 31, 1018 (2020). 4. 3D Printed Models. RESUSCITATIVE TEE PROJECT https://www.resuscitativetee.com/3d-printed-models.

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Exploring the Impact of Social Media on Ultrasound Medical Education

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Introduction: In today's digital world, social media platforms have become an integral way individuals consume information. Social media has developed into a means to interact with learners and share bite-sized educational content. This tool allows information to be consumed at students' own pace to supplement traditional in-class learning models. This study intended to explore the impact of an ultrasound-focused social media page on medical students' ultrasound technique, interpretation of images, and interest in using ultrasound in their future careers. **Methods**: Following Institutional Review Board approval, a voluntary, confidential, online survey was sent to students regarding an ultrasound-focused Instagram page used for supplemental learning in a medical school with an integrated four-year curriculum. The Instagram page included 31 posts over the course of 8 months, including both pictures and reels. Content included ultrasound view acquisition tips, structure identification, pathology, and student highlights. The survey instrument consisted of questions answered using a Likert scale to measure participants' agreement or disagreement with specific statements. These statements included interest in using ultrasound in future careers, knowledge of views and structures, techniques and skills, and confidence to interpret images. **Results**: A total of 27 participants who followed the Instagram page and were enrolled at the specific medical school completed the survey. 66.7% reported participation in the Instagram page for over six months. 89.9% of students agreed or strongly agreed that they learned something by following the account. 77.8% of students agreed or strongly agreed that since following, they experienced improved knowledge structures and acquiring views. 59.3% of students agreed or strongly agreed that since following, they had enhanced ultrasound technique and skills. 77.8% of students agreed or strongly agreed that since following, they feel more confident in interpreting ultrasound images. 81.8% of students agreed or strongly agreed that since following, they were more interested in using ultrasound in their career. **Conclusions**: Social media platforms can be successful supplementary tools for ultrasound medical education to bridge the gap between traditional curriculum and meeting students online for non-traditional learning. Participation with the ultrasound-focused Instagram page was associated with positive outcomes regarding knowledge acquisition, technique enhancement, confidence in interpreting ultrasound images, and interest in ultrasound as a career. Future studies should explore strategies to further optimize the use of social media in ultrasound education and address any barriers to community engagement within these platforms. **References**: Bahner, P., (2012) How we use social media to supplement a novel curriculum in medical education, Medical Teacher, 34:6, 439-444, DOI: 10.3109/0142159X.2012.668245, Alsafi, N., & Alsafi, A. (2021). Instagram: A platform for ultrasound education? Ultrasound: Journal of the British Medical Ultrasound Society, 29(1), 44-47. https://doi.org/10.1177/1742271X20920908 Hempel, D., Haunhorst, S., Sinnathurai, S., Seibel, A., Recker, F., Heringer, F., Michels, G., & Breitkreutz, R. (2015). Social media to supplement point-of-care ultrasound courses: The "sandwich e-learning" approach. A randomized trial. Critical Ultrasound Journal, 8. https://doi.org/10.1186/s13089-016-0037-9

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Outcomes of a Checkout System for Point-of-Care Ultrasound Education in the Emergency Department

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Introduction: Point-of-care ultrasound (POCUS) is becoming increasingly common as the standard of practice in many institutions. Many clinicians, however, feel uncomfortable using ultrasound and have limited resources to practice. To address this need, we implemented a cost-effective checkout system using several handheld ultrasound probes and older, larger ultrasound machines no longer in clinical use. The aim of our study was to evaluate clinician perceptions and effectiveness of this new probe checkout system as a way to allow clinicians to become more comfortable and skilled with POCUS in a cost-effective manner. **Methods**: Subjects were associated with an emergency department and included students, residents, attendings, and other emergency department staff. There were a total of 31 participants. A post-experience survey assessing perceptions and effectiveness of the new program was sent to those who checked out ultrasound equipment. Subjects' responses were analyzed and reported using descriptive statistics. **Results**: All those who checked out ultrasound equipment completed the survey. 42% of subjects reported that the checkout was their first experience using this ultrasound equipment. The average length of check-out was 4.2 days, with most subjects using the equipment between 1-3 days. The equipment was primarily used for self-education (50%), followed by teaching others (25%), clinical use (25%), use on family/friend/pet (25%), and research /exploring research ideas (15%). The handheld ultrasound probes were the most popular, with 80% of participants choosing this option for checkout. Over 90% of staff reported that the equipment was extremely helpful for its intended purpose. **Conclusions**: As POCUS becomes more ubiquitous, it is increasingly important to provide opportunities for staff to become familiar with the equipment, practice using it on their own time, and have equipment available for teaching others. Historically, the cost of equipment has limited access and has been a barrier to education. With handheld probes becoming more affordable, a checkout system of ultrasound equipment is both a cost-effective and convenient way to allow users access to these resources and improve their clinical ultrasound skills. **References**:

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Non-Physician Point-of-Care Ultrasound (POCUS) Carotid Pulse Check Training

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Introduction: During sequential pauses in cardiopulmonary resuscitation (CPR), the traditional approach of using a two finger palpation to determine the return of spontaneous circulation (ROSC), is crucial in guiding medical decision making and resuscitation procedures that will affect a patient's chances of survival. However, current protocols may not be as effective in performing timely pulse checks. Emergency responders, physicians, and other medical professionals may fall short in providing an accurate two-finger carotid palpation within the recommended five to ten second time frame, resulting in a delay in CPR administration or unnecessary chest compressions. With emergency responders having accuracy rates as low as 2% while performing manual pulse checks during CPR, point-of-care ultrasound (POCUS) may prove to be an effective alternative to the traditional carotid palpation method in determining the presence of a pulse during CPR. (1) **Methods**: Sixteen medical student volunteers received hands-on training with POCUS from expert physicians, and were placed in a cardiac emergency simulation. During the simulation, medical students completed a ten-event cardiac emergency series using handheld ultrasound linear probes, placed in a vascular setting in connection to mobile devices to transmit the images. Pulse checks were performed during a ten-second time window, every two minutes in between chest compressions, in accordance with the 2020 American Heart Association guidelines for CPR, and were recorded by a "no pulse" or "pulse present" verbal cue. Fleiss' kappa was used to assess the level of agreement between examiners on detecting a simulated carotid pulse. Point estimate and asymptomatic 95% Confidence Interval was estimated and asymptomatic p-value < 0.05 was considered as statistically significant. **Results**: The Sample Data contains ten effective subjects and sixteen raters. Overall agreement was 0.974 (95% CI, 0.918 – 1.00), p < .001.
For the "No Pulse Present'' rating category, the Conditional Probability (CP) value was 0.985, whereas for the "Pulse Present" rating category, the CP value was 0.989. For both the "No Pulse Present" and "Pulse Present" rating categories, the Kappa value was 0.974, Standard Error was 0.029, and z-score was 33.743. This gave a p-value < 0.001 with a lower bound of 0.918 and upper bound of 1.0 for both rating categories. **Conclusions**: Medical students using POCUS can efficiently and reliably determine a simulated pulse during CPR, as opposed to the inaccuracies present with the traditional two-finger carotid palpation method. By integrating this technique into the emergency department, POCUS may prove to be a superior alternative to manual carotid palpation. **References**: 1. Eberle B, Dick W.F., Schneider T, et al. Checking the carotid pulse check: diagnostic accuracy of first responders in patients with and without a pulse. Resuscitation. November 17, 1998; 33(2): 107-116. doi: 10.1016/S0300-9572(96)01016-7.

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A prospective observational cohort study: Field Ultrasound Measurements of Central Volume Status and Acute Mountain Sickness

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Introduction: High altitude illness (HAI) is a term used to describe various syndromes that develop in unacclimatized people undergoing ascent to high altitudes.1 Acute Mountain Sickness (AMS) is the most common altitude illness; symptoms include headache, fatigue, lightheadedness, lack of appetite, insomnia, nausea, and vomiting. If left untreated, AMS can develop into potentially life-threatening high altitude pulmonary edema (HAPE) and high altitude cerebral edema (HACE).1 AMS has no diagnostic physical findings though the Lake Louise AMS score is considered the gold-standard for assessing its severity. Increased peripheral edema, decreased urinary output, and increased weight have been observed in those with AMS.2 There is only one study to date correlating US measurements of intravascular volume status with AMS severity in the wilderness setting.3 This study, however, is limited by the large variability in the LVOT VTI measurements from one individual to another and a lack of control for acetazolamide prophylaxis. Furthermore, LVOT VTI with PLR has limited utility in assessing volume status when measured at a single point in time. Our study aims to address these limitations by assessing volume status using serial measurements in individuals ascending to altitude while controlling for acetazolamide use. **Methods**: Subjects were recruited to ascend the White Mountains to an altitude of 12,470 feet. Subjects were randomized to acetazolamide as per the standard dosing regimen for altitude sickness, whereas the control group remained unmedicated. Three times daily, participants recorded their water consumption and urinary frequency, filled out a Lake Louise AMS questionnaire, and had intravascular volume status assessed via ultrasound by measuring the left ventricular outflow tract velocity-time integral (LVOT VTI) before and after passive leg raise (PLR). Prevalence of AMS between the exposed and unexposed groups will be compared. **Results**: Data collection ended on August 4th 2023 and is currently being analyzed. **Conclusions**: Due to the increasing number of individuals traveling to high altitudes, it is crucial for medical professionals to have options for assessing those at risk for AMS. Ultrasound is an effective tool for assessing volume status which may be correlated with symptoms of AMS. After data analysis occurs, results and conclusions will be reported.
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Comparing Augmented Reality versus traditional ultrasound-guided femoral nerve blocks using motion analysis: A Pilot Study

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Introduction: Hand-eye coordination is paramount to the success of ultrasound-guided procedures such as nerve blocks. Observing the ultrasound (US) screen is necessary for these procedures, and often requires clinicians to manipulate their block needles without directly visualizing their instruments. Augmented Reality (AR) can eliminate this challenge. By projecting ultrasound images to wearable glasses, AR can minimize head turning and augment visuospatial ability without the need for equipment repositioning. Motion tracking has previously been used to objectively assess performance in ultrasound-guided procedures. In this pilot study, we hypothesized that AR guidance in femoral nerve blocks would reduce motion metrics when compared to conventional US-guided needling. **Methods**: A group of physicians with variable nerve block experience ranging from novice to expert performed femoral nerve blocks on a simulation trainer under both AR-assisted and conventional US guidance via crossover design. Under the AR-assisted arm, participants wore AR glasses projecting real-time images from the ultrasound probe to a heads-up display (HUD). Participants had minimal practice using the AR HUD before performing the nerve blocks. Electromagnetic sensors were attached to the probe and participants' hands to record four motion metrics: path length, rotational sum, translational motions, and time. Nerve blocks were segmented into two checkpoints for performance evaluation. Checkpoint 1 (start of procedure to needle's first contact with the skin) involved nerve visualization under ultrasound. Checkpoint 2 (needle insertion to needle removal) involved positioning the needle superiorly and inferiorly to the femoral nerve before withdrawing the needle. **Results**: Seven physicians participated in this study. Paired T-test analysis revealed no significant differences in motion metrics between AR-assisted and conventional US-guided nerve block groups. **Conclusions**: AR glasses are a non-inferior tool for performing ultrasound-guided femoral nerve blocks in the simulation setting. Further studies should be conducted to explore the utility of this emerging technology in educating novice learners in nerve blocks and other ultrasound-guided procedures. **References**: Nguyen T, Plishker W, Matisoff A, Sharma K, Shekhar R. HoloUS: Augmented reality visualization of live ultrasound images using HoloLens for ultrasound-guided procedures. Int J Comput Assist Radiol Surg. 2022;17(2):385-391. doi:10.1007/s11548-021-02526-7, Jang YE, Cho SA, Ji SH, et al. Smart Glasses for Radial Arterial Catheterization in Pediatric Patients: A Randomized Clinical Trial. Anesthesiology. 2021;135(4):612-620. doi:10.1097/ALN.0000000000003914, Baribeau V, Weinstein J, Wong VT, et al. Motion-Tracking Machines and Sensors: Advancing Education Technology. J Cardiothorac Vasc Anesth. 2022;36(1):303-308. doi:10.1053/j.jvca.2021.07.036, Baribeau V, Sharkey A, Murugappan KR, et al. Assessing Skill Acquisition in Anesthesiology Interns Practicing Central Venous Catheter Placement Through Advancements in Motion Analysis. J Cardiothorac Vasc Anesth. 2022;36(8 Pt B):3000-3007. doi:10.1053/j.jvca.2022.01.039

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POCUS of Newly Termed Tibial-Soleal Groove (TSG) Provides Important Landmark Identifying Great Saphenous Vein/Nerve for Clinical Skills

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Introduction: INTRODUCTION. Everyone seems to know someone who has benefited from a coronary artery bypass graft procedure which very likely involved the great saphenous vein (GSV) except in surgical revascularization of the left anterior descending artery. Coronary artery disease remains the most common cause of death globally making it notoriously popular as enemy number one in public health arenas. GSV continues to be the most commonly used bypass graft. GSV has 3 clinical surgical associations (grafts, varicosities, cutdowns). In 1967 it became a life extending structure when Dr. Favaloro described it as an autologous graft. High tie varicose vein procedures and injections of GSV have helped sufferers for decades. Cutdowns for intravenous access are lifesaving. GSV is a consistent superficial vein with a dependable landmark which deserves further scrutiny regarding additional anatomical sites. The objective of this study was to conduct POCUS using a GE Vscan Air probe following GSV location analysis from novel GAX-specimens with BriteVu (BV) contrast MRI/CT images versus formalin-fixed cadavers (FFC) describing new terminology satisfying surgeons and anatomists. **Methods**: METHODS. Literature search of GSV anatomy from texts/atlases was conducted. CT/MRI/POCUS-GE Vscan Air probe imaging post BriteVu contrast and subsequent dissection of GAX-specimens (n=6:12 sides) versus FFC (n=15:30 sides). Dissection of 42 lower limbs in total was conducted and analyzed. **Results**: RESULTS. GSV analysis from texts/atlasses, imaging and dissections revealed a consistent pattern of an undescribed unnamed specific location between the knee and ankle of the GSV journey. Pocus and dissection of 42 lower limbs demonstrated 93% GSV's were within 3mm on either side of the intersection between the medial tibial bone and soleus muscle. Below the knee, GSV ascends lying in the tibial-soleal groove (TSG) from the medial mid-tibial level up to the tibial tuberosity (approximately 10cm) formed between the anteromedial tibia and anterior medial soleus muscle. The author has provided a term for this consistent GSV location below the knee as the TSG. **Conclusions**: CONCLUSIONS. This study revealed GSV has a consistent superficial anatomical location below the knee newly termed the tibial-soleal groove (TSG) which can be successfully imaged via POCUS using a GE Vscan Air probe and could contribute to improved surface palpation anatomy and surgical descriptions.
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Methamphetamine Abuse and Cardiac Ejection Fraction

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Introduction: Methamphetamines are widely abused illegal stimulants in the US, with nearly 2.6 million people aged 12 and older reporting usage in the past year, according to a 2020 report.1 The addiction's financial impact ranges from $16.2 to $48.3 billion, a figure expected to rise given the current prevalence of methamphetamines.2 Consequently, research on methamphetamine-associated heart failure (MethHF) is crucial to alleviate the economic burden and improve healthcare for affected individuals within the US. While it has long been known that methamphetamine use can lead to reduced heart function and eventual MethHF, quantifying this relationship is of utmost importance due to the need for early diagnosis and prompt intervention. MethHF patients typically exhibit a reduced left ventricular ejection fraction (LVEF) and significant left ventricle dilation, which serves as the primary indicator of heart failure. **Methods**: This study aims to explore the length and frequency of methamphetamine abuse and its effect on the severity of heart failure through calculations of the LVEF and cardiac dilation using Point-of-Care ultrasound (POCUS). Eligible patients - methamphetamine users who have no confounding heart abnormalities - at the UCI Medical Center's Emergency Department were approached and consented. A licensed clinician then performed a parasternal long-axis ultrasound to measure E-Point Septal Separation (EPSS) and calculate LVEF. Additionally, the left ventricular diameter was measured by capturing images of the heart in systole and diastole. Patients were determined to have reduced LVEF if POCUS measurements yielded values of 40% and below. **Results**: Out of 123 total enrolled patients, 72 patients reported methamphetamine use. When specifically analyzing patients with methamphetamine use history, 9.7% exhibited mild heart failure, 6.9% exhibited moderate heart failure, and 23.6% exhibited severe heart failure. A chi-square test on the data yielded a value of 17.287 at a significance level of 0.001, meaning that there is a statistically significant association between methamphetamine use and reduced LVEF and associated MethHF as shown through POCUS. **Conclusions**: Since the effects of MethHF could be reversible if diagnosed and treated promptly, the data suggests that it may be beneficial to use POCUS to quickly screen methamphetamine using patients for heart failure when they present to the Emergency Department. Continued studies are necessary to examine the utility of POCUS in screening various iterations of heart failure who have abused methamphetamine for various durations and frequencies. **References**: 1. Kinas D, Dalley M, Guidry K, Newberry MA, Farcy DA. Point-of-Care Ultrasound Identifies Decompensated Heart Failure in a Young Male with Methamphetamine-Associated Cardiomyopathy Presenting in Severe Sepsis to the Emergency Department. Case Rep Emerg Med. 2018;2018:2859676. Published 2018 Oct 9. doi:10.1155/2018/2859676, 2. "Meth and Heart Disease: A Deadly Crisis We Don't Fully Fathom, Report Says." 16 Aug. 2021

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Zimbabwe Telehealth Pilot Program Identifies High Risk Patients In An Underserved Population Using Point Of Care Echocardiograms And Digital Electrocardiogram

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Introduction: Developing countries have increasing death rates due to cardiac disease. Cardiac disease is now the 4th highest cause of death in Zimbabwe. The population is underserved, with only 5 cardiologists and 10 echocardiography (echo) machines in the country. **Methods**: Local doctors in Zimbabwe used point of care echo and digital electrocardiogram (ECG) to identify high risk patients. A Butterfly IQ ultrasound probe and a SmartHeart digital ECG device were paired with a smart phone. Echoes and ECGs were performed on patients presenting with potential cardiac complaints (hypertension, chest pain, dyspnea and edema) and stored on the Cloud. ECGs and echoes were then interpreted by cardiologists in the United States and results were returned to the local doctors in Zimbabwe. **Results**: Average age was 48.8. 62 people had echoes, 73 had ECGs and 24 had both. Symptoms in the ECG patients (%): chest pain 57, dyspnea 38 and palpitations 23. ECG findings (%): normal 30, left ventricular hypertrophy (LVH) 29, LVH with repolarization changes 13, T wave changes 13, ischemia 7, arrhythmia 16 (atrial fibrillation 2, complete heart block 1, sinus tachycardia 6). Echo patient symptoms (%): chest pain 29, dyspnea 50, palpitations 24, edema 30, hypertension 30. Echo findings were (%): reduced ejection fraction (EF) in 44, LVH with normal EF in 24 and normal echoes in 23. Only 5% had primary rheumatic valve disease. 25% of echo patients had nonrheumatic valve disease, primarily atrioventricular valve regurgitation related to cardiomyopathy. Concomitant ECGs were done in 11 of the 27 patients with low EF and all showed LVH with repolarization changes. Other echo findings were (#) pericardial effusion 4, myxoma 1, apical clot 1, dilated aorta 4 and right ventricular enlargement in 8. **Conclusions**: Telehealth in developing countries is feasible, and patients at high cardiac risk who need referral to specialty care can be easily identified using point of care echo and ECG. Hypertension is an important risk factor; left ventricular hypertrophy and reduced ejection fraction were the most prevalent findings. Surprisingly, valve disease appeared more commonly in patients with cardiomyopathy than as de novo rheumatic disease. **References**: 1. GBD 2019 Diseases and Injuries Collaborators*. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet 2020; 396: 1204–22. Top 10 causes of death in 2019. https://doi.org/10.1016/S0140-6736(20)30925-9 2. Baribeau Y, Sharkey A, Chaudhary O, et al. Handheld Point-of-Care Ultrasound Probes: The New Generation of POCUS. J Cardiothorac Vasc Anesth. 2020 Nov;34(11):3139-3145. doi: 10.1053/j.jvca.2020.07.004. Epub 2020 Jul 7. PMID: 32736998; PMCID: PMC7340048. 3. Jae Oh, Garvan Kane, James Seward, A. Jamil Talik. The echo Manual. Fourth Edition. Wolters Kluwer. Philadelphia 2019. 4. Smallwood N, Dachsel M. Point-of-care ultrasound (POCUS): unnecessary gadgetry or evidence-based medicine? Clinical Medicine. 2018; 18:219-224. 5. Russell F, Ehrman R, Cosby K, et al. Diagnosing acute heart failure in patients with undifferentiated dyspnea: A lung and cardiac ultrasound (LuCUS) protocol. Academic Emergency Medicine. 2015; 22:182-191.

Impact of Education on POCUS Adoption and Sustainability in Kenya: Preliminary Findings from Scaled Maternal Health POCUS Implementation

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Introduction: In 2020, almost 95% of all maternal deaths occurred in low and lower middle-income countries (1). In sub-Saharan Africa, as many as 200,000 mothers and 28 of every 1000 infants die in childbirth every year (2, 3). Globally, many critical efforts are underway to improve the quality of antenatal care ('ANC') through investments in clinical training, healthcare infrastructure, and the supply chain. One element of the quality antenatal care puzzle – ultrasound during pregnancy and delivery – is a critical tool recommended by the WHO (4) for early detection of life-threatening complications. Despite advances in portability, affordability and ease of use, widespread adoption of point-of-care ultrasound in LMICs lags behind these guidelines due to lack of training. [link] We describe here our approach to driving adoption through pairing equipment with training and teaching on clinical integration in public-sector hospitals in Kenya. **Methods**: In 2022, Kenyatta University, Global Ultrasound Institute, and a major handheld point of care ultrasound manufacturer partnered to launch the largest ever deployment of handheld ultrasound equipment and training to mid-level providers across Kenya. This partnership aimed to transform ANC through the deployment of 500 ultrasound devices coupled with robust training for a total of 514 practitioners. These practitioners were recruited from 224 public facilities from 8 Kenyan counties with the highest maternal mortality rate (5). Between September - December 2022, each of the 514 practitioners received 5 days of in-person hands-on training using a standard obstetrical ultrasound training curriculum which included lecture, hands-on scanning practice, and mentored scanning in a clinical setting. Each participant performed a minimum of 100 precepted scans, 20 in each of the following clinical applications: 1. fetal presentation, 2. # of gestations, 3. fetal cardiac activity, 4. placental location, and 5. amniotic fluid assessment. Online pre and post tests were administered and an Objective Structured Clinical Examination (OSCE) was administered on the fifth day. Following the training, learners returned to their public facilities to integrate POCUS in their antenatal care clinics and were provided with ongoing scan feedback by expert trainers. Impact was assessed through surveys administered pre-training, post-training and 1 month post training, and probe utilization data metrics were captured and reported by the device manufacturer on a monthly basis. **Results**: Surveys demonstrated the learner cohort was majority (82%) mid-level practitioners (nurses/nurse-midwives, clinical officers) with an average of 12 years of post-schooling clinical experience; the majority were female [48.5%,n=248]; and 94% were novice medical imaging users with no prior experience in using ultrasound. 1 month post training survey results demonstrated that 88% [n=450) reported identifying a high-risk condition since beginning to use POCUS in practice. Probe utilization data suggests at 9 months post-training initiation, an average of 10,000 scans are being performed monthly with the majority being in the OB ⅔ (2nd /3rd trimester) preset. A random sample of 255 participants were selected at six months post training to evaluate knowledge and skills retention. The findings showed that the level of confidence in performing POCUS had risen from an average of 56% to 95% among those who were extremely confident in identifying the five high risk conditions. In general, the performance of POCUS exams was impressive, with most regions achieving success rates above 85%. Fetal presentation, fetal heart rate abnormalities, and amniotic fluid assessment display particularly high success rates, ranging from 89% to 100% across all counties On decision making 74% reported to have utilized POCUS in making decisions on patient management while, 85% reported referring patients because of POCUS findings. **Conclusions**: Preliminary findings from this largest-ever deployment paired with training of ultrasound in a low-resource setting support the hypothesis that when distribution of ultrasound devices is paired with training and education for end-users, a high level of device utilization with immediate integration into ANC work-flows and identification of high-risk conditions is made possible. Impact evaluation on how this integration of POCUS at ANC point-of-care shapes referral of critical prenatal conditions, and affects outcomes at the patient, health care provider and system level is ongoing. **References**: https://www.who.int/news-

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Pathways for Progress: The Relationship between Point-of-Care Ultrasound and the United Nations 2030 Sustainable Development Goals

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Introduction: Diagnostics are an essential bridge in the path from patient presentation and illness to treatment and well-being, yet almost half of human beings world-wide lack access to diagnostic imaging in their healthcare delivery. A 2021 Lancet commission report estimates the proportion of individuals without access to diagnostic imaging in low-income countries (LICs) is more pronounced at 81%, and that over 1 million premature deaths could be avoided annually in LMICs by reducing diagnostic gaps [citation]. Our recent pandemic amplified world-wide health disparities, and made clear the urgent need for improved progress towards the 2030 Sustainable Development Goals (SDGs). We outline here the pathway through which POCUS can propel countries to reach the SDGs, and the diagnostic utility of specific POCUS exams on top causes of mortality in low-income countries (LICs). Given improvements in user-interface geared towards novice healthcare providers, recent technological advances allowing miniaturization of ultrasound, and connectivity to cloud-based tele-medicine platforms, POCUS as a diagnostic modality is well-suited to address virtually all imaging needs at a fraction of the cost of other equipment. When paired with POCUS education, and integration of POCUS into clinical decision making pathways, this combination of increased clinician capacity and machine usability promotes the provision of high-quality care even in remote or resource-limited environments. The benefits of early diagnosis of high risk conditions is amplified in austere environments to speed timely referrals, diagnose earlier in the disease course potentially allowing less-costly interventions and better stewardship of scarce resources. **Methods**: The SDGs are a collection of 17 interlinked objectives designed by the United Nations to serve as a world-wide shared blueprint for peace and prosperity. The SDGs are a high visibility strategic plan to address global challenges including poverty, inequality, climate change, environmental degradation, peace and justice. Specific targets under each of the goals are expected to be achieved globally and by individual UN member states by 2030. In this presentation, we review the current state of POCUS adoption in LICs against listed WHO leading causes of mortality that could otherwise be abated through POCUS; review the clinical applications and health impacts of POCUS as they relate to multiple targets under SDG 3; and describe the ways in which POCUS drives the non-human health/one-health objectives of SDGs 4, 5, 8, 10, 11, 14, 15 and 17. **Results**: SDG 3 (Good Health and Well-being) includes subgoals of reducing preventable traumatic and maternal mortality, and POCUS for eFAST and identification of high risk pregnancy conditions prior to delivery would undoubtedly improve early detection of operative high risk conditions within this SDG. At scale on a global level, POCUS has the capacity to catalyze major improvements in population health and overall societal well-being, through improved access to quality healthcare and empowerment of healthcare providers. Moreover, POCUS can have significant planetary health benefits by reducing environmental waste through less reliance on other imaging modalities, reduced need for patient/provider travel through telemedicine applications and overall improved access to diagnostic imaging in 'last mile' contexts. Each of the WHO identified top causes of death in LICs has a POCUS diagnostic exam that could speed diagnosis and time to treatment eg. lower respiratory illness and pneumonia identification through lung ultrasound. We further present POCUS correllates to SDGs 4,5,8,10,11,14,15 and 17, as well as exam types for diagnostic support for each of the top 10 causes of death in LICs. **Conclusions**: We conclude with a 'call to action' proposing that global health funding and policy be leveraged to support the widespread deployment of POCUS to allow this cross-cutting technology to improve early diagnosis across many disease states and improve ability of LICs to reach the SDGs. **References**: 1. https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death 2. https://sdgs.un.org/goals 3. https://www.thelancet.com/commissions/diagnostics 4. "Medical imaging and nuclear medicine: a Lancet Oncology Commission"Lancet Oncol. 2021 Apr;22(4):e136-e172. doi: 10.1016/S1470-

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Obstetric Ultrasound and the Detection of Uterine Incarceration: A Case Report

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Introduction: Obstetric complaints and urinary retention are common reasons for presentation to the emergency department, with a broad range in acuity and rarity of their etiologies. Uterine incarceration is a rare and sinister complication of pregnancy which may be life-threatening if unrecognized. Diagnosis of uterine incarceration can be challenging, as it requires a high index of clinical suspicion and timely imaging to identify. This case report describes the diagnosis of uterine incarceration with ultrasound in the Emergency Department. **Methods**: N/A (case report) **Results**: A 38-year-old G4P0030 female at 15 weeks and 3 days gestation presented to the Emergency Department for urinary retention. Her symptoms had begun 4 days prior, when she was evaluated at a local hospital and required urinary catheterization for an output of 1,100 mL of urine. There, a renal and bladder ultrasound were unremarkable, and she was discharged. During the following days she reported a sensation of an incomplete voiding, and the day of presentation she was unable to void entirely. She denied any symptoms other than urinary retention. Initial vital signs demonstrated a heart rate of 96, blood pressure of 112/80, respiratory rate of 18, oxygen saturation of 98%, and temperature of 36.3°C. Home medications included prenatal vitamins, bupropion, and cetirizine. A foley catheter was placed in the Emergency Department with immediate return of 550 mL of urine, after which the patient noted improvement in her discomfort. Subsequent physical exam revealed unremarkable cardiopulmonary examination with a nontender abdomen and no costovertebral angle tenderness. A complete blood cell count, basic metabolic panel, and urinalysis were bland. Bedside obstetric ultrasound was performed and confirmed a singleton intrauterine pregnancy with fetal heart tones at 163 bpm. Given her second presentation for urinary retention, there was suspicion for uterine incarceration. A comprehensive transabdominal and transvaginal ultrasound were obtained which uncovered a retroverted uterus with posterior and caudal displacement of the fundus with anterior displacement of the cervix, consistent with uterine incarceration. Bedside reduction under procedural sedation was performed conjointly by the Obstetrics and Emergency Medicine teams and was successful on the second attempt. The patient was discharged with follow-up to Maternal Fetal Medicine with no recurrence of incarceration. **Conclusions**: Uterine incarceration is a rare cause of urinary retention in pregnancy. It typically occurs in the second trimester when a retroverted uterus fails to properly ascend into the abdomen and becomes trapped between the sacral promontory and the pubic symphysis. Failure to identify this pathology can result in renal injury, bladder rupture, uterine rupture, fetal demise, and maternal death. The use of ultrasound permits the rapid identification and thus management of this uncommon and potentially deadly complication of early pregnancy. **References**: 1. Gibbons JM, Paley WB. The Incarcerated Gravid Uterus. Obstet Gynecol. 1969; 33(6), 842–845. 2. Patterson E, Herd AM. Incarceration of the Uterus in Pregnancy. The American Journal of Emergency Medicine. 1997; 15(1), 49–51. https://doi.org/10.1016/S0735-6757(97)90047-4. 3. Newell SD, Crofts JF, Grant SR. The Incarcerated Gravid Uterus: Complications and Lessons Learned. Obstetrics & Gynecology. 2014; 123(2), 423–427. https://doi.org/10.1097/AOG.0000000000000102. 4. Sweigart AN, Matteucci MJ. Fever, Sacral Pain, and Pregnancy: An Incarcerated Uterus. West J Emerg Med. 2008; 9(4), 232–234. 5. Shnaekel KL, Wendel MP, Rabie NZ, Magann EF. Incarceration of the Gravid Uterus. Obstetrical & Gynecological Survey. 2016; 71(10), 613–619. https://doi.org/10.1097/OGX.0000000000000362. 6. Dierickx I, Meylaerts LJ, Van Holsbeke CD, De Jonge ET, Martens IF, Mesens T, et al. Incarceration of the Gravid Uterus: Diagnosis and Preoperative Evaluation by Magnetic Resonance Imaging. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2014; 179, 191–197. https://doi.org/10.1016/j.ejogrb.2014.05.037.

Ultrasound Evaluation of Lens Dislocation and Iridodonesis

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Introduction: Ultrasound is commonly used as a tool for diagnosis and acute evaluation in emergency settings. This abstract will describe a case of ocular ultrasound used to quickly identify lens dislocation and incidentally capture associated iridodonesis in a patient after a fall. **Methods**: Case Description: A 69 year old female presented to the emergency department via EMS due to two falls earlier that day at her nursing facility. Both falls were witnessed and assisted, but the patient did strike her posterior skull on a wall during the first fall. The patient's up-to-date medication list included only 30 mg daily olanzapine and no blood thinners. Physical exam was negative for neurological deficits, and the HEENT exam was atraumatic. Initial visual acuity was unable to be assessed due to patient agitation, although she did endorse cloudy vision on the R that she said had been present for years. A CT Head scan was performed, showing subtle posterior R globe hyperdensity – there was concern for vitreous hemorrhage. Bedside ultrasound was able to identify the true pathology rapidly. She was admitted due to recurrent falls, asymptomatic COVID-19+ status, unexplained weight loss, and mild hypophosphatemia. As an inpatient, ophthalmology consulted and MRI orbits confirmed the diagnosis of lens dislocation. This patient's bedside ultrasound findings, ophthalmology exam, and MRI reads were all consistent with R lens inferior dislocation, as well as dense cataract on that lens. Her hospital course was overall uneventful with ophthalmology eventually deciding on out-patient follow-up for a vitrectomy/lensectomy. **Results**: Discussion: Although confirmed by other imaging modalities and intensive examination later in her admission, the diagnosis of lens dislocation was rapidly identified soon after admission via ultrasound. Not only did this modality allow for the direct detection and measurement of the lens in the posterior chamber of the R eye, but in this case specifically it was able to capture footage of iridodonesis-- an ultrasound finding that has not previously been published. This "dancing of the iris… elicited by rapid movement of the eye" is a finding often associated with lens dislocation. Ultrasound has previously been shown to be able to effectively quantitatively measure the degree of lens subluxation. However, this case demonstrates its capacity to also qualitatively assess and capture video of ocular pathologies to rapidly guide diagnosis and treatment of a variety of ocular conditions both in the emergency room and beyond. **Conclusions**: See above-- author's note: because this is a case study, I altered the sections for submission with my own titles. Thank you! **References**: 1. Aoxiang Wang, Dapeng Mou, Ningli Wang, Haiyan Wang, "The Imaging Characteristics of Lens Subluxation on the Ultrasound Biomicroscopy", Contrast Media & Molecular Imaging, vol. 2022, Article ID 7030866, 6 pages, 2022. https://doi.org/10.1155/2022/7030866, 2. Desai D, Tajik AJ. Iridodonesis. N Engl J Med. 2017 Sep 14;377(11):e14. doi: 10.1056/NEJMicm1615424. PMID: 28902597., 3. Dudea S. M. (2011). Ultrasonography of the eye and orbit. Medical ultrasonography, 13(2), 171–174., 4. Michalke JA. An overview of emergency ultrasound in the United States. World J Emerg Med. 2012;3(2):85-90. doi: 10.5847/wjem.j.issn.1920-8642.2012.02.001. PMID: 25215044; PMCID: PMC4129790.

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An Ultrasound Advanced Competency in Medical School Translates into basic Competency in Multiple Fields of Medicine. The Honors Ultrasound Experience at Ohio State.

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Introduction: Advanced training in ultrasound at Ohio State has been written up in Academic Medicine, described a fourth-year elective in advanced ultrasound techniques. Students accepted for this longitudinal elective participate in multifaceted educational activities to expand their knowledge base, bedside ultrasound skills, ability to analyze emerging research and literature, and complete an honors ultrasound project. Students participate in lectures by providers from a wide range of specialties that incorporate ultrasound into clinical practice. Students also participate in faculty-guided scanning sessions and journal clubs, and complete online modules and quizzes through the course of the academic year. Each student presents an ultrasound digital portfolio of images acquired over the course of their fourth year and answers a range of questions covered in the course and about their images with an in-person oral exam at the end of the course. Additionally, students give oral presentations on their longitudinal projects and submit a written paper as part of their final assessment. **Methods**: Third year students matriculating in an accredited medical school are recruited and screened for enrollment. Accepted students meet with course leadership to discuss career goals and aspirations in regard to using point of care ultrasound. Students are assigned an ultrasound project that meets their career goals and develop strategies to complete their project within the ultrasound ecosystem at Ohio State. Students complete online modules with quizzes, attend and present at journal clubs, participate in faculty-guided didactics and hands-on sessions, and are given a final ultrasound assessment of performance at the end of the course. **Results**: Over an 18-year period, over 450 medical students have participated in the Honors Ultrasound elective. A broad range of careers students ultimately enter include but are not limited to: emergency medicine, internal medicine, general surgery, radiology, obstetrics and gynecology, family medicine, ophthalmology, and others. The scope of their projects includes near-peer teaching of ultrasound as part of the medical school curriculum, volunteering at local clinics, developing communities of practice, and specialty-specific projects related to their field of choice. **Conclusions**: Teaching ultrasound to fourth year medical students is a feasible construct that guides students to an advanced competency achievable during medical school. As students enter into residencies and careers, they will utilize ultrasound in numerous ways that continue to grow and evolve. More research is needed to further delineate the optimal training of medical students and what training should be included in medical school versus what should be delivered in residency. Early exposure, repeated educational sessions, and retention of key skills are all areas that should be further researched. The Honors Ultrasound program is a viable program that prepares future physicians with the ability to practice and learn ultrasound fundamentals, critically analyze literature, and develop leadership skills during medical school. **References**: n/a

Making Image Acquisition Testing Feasible for Large Medical School Classes Via Asynchronous Ultrasound OSCEs

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Introduction: Assessments such as observed standardized clinical exams (OSCE) are essential to ensure skills are learned sufficiently by medical students. When a skill is not performed well, students receive feedback and an opportunity to improve. If ultrasound is to be taught as a clinical skill in medical schools it should be treated like other learned clinical skills and include image acquisition skills assessments. An ultrasound OSCE however is labor intensive for ultrasound faculty, which are in limited supply. A 7 view OSCE would require 63 hours of faculty time for an average size medical school class. The logistics of a single faculty member dedicating such time is not feasible. It would also be difficult to recruit sufficient volunteer ultrasound faculty on a regular basis for this. To address this problem we developed an ultrasound image acquisition OSCE with asynchronous but timely feedback via cloud stored images and a standardized grading rubric that greatly reduced the time needed. **Methods**: One hundred twenty nine first year medical students completed a required ultrasound OSCE in their doctoring course. Students were given 20 minutes each to obtain 7 views in a proctored exam setting. Images were saved and submitted to a cloud. A single faculty then reviewed the images remotely. Students were given a score for each view using a standardized grading rubric, narrative feedback to optimize views that scored less than full points, and narrative feedback regarding the image set as a whole. Views that did not pass the minimum score had to be resubmitted during a remediation OSCE. Data was collected on faculty time spent and student performance. **Results**: A total of 129 students were able to receive feedback from a single faculty member. Faculty time to complete the evaluations of student images was 10.5 hours. The average score was 25.8 out of 28. Only 3 images out of the 903 total images submitted had to be remediated, and belonged to 3 separate students. All three students obtained sufficient images in the remediation OSCE using only the narrative feedback from faculty and their own self study. **Conclusions**: An ultrasound OSCE with asynchronous feedback made performing the assessment feasible from a faculty standpoint. It reduced the required time to perform a large scale ultrasound OSCE by 83%. More than 99.9% of images were performed sufficiently using this method, making it feasible for students as well. Students received rigorous feedback from their primary ultrasound faculty that was both standardized and tailored to each individual, offering superior feedback to that generated by a volunteer faculty pool with varying interest in medical education. The asynchronous ultrasound OSCE was a successful, practical, potentially superior method of assessing medical student image acquisition skills. **References**: None.

Fundamentals of Clinical Ultrasound: A Hands-On Curriculum for Pre-Clinical Medical Students

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Introduction: Point-of-care ultrasound (POCUS) continues to gain traction in clinical medicine for its portability and capacity for real-time imaging. Despite a growing movement to incorporate ultrasound into undergraduate medical education, there remains a shortage of learning opportunities, especially for hands-on practice. We aimed to address this issue by piloting a structured ultrasound education program at the Renaissance School of Medicine (RSOM). Herein, we describe the development, implementation, and outcomes of a series of hands-on ultrasound workshops that combined lectures with hands-on sessions taught by instructors of various skill levels. **Methods**: We offered these workshops to second-year students at RSOM, providing seven sessions over four months. 12 students were enrolled per workshop, totaling 45 unique participants. Each session was taught by four instructors: two second-year medical students (founders of the series) and a fellow and attending physician in Emergency Medicine. Topics covered included the cardiac, eFAST, DVT, and shoulder exams. For each workshop, the medical student instructors first provided a PowerPoint presentation on ultrasound basics, followed by an explanation of the relevant scan by the fellow physician. Students then scanned Standardized Patient (SP) actors under instructor supervision. Afterward, students completed an anonymous Qualtrics post-workshop survey. **Results**: A 5-point Likert scale (1 = not effective at all, 5 = extremely effective) was used. Students found scanning on Standardized Patients (95% CI: 4.3-4.9) and instructors of various skill levels (95% CI: 3.8-4.6) to be the most effective resources. 5-minute Sono videos were minimally effective (95% CI: 2.1-3.7). Across instructor levels, attending physician (95% CI: 4.2-4.8), fellow physician, (95% CI: 3.4-4.6), and medical student level (95% CI: 3.9-4.7) were rated similarly, without significant differences in effectiveness (p>0.2). Student competence (1 = no experience, 4 = able to perform independently) after workshops also demonstrated significant improvements: including in recognizing relevant anatomy (95% CI: 1.4-3.2 before, 2.6-4.0 after, p<0.0001) and performing the indicated scan (95% CI: 1.0-2.8 before, 2.7-3.9 after, p<0.0001). Additionally, participants were asked, “What did you like best about the workshops?” Responses included “… opportunity to physically maneuver the probe…” “…direct guidance”; “multiple people teaching”. **Conclusions**: In our workshops, employing a variety of instructor levels and scanning real people (SPs) were highly effective learning modalities. Students derived significantly less benefit from videos. Interestingly, no significant difference in effectiveness was seen between attending, fellow, and medical student instructors. Instead, the combination of teaching methods provided by individuals at these different training levels likely improved students’ learning experiences. Integrating multiple resources within the workshops led to significant improvements in self-reported ultrasound competence. To further expand ultrasound education, future efforts may consider incorporating instructors of various skill levels in the curriculum and increasing the amount of supervised clinical instruction. **References**: 1. So S, Patel RM, Orebaugh SL. Ultrasound imaging in medical student education: Impact on learning anatomy and physical diagnosis. Anatomical Sciences Education. 2017;10(2):176-189. 2. Oteri V, Occhipinti F, Gribaudo G, Marastoni F, Chisari E. Integration of ultrasound in medical School: Effects on Physical Examination Skills of Undergraduates. Med Sci Educ. 2020;30(1):417-427. 3. Alerhand S, Choi A, Ostrovsky I, et al. Integrating Basic and Clinical Sciences Using Point-of-Care Renal Ultrasound for Preclerkship Education. MedEdPORTAL. 16:11037.

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An Asynchronous Ultrasound Curriculum For Internal Medicine Clerkships - A Pilot Study

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Introduction: The objective is to describe and report results of a pilot education program for an asynchronously delivered ultrasound curriculum for internal medicine clerkships. **Methods**: An asynchronously delivered ultrasound curriculum was piloted in an internal medicine clerkship for third year medical students. Students who participated in this pilot had completed two years of preclinical ultrasound curriculum and passed image acquisition testing prior to starting their clerkships. Students had a hand held ultrasound during the clerkship to allow them to complete the learning modules and assignments, and more easily scan their own patients. Students completed online modules and were encouraged to engage in exploratory ultrasound learning. Assessments consisted of a patient write up with a discussion of medical decision making for incorporation of ultrasound, image submissions with ratings and feedback, and a pathology/medical decision making multiple choice quiz. The image submissions were rated on a scale from 0-2 for two categories: image anatomic content and technical elements (depth, gain, and settings). A score of >1 in each of the two categories was required to pass the assignment. Students submitted five views for the assignment which included the IVC, parasternal long, subxiphoid, anterior lung, and costophrenic angle. Students' scores for each assignment were analyzed via descriptive statistics. Students' responses to an end of course survey were also qualitatively analyzed for themes. student qualitative analysis. Faculty time for grading assignments were also recorded to determine faculty effort required for the pilot. **Results**: One hundred and ten students completed the curriculum and were included for analysis. For the image acquisition assignment the mean score for each image was 1.79 (SD=0.21). The mean scores for image quality ranged from a low of 1.62(SD=0.66) for the costophrenic angle to a high of 1.90 (SD=0.51) for the inferior vena cava. The mean scores for image settings ranged from a low of 1.73 (SD=0.51) for the inferior vena cava to 1.90 (SD=0.30) for the parasternal long cardiac view. The majority of the students passed the image submission assignment without resubmissions (89%). Twelve students had to resubmit images without requiring in person remediation to correct the views. The mean score on the MCQ pathology recognition quiz was 78% (SD=15%). For the pass/no-pass patient write up all students received a pass and variable amounts of written feedback to further guide their development of medical decision making skills for ultrasound. Seventy-seven students completed the end of course survey. The majority of students reported the curriculum extremely or moderately improved their: clinical reasoning (72%), learning of pathophysiology (69%), and patient care (55%). We analyzed student free text responses using qualitative content analysis revealed themes that included improved “medical decision making and patient care” and creating “opportunities for independent practice” of ultrasound. Faculty time for the image submission assignment was 5 minutes per student and 10 minutes per student for the medical decision making patient write up assignment. **Conclusions**: An asynchronous delivered ultrasound curriculum for clerkships allows students greater access to ultrasound learning when ultrasound trained faculty availability is limited. Students had access to educational modules that were clinically focused to support their ultrasound learning on their internal medicine clerkship. They reported this helped them improve their medical decision making and patient care. Students also had access to ultrasound probes, which they reported using for independent practice to further build skills. Asynchronous feedback via assignments addressed the skills of medical decision making and pathology recognition, allowing faculty to give feedback and assess students’ knowledge. While published methods of ultrasound curriculum delivery for clerkships is largely based on scanning rounds with faculty or ultrasound lab sessions, this is labor intensive and not feasible for many medical schools due to the cost of faculty time and lack of sufficiently trained faculty to conduct such teaching. These methods also do not encourage students to build ultrasound into their medical decision making skills that they are developing with the patients they personally care for during their clerkships. This method of asynchronously delivered ultrasound

curriculum makes ultrasound learning in the clinical environment more accessible, especially for ultrasound curricula with limited ultrasound faculty or financial support for faculty time. It also provides more consistent feedback as the primary ultrasound faculty delivering the preclinical curriculum was able to deliver this curriculum in its entirety. Additionally, it encourages students to scan their own patients and engage in exploratory learning, which ultrasound training that is confined to specific times and environments may not. For students with robust preclinical curricula that promote the development of independent scanning skills, an synchronously delivered ultrasound curriculum is a viable method to deliver ultrasound training in clerkships and wisely use limited ultrasound faculty resources to maximize available learning for students. **References**: None.

See one, do one, teach one: Recruiting advanced ultrasound medical students for peer and near-peer proctoring.

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Introduction: There has been increasing focus on education in bedside ultrasonography. Incorporation of ultrasonography education in medical school curricula is restricted by limited faculty resources to provide adequate teaching and oversight. Peer and near-peer education is a form of teaching that involves tutors who are of the same or at least one academic year ahead of the person being tutored. This education strategy has been shown to be effective at teaching bedside ultrasonography and alleviate the number of faculty instructors required. Despite the benefit of student proctors, there is not a clear method to recruit and train peer and near-peer proctors. **Methods**: Third and fourth year medical students who had completed basic and intermediate ultrasound courses were offered enrollment into an advanced ultrasound course that ran from September 2022 to May 2023. Students in the advanced course attended hands-on scanning sessions and pathology lectures, completed quizzes on ultrasound topics and were required to individually spend 15 hours on supplementary ultrasound education of their choosing with a component of those 15 hours coming from proctoring. Proctoring signups from students in the advanced course were tracked over this period. Proctors were provided with resources to prepare to teach a particular scan that they signed up for. Proctors demonstrated their scan while reviewing indications for the scan, optimal techniques for adequate image acquisition, interpretation of the images and relevant medical decision making based on the findings (I-AIM method). **Results**: 59 students enrolled in the advanced ultrasound course. In total, the enrolled students signed up for 212 hours of proctoring, averaging 3.6 proctoring hours per student. Students who completed the advanced course averaged 8.2 proctoring hours per student. Students proctored for first, second and third year medical students and high school students. Through the year, 95.6% of events that requested student proctors were fully staffed. **Conclusions**: Medical students enrolled in advanced ultrasound courses can be recruited for peer and near-peer proctoring. **References**: 1. Jeppesen KM, Bahner DP. Teaching bedside sonography using peer mentoring: a prospective randomized trial. J Ultrasound Med. Mar 2012;31(3):455-9. doi:10.7863/jum.2012.31.3.455 2. Rong K, Lee G, Herbst MK. Effectiveness of Near-Peer Versus Faculty Point-of-Care Ultrasound Instruction to Third-Year Medical Students. Pocus j. 2022;7(2):239-244. doi:10.24908/pocus.v7i2.15746
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Sound Visionaries: Connecting a Community Through Ophthalmic Ultrasound Education

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Introduction: Point of care ultrasound (POCUS) has become a mainstay of most medical specialties, including ophthalmology, yet there are few training pathways in medical school. Additionally, there is insufficient clinical exposure during pre-clinical years for students to make an informed speciality selection and cultivate mentorship.Specialty-specific ultrasound communities of practices (COP) can help by providing primarily first and second year medical students with early clinical exposure and mentorship through the medium of ultrasound. The Ultrasound in Ophthalmology Community of Practice (USO COP) is a student-run interest group promoting the use of POCUS in ophthalmology and emergency medicine. Our mission is to unite medical students, residents, fellows, and faculty through Clinical, Administrative, Research, and Education (CARE) initiatives in the Department of Ophthalmology at Ohio State. **Methods**: We are a registered student organization with 30 medical students, residents, and faculty as members. The executive committee was initially composed of a President, Treasurer, and Secretary, but we quickly recognized a need for an Education Chair and Research Chair as the community grew. Two resident-led journal clubs are held per year with guidance from attendings. **Results**: Introductory event: Attendance was limited to 20 members to ensure quality of instruction and experience. We first reviewed safety concepts like thermal and mechanical indices, indications, and detection of pathologies (e.g. retinal detachments, dislocated lenses, vitreous hemorrhage). We then offered hands-on scanning opportunities using a linear probe on an X-porte machine, an ophthalmic B-scan probe, and a physical exam triage skills station, all with attending physician oversight. Curriculum: Members can attend a morning teaching session on the principles of ophthalmic ultrasound with hands-on scans. Subsequently, students work with sonographers and an ocular oncologist to appreciate the role of clinical ultrasound to diagnose and monitor pathology. Students may take a post-curriculum evaluation to assess their knowledge, confidence, and skills. Developmental Milestones: Directions for USO COP focus on growth as measured by “Developmental Milestones” (Table 1), which are standardized goals denoting five levels of achievement in Clinical Patient Care, Education, Research, and Administration (Figure 1). USO COP has made advances in Administration and Research, with room for growth in Education and Clinical Patient Care. **Conclusions**: Our next goals are to achieve Level 3 milestones in Clinical Patient Care and Education. We hope our community may eventually serve as a model to other programs looking to build relationships with medical students through ultrasonography. **References**: Bahner, D.P., Royall, N.A. (2018). Undergraduate Ultrasound Education. In: Tayal, V., Blaivas, M., Foster, T. (eds) Ultrasound Program Management. Springer, Cham.

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Delivering a 3-Hour POCUS Right Upper Quadrant Learning Method for First Year Medical Students

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Introduction: Abdominal examination of the right upper quadrant (RUQ) is extremely important regarding physical examination, point of care ultrasound (POCUS), pathology and differential diagnosis. Following a keen visual observation, RUQ palpation is performed at superficial and deep levels. This is notoriously problematic for many first-year medical students (MS1's) as the arrangement of anatomy is generally difficult to grasp even when skin, superficial fascia and muscles are removed. Thus, when these layers are intact in the living, palpation of structures, air and fluid appear both vague and frustrating. Simultaneous, pre and/or post POCUS with palpation would aid connecting the kinesthetic sense from the hand with RUQ structures/spaces. MS1's become less frustrated and indeed motivated to master RUQ palpation when integrated with sonoanatomy during POCUS teaching sessions. The objective of this study was to deliver a learning methodology for MS1's to identify RUQ palpation landmarks, conduct POCUS and interpret sonoanatomy aiding physical examination, imaging and critical thinking skills. **Methods**: MS1's (N=102) received formal 2-hour live interactive recorded POCUS teaching sessions with first hour as PowerPoint didactic lecture sharing ideal probe types, sonoanatomy surface landmarks and image structures/spaces. Second hour POCUS demonstration with volunteer patient using full cart and handheld POCUS systems. Finally, a 1-hour POCUS workshop session is attended by each student on a team of 3, using a handheld GE Vscan-air (5-12Hz) probe and Fukuda Denshi cart system with conventional and Sonivate finger probes. During the hour workshop, each MS1 has 20 minutes (20min) of individual probe scanning time on the RUQ (list of palpation and image acquisitions is required), 20min observing or volunteering as a patient (being positioned and asked questions by the scanning person) and 20min identifying structures/spaces from ultrasound imaging. Assigned ultrasound MS2 TA's and a floating ultrasound faculty help support workshop learning objectives. US board style MCQ's with normal and basic pathophysiology were given and a voluntary 8-min practical exam was administered. **Results**: MS1's N=102 passed US MCQ's with at least 80%, and 29 students participated in voluntary POCUS practical exam. 29 (100%) passed the practical exam with 6 (21%) receiving honors. RUQ has significant common pathologies originating from its indigenous structures and interestingly fluid created from pathologies away from the RUQ can also be identified within RUQ. Adding POCUS when learning physical examination skills provides interest, curiosity and motivation helping confirm palpation skills. Perhaps successful physical examination and POCUS are better taught side by side. **Conclusions**: This study demonstrated a successful RUQ POCUS 3-hour learning method for MS1's, consisting of live interactive 1-hr PowerPoint, 1-hr patient demonstration and 1-hr hands on workshop with teams of 3-students allowing 20min of individual probe scanning time resulting in over 80% on US MCQ's and 6 honors from 8min practical assessment. **References**: Bloom BA, Gibbons RC. Focused Assessment With Sonography for Trauma. [Updated 2023 Feb 5]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470479/ Brandon, Caroline and others, 'Focused Assessment with Sonography in Trauma (FAST)', in Alan Chiem, and Vi Am Dinh (eds), Emergency and Clinical Ultrasound Board Review, Medical Specialty Board Review (New York, 2020; online edn, Oxford Academic, 1 June 2020), https://doi.org/10.1093/med/9780190696825.003.0001, accessed 11 Aug. 2023.

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Implementation of Musculoskeletal Ultrasound Education in the Pre-Clinical Years of Medical School

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Introduction: Ultrasound is an increasingly common tool in clinical medicine with uses in virtually every specialty(1). While many medical schools do have some form of introduction to ultrasound as part of their curriculum, not all schools have adopted ultrasound training as a formal curricular component(2). We sought to implement an ultrasound education experience for medical students in their first year of medical school to assess the feasibility of broader implementation into the pre-clinical curriculum in the future. **Methods**: At our institution, the medical school curriculum is organized into blocks focusing on different organ systems. Our study took place during the first of these, called the "Bone and Muscle block," which involves significant anatomy, dissection, and physical exam teaching. Ultrasound sessions were created and led as a coordinated effort between ultrasound faculty, Bone and Muscle block faculty leaders, upper-level medical students with training in MSK US, and volunteer models; they focused on ultrasound identification of knee, shoulder, and wrist anatomy. Sessions were optional for students. The sessions consisted of a short presentation taught by a 4th-year student enrolled in Honors Ultrasound, followed by small group hands-on ultrasound skills at 3 stations: knee, shoulder, and wrist ultrasound. At the end of each session, students were encouraged to complete an optional survey about their experience. A total of 6 identical sessions were scheduled, allowing for a maximum of 180 students overall. **Results**: 169 students participated in the optional ultrasound sessions, with 84.3% of those who completed the survey reporting that the ultrasound session helped solidify their understanding of musculoskeletal anatomy, while 15.7% were indifferent. Of the subjective feedback collected in the surveys, 99% were positive. Comments included mentioning how helpful the session was to learn anatomy, how the size of the groups and time was well-allocated, and appreciation for the structure of the sessions during which scans were demonstrated before students used the probes themselves. **Conclusions**: The primary objective of this study was to utilize ultrasound in the Bone and Muscle block to assist medical students in learning relevant musculoskeletal anatomy. This study showed an overall positive impact on students' learning, with students preferring to keep the session as part of the LSI Bone and Muscle block. Furthermore, students reported that the sessions were overall beneficial and helped them to solidify their knowledge of musculoskeletal anatomy. This experience shows the feasibility of a more formal curricular implementation in the future. **References**: 1. Patel SG, Benninger B, Mirjalili SA. Integrating ultrasound into modern medical curricula. Clin Anat. 2017;30(4):452-60.
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Transesophageal Echocardiography – Student Early Engagement in Didactic Sonography (TEE-SEEDS)

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Introduction: Ultrasound training in medical education presents a novel opportunity to increase competence in anatomy, imaging skills, and clinical correlates. Transesophageal echocardiography (TEE) is an essential diagnostic tool for many cardiac pathologies, particularly when transthoracic echocardiography fails. Recent advances in TEE simulator technology enable student education without patient risk. Our hypothesis was that a simulator-based TEE training method would improve the confidence, knowledge, and skills of medical students without prior TEE instruction, and that students with more general ultrasound experience would benefit the most. **Methods**: Second-year students with moderate ultrasound training and fourth-year ultrasound students with extensive ultrasound training were recruited. Participants took pre- and post-training confidence surveys on cardiac anatomy, general ultrasound, cardiac ultrasound, and TEE. They also took a 15-question TEE knowledge quiz pre- and post-intervention. The subjects watched an instructional video on basic TEE views and identification of anatomic structures on a HeartWorks simulator prior to live training. After training, participants were instructed to obtain mid-esophageal four-chamber, mid-esophageal long-axis, transgastric-short, and mid-esophageal bi-caval views to assess their skills, indicating heart chambers and main vessels on all TEE images. **Results**: Data was collected from 10 second-year and 7 fourth-year medical students. The second-year students significantly improved their knowledge scores by 37.9% (p=0.006), averaging 13.1/15 correct responses. The fourth-year students also significantly increased their test scores by 34.0% to 13.4/15 (p=0.01). Second-year students significantly increased their confidence across all categories including: cardiac anatomy (16.9%), general ultrasound (29.8%), cardiac ultrasound (47.6%), and TEE (400%). Fourth-year students reported even greater significant rises in confidence for cardiac anatomy (37.7%), general ultrasound (40.8%), cardiac ultrasound (65.0%), and TEE (446%). All participants successfully obtained all four TEE views and accurately identified anatomical structures. **Conclusions**: This pilot study demonstrates the feasibility of this training method on a cohort of medical students with varied ultrasound experience. The data suggests that our TEE training protocol with hands-on simulator practice increases medical student knowledge, confidence, and skills in using TEE. The applied teaching protocol was more effective at building TEE confidence in the latter stages of medical training. The results of this study could assist educators in effectively implementing TEE training into the medical curricula. Further investigation with a larger sample size can help determine the best way to implement TEE training in medical schools. **References**: N/A

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Using asynchronous ultrasound modules to demonstrate musculoskeletal anatomy: a pilot study

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Introduction: With the recent widespread availability of ultrasound technology, it has become an increasingly popular point of care tool. However, ultrasound is a highly user dependent skill. Providing medical students with ultrasound experience early in their training can increase their comfort with the imaging modality and increase their accuracy in obtaining and interpreting ultrasound images. Additionally, the use of ultrasound instruction in conjunction with anatomy education has been shown to enhance students' understanding of the musculoskeletal system. Despite the benefits, there are many barriers to incorporating ultrasound into medical education - specifically limited curricular space and faculty availability. This project aims to reduce the burden on the curriculum and faculty by designing musculoskeletal ultrasound modules to be used asynchronously. **Methods**: Wrist, shoulder, and ankle modules were developed to reinforce the M1 anatomy curriculum at our institution. The modules focused on structures that students are expected to learn in their anatomy curriculum. Additionally, correlation with other imaging modalities and clinical scenarios were included. Handheld ultrasound machines are available for students to checkout and use. The modules were made available to students during a pilot period and students who used the module(s) were asked to complete a survey regarding the usefulness of the module(s). **Results**: During this pilot, three students completed modules. Two students completed the shoulder module and one completed the wrist module. Students perceived the modules as helpful in regards to reinforcing musculoskeletal anatomy and incorporating ultrasound into their education. Some had difficulty replicating the images shown in the modules on their own. **Conclusions**: A pilot of asynchronous modules to aid in understanding of musculoskeletal anatomy using ultrasound was well received by learners and may be a valuable addition to our curriculum. **References**: Walrod BJ, Schroeder A, Conroy MJ, Boucher LC, Bockbrader M, Way DP, McCamey KL, Hartz CA, Jonesco MA, Bahner DP. Does Ultrasound-Enhanced Instruction of Musculoskeletal Anatomy Improve Physical Examination Skills of First-Year Medical Students? J Ultrasound Med. 2018 Jan;37(1):225-232. Chen, WT., Kang, YN., Wang, TC. et al. Does ultrasound education improve anatomy learning? Effects of the Parallel Ultrasound Hands-on (PUSH) undergraduate medicine course. BMC Med Educ 22, 207 (2022).

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Undergraduate Ultrasound Training in Osteopathic Medical Education and Various Healthcare Colleges at Des Moines University

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Introduction: Des Moines University has developed a vertically integrated ultrasound (US) curriculum into a multidisciplinary healthcare educational system. This work outlines how we have implemented US throughout the medical training in different healthcare curricula to help students feel confident operating an US machine, performing exams to find the desired image through proper probe selection and manipulation, and interpreting the digital images with proper communication relative to their training. A vertical curriculum is most developed for the osteopathic medical students. **Methods**: We review the US training in different healthcare curriculum, student champions, student teaching assistants, limited faculty champions, equipment and resources needed to deliver US training in interdisciplinary healthcare professional undergraduate education. A survey of the ultrasound curriculum from the osteopathic medical students in each class was completed using Likert scale options from 2017 to 2021. **Results**: The open lab is well attended by DO students compared to other students with the strongest attendance in the fall semester. Data from the surveys has shown that ultrasound exposure and confidence has grown all four years from OMSI to OMSIV. Survey results from 2019 demonstrated that 71.6% of third year DMU students either "liked" or "strongly liked" their ultrasound experience during didactic years. In addition, 74.7% said learning the e-FAST and RUSH exams improved their understanding of trauma and shock. Three years of data shows that observation, interpreting results, operating equipment, and ultrasound support of diagnostic reasoning has increased during their 3rd and 4th year clinical rotations. **Conclusions**: Ultrasound training has increased in the DMU curriculum with more exposure across the colleges at DMU since 2017. Over four years of medical school confident in using ultrasound equipment has significantly grown while being somewhat confident is significantly reduced. Exposure to ultrasound use, interpretation, and diagnostic reasoning is significant during the 3rd and 4th osteopathic clinical years. The ultrasound curriculum is well received amongst osteopathic students and students from other colleges. **References**: 1. Hoppmann RA, Rao VV, Poston MB, Howe DB, Howe DB, Hunt PS, Fowler SD, Paulman LE, Wells JR, Richeson NA, Catalana PV, Thomas LK, Wilson LB, Cook T, Riffle S, Neuffer, FH, McCallum JB, Keisler BD, Brown RS, Gregg AR, Sims KM, Powell CK, Garber MD, Morrison JE, Owens WB, Carnevale KA, Jennings WR, Fletcher S; An Integrated Ultrasound Curriculum (iUSC) for Medical Students: Four Year Experience. Crit Ultrasound J, 3:1-12, 2011. 2. Oksana H. Baltarowich, MD, Donald N. Di Salvo, MD, Leslie M. Scoutt, MD, Douglas L. Brown, MD, Christian W. Cox, MD, Michael A. DiPietro, MD, Daniel I. Glazer, MD, Ulrike M. Hamper, MD, MBA, Maria A. Manning, MD, Levon N. Nazarian, MD, Janet A. Neutze, MD, Miriam Romero, MD, Jason W. Stephenson, MD, and Theodore J. Dubinsky, MD; National Ultrasound Curriculum for Medical Students. Ultrasound Quarterly, 30(1): 13-19, 2014. 3. Danika K. Evans, DO, Molly E.W. Thiessen, MD; Novel Approach to Introducing an Ultrasonography Curriculum with Limited Instructor Resources. J Am Osteopath Assoc. 119(8): 533-540, 2019. 4. Denise Rizzolo, PhD, MS, PA-C; Rachel Krackov, PhD, MPAS, PA-C, RVS; PA use of point-of-care ultrasound: A pilot survey. Journal of the American Academy of Physician Assistants. 31(6): 2018. 5. Tatyana Kondrashova, MD, PhD, Peter Kondrashov PhD, Integration of Ultrasonography into the Undergraduate Medical Curriculum: Seven Years of Experience. Missouri Medicine 115(1):38-43, 2018.

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Incorporating an ultrasound assessment station into existing standardized patient encounters

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Introduction: Ultrasound training is increasingly incorporated into medical education. With the addition of ultrasound to the curriculum, comes the need for assessment. There are many methods that are used to assess ultrasound knowledge: multiple choice questions, image rating, Objective Structured Clinical Exams (OSCEs), direct observation, self-assessment, Objective Structured Assessment of Ultrasound Skills (OSAUS), etc. Many of these methods require curricular time and require experienced faculty. We describe adding an ultrasound station to two standardized patient (SP) encounters during the M2 year to limit curricular and faculty time required for assessment. **Methods**: At our institution, M2 students participate in 7 SP encounters per year. An ultrasound station was added to two of these encounters. The SP encounters chosen for ultrasound (1) had a chief concern that could require ultrasound evaluation and (2) were immediately after students learned the relevant ultrasound exam. The students completed their traditional SP encounter and then moved to a different room to complete an assigned ultrasound task. SPs were utilized for scanning. The students were allowed to get technical help with machine issues but were not given other assistance. They were given 10 minutes to obtain and label a specified view/image. The images were saved and SP provided feedback to the student regarding professionalism, explanation of the exam, draping/modesty, etc. **Results**: At our institution, 60 M2 students per year complete the two ultrasound assessments. In the Fall semester, they obtain a cardiac image as part of a chest pain SP encounter. In the Spring semester, they obtain and measure an image of an aorta during an abdominal pain SP encounter. Both ultrasound assessments occur the week after the students learn the corresponding ultrasound exams. Incorporation of ultrasound assessment into existing SP encounters negated the need for additional curricular time. Faculty time required was 9 hours for each session; although a technician familiar with ultrasound equipment could be used instead. The asynchronous grading required approximately 6 hours of faculty time per year. **Conclusions**: We describe a method of ultrasound assessment that can be incorporated into existing SP encounters without increasing curricular time or requiring a large faculty commitment. **References**: Zayyan M. Objective structured clinical examination: the assessment of choice. Oman Med J. 2011;26(4):219-222. Kissin EY, Grayson PC, Cannella AC, DeMarco PJ, Evangelisto A, Goyal J, et al. Musculoskeletal Ultrasound Objective Structured Clinical Examination: An Assessment of the Test. Arthritis Care & Research. 2014;66:2-6., Höhne E, Recker F, Dietrich CF, Schäfer VS. Assessment Methods in Medical Ultrasound Education. Front Med (Lausanne). 2022;9:871957.

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A Pilot Structured Point-of-Care Ultrasound Curriculum for an Off-Service Rotation during Emergency Medicine Residency

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Introduction: Conventional Point-of-Care Ultrasound (POCUS) education during Emergency Medicine (EM) Residency provides an orientation didactic and hands-on session followed by longitudinal scanning requirements during Emergency Medicine rotations, among other asynchronous and simulated activities. Given that most PGY-1 EM residents spend the majority of their PGY-1 year on off-service rotations, POCUS knowledge and skills wane which makes incorporating POCUS into clinical workflow difficult. This pilot structured curriculum will reinforce POCUS knowledge and skills during an off-service rotation by providing PGY-1 residents a handheld POCUS device and novel objectives to increase their

medical knowledge of POCUS, to increase skills in acquiring and interpreting scans, and to increase likelihood and comfort of performing POCUS in the Emergency Department. This curriculum aims to unearth the potential for POCUS education in the unexplored territory of off-service rotations during EM residency. **Methods**: A novel curriculum adapted from ACEP Guidelines on Emergency Ultrasound will be presented to PGY-1 residents for the duration of their 4-week Nephrology rotation at an academic urban hospital with an EM residency between September 25, 2023 until September 27, 2025. The curriculum involves providing residents a handheld POCUS device (Butterfly iQ+) connected to their hospital-provided iPhone, POCUS goals and objectives for predefined ACEP core applications, as well as expert faculty feedback of saved studies. A pre-rotation survey will collect previous experience with POCUS, comfort performing core applications, and attitudes toward incorporating POCUS clinically. A pre-rotation exam will collect baseline medical knowledge pertaining to image acquisition and interpretation. A post-rotation survey and exam will assess the amount of ultrasound faculty-approved scans performed, changes in comfort performing POCUS, attitudes toward incorporating POCUS clinically and changes in medical knowledge. **Results**: Ongoing research intends to demonstrate benefit of an off-service POCUS curriculum to augment conventional education and improve resident comfort and competency performing POCUS in the ED. **Conclusions**: A novel structured POCUS curriculum intends to explore the untapped educational potential of performing POCUS during an off-service rotation to improve the educational experience of EM residents. If successful, the curriculum will be expanded to numerous off-service rotations reinforcing and strengthening POCUS knowledge and skills longitudinally throughout residency training. **References**: American College of Emergency Physicians. (2017). Ultrasound Guidelines: Emergency, Point-of-care, and Clinical Ultrasound Guidelines in Medicine. Annals of Emergency Medicine, 69(5), e27-e54. doi:10.1016/j.annemergmed.2016.08.45 Kirkpatrick DL, Kirkpatrick JD. Evaluating training programs: The four levels. 3rd ed. San Francisco: Berrett-Koehler Publishers; 2006. Bhagra A, Tierney DM, Sekiguchi H, Soni NJ. Point-ofCare Ultrasonography for Primary Care Physicians and General Internists. Mayo Clin Proc 2016;91:1811-1827 Schnittke N, Damewood S. Identifying and Overcoming Barriers to Resident Use of Point-of-Care Ultrasound. West J Emerg Med 2019;20:918-925. Brant, J.A., Orsborn, J., Good, R. et al. Evaluating a longitudinal point-of-care-ultrasound (POCUS) curriculum for pediatric residents. BMC Med Educ 21, 64 (2021). https://doi.org/10.1186/s12909-021-02488-z Robert N Geis, MC, USN and others, Novel Internal Medicine Residency Ultrasound Curriculum Led by Critical Care and Emergency Medicine Staff, Military Medicine, Volume 188, Issue 5-6, May-June 2023, Pages e936–e941, https://doi.org/10.1093/milmed/usab392 AEM Educ Train. 2020 Jul 20;4(3):212-222. doi: 10.1002/aet2.10463. eCollection 2020 Jul. Damewood SC, Leo M, Bailitz J, Gottlieb M, Liu R, Hoffmann B, Gaspari RJ. Tools for Measuring Clinical Ultrasound Competency: Recommendations From the Ultrasound Competency Work Group. AEM Educ Train. 2019 Jul 30;4(Suppl 1):S106-S112. doi: 10.1002/aet2.10368. PMID: 32072114; PMCID: PMC7011402. Bahner DP, Hughes D, Royall NA. I-AIM: a novel model for teaching and performing focused sonography. J Ultrasound Med. 2012 Feb;31(2):295-300. doi: 10.7863/jum.2012.31.2.295. PMID: 22298874.
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Almost FAM-US: Implementing a Longitudinal POCUS Curriculum in a Family Medicine Program

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Introduction: Point-of-Care Ultrasound (POCUS) has become an essential skill for providing quality medical care. The Accredited Council for Graduate Medical Education updated their program requirements in 2022 for Family Medicine residencies, recommending integrated POCUS training into their curriculums. The AAFP has also published POCUS Guidelines as a framework to establishing a curriculum. However, formulating and implementing a longitudinal POCUS curriculum remains a daunting task. Prior to 2020, our program was only teaching POCUS during electives, with a significant gap in POCUS training for the majority of residents. We aimed to implement a longitudinal POCUS curriculum embedded in our FM residency program, focusing on the learning objectives of education on image acquisition, image interpretation, and clinical integration. **Methods**: During 2020-2022, our program held quarterly POCUS training workshops in mixed formats of virtual and cohorted in-person teaching due to COVID restrictions. Development of a longitudinal POCUS curriculum was initiated in Spring of 2022. Nine POCUS workshops were implemented throughout the academic year of 2022-2023, teaching a core spectrum of POCUS topics. Workshops were lead by a lead FM instructor, with supporting faculty/fellows from IM. Most workshops used standardized patients as scanning models, with trainings housed in a simulation center. The abdominal and lung sessions were paired with paracentesis and thoracentesis training. We also piloted working with Sensitive Exam Training Associates (SETAs) for the pelvic ultrasound workshop. Asynchronous learning modules were provided via Global Ultrasound Institute. **Results**: All nine workshops were successfully conducted. Feedback was collected about the educational value and instructional quality, in addition to free-text feedback. Each session rated highly in terms of educational value, with 100% of responses rated with "Good" or "Excellent." Residents rated quality of instruction close to 100% "Good" or "Excellent," with only 1 "Satisfactory" in the MSK session. Positive feedback comments from residents included the wide variety of topics, hands-on time, instructor expertise, and standardized patients. Residents desired smaller instructor-to-learner ratios, case-based learning, phantom models for procedural training, and formal teaching on documentation. Uploading images for review, as well as consistent clinical documentation proved challenging for the residents. **Conclusions**: Over three academic years, OHSU Family Medicine was successful in implementing a longitudinal POCUS curriculum into resident training. Formats for training are highly modifiable depending on programmatic needs. Residents rated our curriculum highly, with hopes to build on their skills from repeating the curriculum year-to-year. Our ultimate goal would be to graduate FM residents with POCUS skills as a core competency. **References**: American Association of Family Physicians. Recommended Curriculum Guidelines for Family Medicine Residents Point of Care Ultrasound. Reprint accessed October 2021. https://www.aafp. org/dam/AAFP/documents/medical_education_ residency/program_directors/Reprint290D_POCUS. pdf

POCUS Champion Pathway: Innovative Training Structure Supporting the Ultrasound Curriculum of a large Internal Medicine Residency Program

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Introduction: The Wake Forest Internal Medicine (IM) residency consisting of 116 residents started a point-of-care ultrasound (POCUS) curriculum in 2017. We have since exhausted the protected time allotted for POCUS education with workshops and didactics. We therefore created a POCUS Champion Pathway to advance our curriculum further. Here, we describe the structure of this training pathway and the impact it is having on the IM POCUS curriculum and medical school. **Methods**: The POCUS Champion Pathway cultivates diagnostic, clinical reasoning, medical management, and procedural skills. It provides guidance for teaching POCUS. Interested rising upper-level residents apply for this pathway each spring. If accepted, they undergo multimodal POUCS Champion training between May – August, consisting of: 1) online curriculum, 2) written test, 3) simulator instruction/competency assessment, 4) supervised scanning ("gel rounds"). Residents earn the "POCUS Champion" title after completing all training requirements. They become ultrasound advocates, instructors, and leaders. POCUS Champions educate others through: 1) POCUS Focus Noon Report presentations. 2) teaching/encouraging POCUS in the clinical setting, 3) hosting procedure workshops, 4) supervising "gel rounds" for the medical school's POCUS elective, 5) mini-presentations during POCUS Champion Pathway conferences. **Results**: Twenty-eight (2021), 29 (2022), and 32 (2023) residents accepted into the POCUS Champion Pathway the past three years completed POCUS Champion training. All passed the written and scanning assessment, and 100% felt their training increased their comfort level performing and interpreting POCUS exams. Collectively, IM residents were performing a couple hundred POCUS exams each academic year (2018-2021) prior to the POCUS Champion Pathway's inaugural year in 2021. IM residents logged 942 POCUS exams during the 2021-2022 academic year and 2,155 exams during the 2022-2023 academic year. IM clerkship medical students observed over 850 POCUS exams and performed over 720 POCUS exams with resident led clinical instruction the past two years. The satisfaction rating for our POCUS curriculum has shifted from unsatisfied in 2017 to satisfied/extremely satisfied in 2023. **Conclusions**: The POCUS Champion Pathway advances our POCUS curriculum while working within the confines of the residency structure. It increases comfort, curriculum satisfaction, and clinical use. The key to POCUS proficiency is frequent repetition. Workshops and didactics introduce concepts, but continued use in practice is an essential part of our learning theory. The IM resident POCUS Champions are pivotal to this. Upper-level IM residents spend the most time with interns and students on their inpatient teams. Resident POCUS Champions perpetuate a culture of using ultrasound on the wards and interns learn while simultaneously caring for patients. We as educators must remember that learners can evolve into teachers and teachers continue to learn through experience. The POCUS Champion Pathway embraces this concept and guides residents to become proficient in this skill and then pay it forward. **References**: https://school.wakehealth.edu/education-and-training/residencies-and-fellowships/internal-medicine-residency/curriculum-overview/point-of-care-ultrasound-curriculum

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Just In Time! Assessment of Resident Point of Care Ultrasound Attitudes and Behaviors with the Implementation of a Just in Time Ultrasound Training at Two Internal Medicine Programs.

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Introduction: Point-of-care ultrasound (POCUS) holds exciting potential for physicians to improve bedside care. Within internal medicine (IM), trainees have expressed high sustained interest leading to rapid growth in POCUS curricula over the past decade. The workshop or bootcamp format is widely popular within IM, likely owing to the time limited nature and ease of logistical management. However, this framework has been shown to limited by skill decay, as modeled by Spaced Repetition Theory. We endeavored to explore the impact of an integrated just-in-time (JIT) POCUS curriculum on IM residents' POCUS behaviors and attitudes after assessing baseline practice patterns that occurred in addition to already implemented workshop experiences through the lens of Kirkpatrick's Model of Learning Outcomes. We assessed the impact of these curricula on self-reported attitudes toward POCUS documentation habits, scanning confidence (Kirkpatrick Level 2-Learning), and practice patterns(Kirkpatrick Level 3-Behavior). Lastly, we characterized factors that influenced POCUS work in actual clinical care (Kirkpatrick Level 3-Behavior). **Methods**: This observational cross-sectional survey study conducted at two institutions (Oregon Health & Science University and the University of Nebraska Medical Center) assessed baseline practice patterns for POCUS use and documentation behavior and measured the impact of workflow training activities and a JIT POCUS training curricula on resident reported changes in scanning confidence, practice patterns, and documentation habits via a survey. Descriptive statistics were calculated. **Results**: Self-reported personal and team use of POCUS during ward rotations was similar at about 65.0% during the Observational and Workflow Training Phases, which increased to 89.5% in the Just-in-Time Training phase (p=0.024). Frequency of documenting (mean=41.4 vs 53.4; p=0.463), archiving images (mean=17.2 vs 57.0; p=0.001) or doing both (mean 15.6 vs 39.6; p=0.039) increased consistently over study phases. Personal POCUS use was correlated with team POCUS use (0.431; p<0.001), comfort with POCUS use 0.293 (p=0.01) and co-resident POCUS use (0.242; p=0.035). Attending POCUS use, availability of POCUS devices and perceptions of POCUS usefulness in patient care were not correlated with personal POCUS use. **Conclusions**: We found moderate but statistically significant improvements in both resident and team performance of POCUS and reported documentation habits, which suggests that the JITT intervention may be helpful. More supervising attending faculty need to be trained in POCUS because their clinical expertise could advance resident learning even further by providing scaffolded learning experiences and setting expectations for residents to adequate document their examinations. **References**:

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reFOCUS on POCUS: Pilot for Behavior Change in one Urban, Academic Emergency Department

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Introduction: Learning POCUS image acquisition, interpretation, and documentation is an essential part of EM residency training. Not all EM physicians have had the opportunity of learning POCUS as a part of their curriculum. Learning and using a new skillset may be challenging post residency, without protected education time. This initiative provided quick disruptive interventions to change behaviors in one urban, academic ED. We aimed to create a psychologically safe environment for attending POCUS education. We incorporated clinical environment coaching with a virtual classroom teaching. The goal was 1) to increase the quantity and quality of scans and 2) to increase attendings' confidence and comfort level with image acquisition, interpretation, and documentation. **Methods**: A needs assessment was performed by conducting informal interviews and pre-surveys for ED faculty. The image archive was reviewed. The top five commonly used types of POCUS in the ED, the number of these high yield scans, the percentage of complete versus incomplete scans, and the percentage of complete verses incomplete documentations were analyzed. Short didactics and side-by-side teaching were derived from the preliminary assessment. "ReFOCUS on POCUS" is a six-month curriculum comprised of six high yield topics. At each faculty meeting, a high yield topic is micro-dosed for 15 minutes in a virtual classroom style, open to questions and discussions. The first meeting was an introductory session that covered knobology, machine operation, image archive access, and image documentation. As requested by some faculty, the subsequent two lectures covered obstetrics and DVT. The three remainder sessions targeted lungs, skin and soft tissue, and shoulder. In addition to short didactics, the ultrasound team was available for in-person coaching shifts and clinical shifts. They also provided direct feedback on image acquisition, interpretation, and documentation. **Results**: There were 22 obstetrics scans over 11-week period prior to the obstetrics lecture and 35 obstetrics scans over 11-week period post obstetrics lecture. There was 7.8% non-compliance of attending documentation before the introductory lecture and 4.6% non-compliance of attending documentation post introductory lecture. **Conclusions**: Changing behavior is challenging. Fostering a psychologically safe learning environment with structured monthly lectures and readily available coaching from experts facilitated a behavior change in our department. This is an ongoing project, with a promising outcome thus far. We expect continued improvement of compliance rate with documentation and billing, quantity and quality of scans, and confidence and comfort levels of attendings throughout the year. **References**: 1. Impact of Instructional Practices on Student Satisfaction with Attendings' Teaching in the Inpatient Component of Internal Medicine Clerkships - JGIM, Cassandra M. Guarino, PhD 2. Proof That Positive Work Cultures Are More Productive - Harvard Business Review, Emma Seppala 3. Practical Framework for Fostering a Positive Learning Environment - Pediatrics, Susan L. Bannister, MD, MEd

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Embedding Structured Ultrasound Simulator Sessions into Residency Point-of-Care Ultrasound Training

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Introduction: Point-of-care ultrasound (POCUS) is evolving into a necessary multi-disciplinary clinical skill. Professional internal medicine (IM) organizations support POCUS integration across the education continuum (UME, GME, CME). The Wake Forest School of Medicine IM residency developed a multimodal POCUS curriculum that includes didactics, modules, workshops, ultrasound simulators, and supervised clinical scanning. Here, we report on a unique way we use our ultrasound simulator and the impact it has on IM resident POCUS training. **Methods**: We designed a structured 2-hour small group (2 trainees with 1 instructor) training session on a high-fidelity ultrasound simulator. The educational goals of these sessions include: 1) understanding probe selection and movements, 2) obtaining adequate views of the heart, inferior vena cava (IVC), and lungs, 3) incorporating POCUS into clinical reasoning, 4) recognizing commonly encountered pathology, 5) developing skills to teach POCUS to others. Additionally, the instructor uses a predefined evaluation checklist to assess each residents' knowledge, understanding, scanning skill, and overall competency. These sessions are for 2nd and 3rd year IM residents with prior introductory ultrasound training. Nearly half of the upper level IM residents undergo these ultrasound simulator sessions at the start of each academic year. **Results**: Twenty-eight residents in 2021, 29 residents in 2022, and 32 residents in 2023 participated in these simulator sessions with the same one instructor. One hundred percent of participants completed and passed the ultrasound simulator training and competency assessment. Seventy-one residents completed a post-session survey, and 97% percent strongly agreed or agreed the ultrasound simulator session improved their clinical POCUS skills and ability to teach POCUS. Those who participated are performing significantly more heart, IVC, and lung POCUS exams in the clinical setting than their resident counterparts who did not participate. They are also providing more POCUS instruction to interns and medical students in the clinical setting. Medical students on the inpatient IM clerkship received more resident-led POCUS instruction on the wards after embedding these ultrasound simulator sessions into our IM resident POCUS training. **Conclusions**: Ultrasound simulator training fosters fundamental POCUS concepts and cultivates psychomotor and cognitive skills. Simulators allow pathology recognition in a risk-free environment. Structured simulator sessions offer consistent teaching, practice, and evaluation opportunities. Encouraging use and frequent repetition through various modalities are essential components of our learning theory for POCUS education during residency. Our structured small group ultrasound simulator session allows for competency assessment while simultaneously provides a controlled and engaging learning experience that enhances the trainees understanding and builds confidence to practice their POCUS skills in the clinical setting. Utilizing ultrasound simulation technology to augment POCUS training in the clinical, didactic, and workshop setting is generalizable to all medical fields across the education continuum. Institutional access to an ultrasound simulator influences feasibility. **References**: LoPresti, C. M., Jensen, T. P., Dversdal, R. K., & Astiz, D. J. (2019). Point-of-Care Ultrasound for Internal Medicine Residency Training: A Position Statement from the Alliance of Academic Internal Medicine. The American Journal of Medicine, 132(11), 1356–1360.

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Poster Presentations

Poster 1: Echoes of Potential: Utilizing Ultrasound to Inspire the Next Generation of STEM

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Introduction: An expanding gap exists between the country's science, technology, engineering, and mathematics job market and the number of individuals qualified to fill these positions (Athanasia). Early STEM educational opportunities and career exposure have the potential to cultivate interest amongst students and ultimately bolster the STEM workforce. Therefore, we propose early exposure during community outreach events in collaboration with other foundational sciences, including anatomy. We believe this experience will help advance students' understanding of STEM and promote the pursuance of related careers. **Methods**: The Ohio State University's Division of Anatomy hosts year-round outreach events culminating in May with Anatomy Outreach Days. High schools around Ohio travel to the Columbus campus and rotate throughout OSU's five laboratories, completing activities related to the various body systems. This year, the College of Medicine's Ultrasound Interest Group (USIG) took part in Anatomy Outreach Day, running a room dedicated solely to ultrasound. The ultrasound room contained five different stations, four dedicated to teaching a specific scan (cardiac, FAST, thyroid/neck, and MSK) and one simulation, Bodyworks Eve. Eve is a female patient simulator with an extensive range of cases and pathologies spanning the clavicle to the pelvis. Medical student proctors taught students and assisted with scanning. Each classroom was allotted thirty minutes total, rotating stations every six minutes. Students could practice scanning on their own after observing each demonstration. **Results**: 13 different Ohio high schools, totaling 350 student participants, attended Anatomy Outreach Day this year. Through various testimonials and verbal feedback, we deduced that ultrasound was subjectively the most popular activity. A teacher who has attended Anatomy Outreach Day with her classes for over a decade commented, "This has always been such an integral part of my anatomy curriculum because it has literally been the deciding factor for so many as to whether they were going to continue in their chosen field or not." Feedback from students echoed these sentiments. Many noted ultrasound was a "favorite" part of their day, one student concluding, "ultrasound can be used for so much more than pregnancy" and another even saying "ultrasound is what I will do for my career." **Conclusions**: Ohio State's Anatomy Outreach Day was a beneficial experience that allowed students to engage in STEM educational activities as well as connect with professionals in the field. Specifically, the ultrasound room provided fun hands-on training, live visualization of structures, and a comfortable environment to observe the anatomy. **References**: Athanasia, G. & Cota, J. (2022, April 1). The U.S. Should Strengthen STEM Education to Remain Globally Competitive. CSIS. https://www.csis.org/blogs/perspectives-innovation/us-should-strengthen-stem-education-remain-globally-competitive

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Poster 2: Empowering High School Students through Virtual Anatomy and Ultrasound Integration: Advancing STEM Education in Detroit Public Schools

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Introduction: Ultrasound technology and virtual anatomy have revolutionized medical practice by offering real-time visualization and diagnostic capabilities. Recognizing the potential to enhance STEM (Science, Technology, Engineering, and Mathematics) education and foster interest in healthcare careers among high school students, this study aims to investigate the impact of integrating virtual anatomy and ultrasound into the curriculum of Detroit Public Schools. The purpose is to bridge the gap in knowledge and competence related to visual identification on ultrasound scans, virtual cadaver sections, X-ray images, and MRI images, providing students with essential skills for future success in the medical field. To achieve this objective, a comprehensive educational program has been designed, harnessing virtual reality (VR) technology and hands-on ultrasound training. The program aims to engage high school students in interactive learning experiences, enabling them to explore and interpret complex medical images in a dynamic virtual environment. Students will gain exposure to ultrasound imaging, analyze virtual cadaver sections, interpret X-ray and MRI images, and practice visual identification techniques. **Methods**: The program is rooted in constructivist learning theory, which posits that students learn best when actively engaged in hands-on experiences and real-world problem-solving. The integration of virtual anatomy and ultrasound aligns with this framework, as it fosters experiential learning and encourages students to explore STEM concepts in a practical and immersive manner (Jonassen, 1999). A mixed-methods approach will be employed to collect data and evaluate the program's impact. Pre- and post-assessments will be conducted to measure changes in students' knowledge, competence, and performance related to visual identification and interpretation of medical images. Additionally, qualitative data will be gathered through student feedback and surveys to assess the program's effectiveness in fostering interest in STEM and healthcare careers. **Results**: Preliminary findings are expected to demonstrate significant improvements in students' ability to identify anatomical structures and interpret medical images accurately. The program's hands-on approach and virtual learning experiences are anticipated to positively influence students' interest and confidence in pursuing healthcare careers, particularly among underrepresented minorities (Rafiee et al., 2020). **Conclusions**: In conclusion, the integration of virtual anatomy and ultrasound offers a novel and engaging approach to STEM education for high school students. By bridging the gap in visual identification skills and fostering interest in healthcare careers, this innovative program has the potential to significantly impact the future of healthcare workforce diversity and excellence in Detroit Public Schools. **References**:

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Poster 3: Point of Care Ultrasound in the PA Curriculum: Taking Our Cues From Medical Education

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Introduction: Physician Assistant/Associate (PA) education mirrors that of undergraduate medical education with a didactic phase and a clinical phase. When undergraduate medical education changes, PA education tends to follow. Point of care ultrasound (POCUS) is commonly integrated into the undergraduate medical education curriculum. Anecdotally, it is known that POCUS is also integrated into PA curricula. The purpose of this mixed methods study was to evaluate current POCUS practice at PA programs and compare and contrast them to undergraduate medical education curricula. **Methods**: This study utilized a mixed methods, multistrand, sequential design. Quantitative and qualitative data was collected from each strand of the study to enrich the validity of the findings by triangulation and mutual corroboration. Initially a survey was administered to all PA programs in the United States to determine where POCUS is taught and why as well as how a POCUS curriculum was implemented. Participants were also asked if they would complete an interview. Six PA faculty members representing the Midwest, West and Southern regions of the Physician Assistant Education Association were interviewed. Interviews were recorded, transcribed and evaluated using NVivo qualitative analysis software. **Results**: The faculty data was a sample of 95 PA program directors or faculty members. The majority of participants were from private (n = 54, 56.8%) or public (n = 34, 35.8%) nonprofit institutions. The majority of the sample (81.7%) teaches POCUS in some capacity. Teaching methods used in all programs involved hands-on, small-group instruction. Most participants reported that the teaching methods were designed to give students only a basic introduction to POCUS. The courses that POCUS can be tied to are the practical courses such as clinical skills, procedures, or diagnostic techniques. In general, POCUS was taught during the didactic year (n = 45, 57.4%), followed by being taught in both the didactic and clinic years (35.9%). According to the literature, most accredited medical schools had a POCUS curriculum in place typically during years one and two that teaches fundamentals, diagnostics and procedures. A minority of schools have a curriculum across all four years. **Conclusions**: Point of Care Ultrasound is being taught in the PA curriculum as it is in undergraduate medical education. Although PA education mirrors that of undergraduate medical education, there are differences, most significantly the abbreviated PA curriculum. Therefore, PA POCUS tends to be taught within the clinical courses with a practical component as opposed to the general science courses in the undergraduate medical education curriculum. PA graduates are expected to be practice ready upon graduation and typically do not complete a residency where medical graduates will go on to complete a residency where they can hone their POCUS skills. However, just like undergraduate medical education, the PA profession has not come to a consensus on national standards for students. Future effort should be made to develop national standards for both PA and undergraduate medical education. **References**:

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Poster 4: Establishing Central Financial Leadership for Ultrasound Communities-of-Practice

Amanda Fawcett, B.S., The Ohio State University College of Medicine, Columbus, OH

Introduction: The Ultrasound Interest Group (USIG) is one of the most active student organizations at The Ohio State University College of Medicine, and OSUCOM has a robust extracurricular ultrasound curriculum. USIG has many "Community of Practice" (COP) subsidiaries, which are dedicated to the use of point-of-care ultrasound in a specific medical specialty. Though USIG has been long-established as an officially recognized student organization, the COPs historically have not met this standard. Officially recognized student organizations are eligible for many resources offered by the university, including up to $4,000 per year to spend on programs and speaker events. COPs provide an opportunity for students to practice the clinical use of ultrasound as it relates to their specialty of interest and meet mentors in their intended field. However, there is a gap between the goal of COPs and their actual role in the medical school community. The purpose of this project seeks to identify these barriers and establish more central leadership and COP guidance. **Methods**: A survey was distributed to all 30 COP Executive Board Members across 13 COPs. Student organizations officially recognized by The Ohio State University are required to have, at a minimum, a president, a vice president, and a treasurer. Other organizations may have additional executive board members depending on their needs. Some COPs are not officially recognized by the university at this time because they do not have the minimum three required executive board members. The survey included statements such as "I don't know how to register as a student organization" and "I don't know how to request funding from the university." COP leaders were asked to respond to questions on a scale of 1-5, with 1 corresponding to "Not at all a barrier/concern" and 5 corresponding to "One of the biggest barriers/concerns." All survey responses were kept anonymous. **Results**: In this study, the largest barriers identified by COP leaders were related to the financial duties related to running a COP, including not knowing how to obtain an EIN, open a business checking account, or apply for university funding. In order to better support the COP leaders in their initiatives, a COP Guidelines document was created and distributed to COP leaders. This included a detailed breakdown of how to establish as a recognized student organization, an overview of the funding resources available to each COP and how COP leaders could apply for them, and a sample timeline with a budget for the upcoming year. **Conclusions**: More data is needed to extrapolate the impact of these COP organizations on the campus community. Additionally, each COP will be followed over the duration of a year and will be asked to report out what they accomplished. Our hope is that guidelines specifically addressing the financial aspects will serve as a foundation, enabling the COPs to hold more events and involve more faculty and residents. Moving forward, with this guidance, we hope active and engaged COPs will become the standard at OSUCOM.

References: N/A

Poster 5: Introducing Eve: A High Fidelity Ultrasound Simulation for Preclinical Students

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Introduction: BodyWorks Eve is a high-fidelity ultrasound simulation mannequin that can be controlled via a tablet to demonstrate normal and pathological ultrasound findings in real time. At Ohio State University College of Medicine (OSUCOM), BodyWorks Eve is used mainly in the clinical years to prepare students for their rotations. However, preclinical students get little exposure to abnormal ultrasound findings. Some framework already exists to teach hands-on ultrasound to preclinical medical students as part of their regular curriculum, but it is difficult to see pathology on otherwise healthy student volunteers. OSUCOM students consistently demonstrate an interest in ultrasound education; out of 427 enrolled preclinical students, 260 were engaged in an ultrasound curriculum outside of the required curriculum. However, this leaves nearly 40% of students with very little ultrasound exposure during their preclinical years. Point-of-Care Ultrasound simulation can assist in teaching anatomy and serve as an adjunct to the physical exam. Furthermore, studies have demonstrated that with brief training, medical students were able to successfully identify ultrasound pathology with up to 93% accuracy. The goal of this project is to introduce BodyWorks Eve simulator into the preclinical medical school curriculum, so medical students can see examples of abnormal pathology in real-time, but in a low-stakes scenario. **Methods**: Preclinical curriculum at Ohio State is divided into eight "blocks," including Foundations 1, Foundations 2, Bone and Muscle, Cardiopulmonary, Endocrine and Reproductive, Neurology, GI and Renal, and Host Defense. Of these, the Cardiopulmonary, Endocrine and Reproductive, and GI and Renal blocks are best suited for scanning sessions using BodyWorks Eve. **Results**: BodyWorks Eve will be integrated as a station during existing ultrasound education sessions where medical students scan on other medical student volunteers. During the cardiopulmonary block, BodyWorks Eve will be used to demonstrate a pericardial effusion, right heart strain, and B-lines on a lung ultrasound. During the GI and Renal block, Eve will be used to demonstrate gallbladder pathology, hydronephrosis, and a positive FAST scan. Eve will be used during the Endocrine and Reproductive block to demonstrate an intrauterine and ectopic pregnancy. **Conclusions**: More data is needed after BodyWorks Eve is successfully integrated into Ohio State's preclinical curriculum. The goal is for medical students to gain more clinical ultrasound exposure, regardless of their extracurricular ultrasound involvement. **References**: 1.Johri AM, Durbin J, Newbigging J, et al. Cardiac Point-of-Care Ultrasound: State-of-the-Art in Medical School Education. Journal of the American Society of Echocardiography. 2018;31(7):749-760. doi: https://doi.org/10.1016/j.echo.2018.01.014 2. Andersen GN, Viset A, Mjølstad OC, Salvesen Ø, Dalen H, Haugen BO. Feasibility and accuracy of point-of-care pocket-size ultrasonography performed by medical students. BMC Medical Education. 2014;14(1). doi: https://doi.org/10.1186/1472-6920-14-156

Poster 6: Intermediate Medical Student Ultrasound Education

Abigail Buckley, Medical Student, The Ohio State University College of Medicine, Columbus, OH

Introduction: The Ohio State University College of Medicine is home to the Ultrasound Interest Group (USIG), an extracurricular organization that implements near peer ultrasound training and education at the medical student level. As ultrasound integration into the formal curricular is present, demand from students for more US training in medical school is taken on by the USIG and its faculty advisors. USIG is currently structured into three courses that students can elect to complete in sequential order beginning in any year of their training. First, Beginner Ultrasound (BUS), is intended to create an ultrasound foundation. Next, Intermediate Ultrasound (IUS), is intended to build confidence in the clinical applications of ultrasound and technical skills. Finally, Advanced Ultrasound (AUS), is intended to understand ultrasound integration in career planning and practice relevant ultrasound-guided procedures. **Methods**: The IUS program is a critical halfway point for these students to solidify their foundational skills while also moving to the next level. Normally students complete this course during their M2 year when they finish pre-clinicals and are preparing for rotations and using ultrasound more in patient interactions. Last year, IUS had a preliminary roster of 103 students. Eighty seven took the mandatory pretest, and 80 successfully completed the course. There were three structured scans including an OB/Gyn, Hepatobiliary, and Aorta scan. Students were required to teach scans, participate as ultrasound models, and complete pre-and post scan learning material and quizzes. Because IUS occurs at such a pivotal time in medical training, we want to expand its attendance and clinical learning. We will be implementing a neurology scan, which will include an eye and orbit scan, a brachial plexus scan, and learning material on fetal brain scans. We will adjust the scanning order to better align with the medical school's curriculum and update the requirements to assure that students are learning efficiently and not being burdened with required hours. We will also be developing additional scanning videos, reorganizing the learning objectives and resources for each scan into one document to streamline resource effectiveness. **Results**: We will be assessing the efficacy of our teaching by surveying the students and tracking performance and retention. **Conclusions**: Ultrasound education is clinically relevant and its expansion at the medical student level will help develop these skills at an early point in clinical training. We look forward to this year and creating effective changes in the IUS curriculum.

References: N/A

Co-Authors: Andrew Atoa, David Bahner MD

Poster 7: CLASS, A Proposed Grading System for Evaluating Cardiac Ultrasound Images: Helping students rise to the top of the CLASS

Alexia Markowski, Medical Student, The Ohio State University College of Medicine, Columbus, OH

Introduction: Ultrasound has been taught in undergraduate medical education and is an extremely useful educational tool. While echocardiography is a complicated task to obtain quality ultrasound images, it takes access to equipment and time to practice. Our medical students had access to portable ultrasound devices capable of imaging the heart with proprietary software and learning tools, including artificial intelligence software installed. Due to in person training limitations during the pandemic, innovative ways to provide learning cardiac ultrasound were created. Since there is not an accepted grading system for the evaluation of educational cardiac ultrasound images, our team thought a grading rubric could be helpful as a component to teaching cardiac ultrasound to novice learners. There is currently not any objective grading criteria specific to cardiac ultrasound. Previous assessments used for certain ultrasound modes focused on technical quality and other studies have tried computer-based grading models, but many are either still in development or not widely used (Sassaroli 2019).
CLASS, which stands for Chirality, Location, Anatomy, Size/Shape, and Septum, is a grading criteria rubric designed specifically for quantifying the quality of educational cardiac ultrasound images at our institution. One design advantage of CLASS could be that its use as a self-guided learning tool could help when faculty or in person resources are not readily available. The objective of this study was to determine whether second-year medical students utilizing the CLASS rubric could obtain better quality images than those without exposure to this rubric. **Methods**: This prospective educational study consisted of twenty-six second-year medical students (Class of 2024) from a tertiary academic center with an affiliated medical school. These students were randomized into a control with no access to the CLASS rubric, or intervention group with access to the CLASS rubric. All students were provided a portable ultrasound device for two weeks and were instructed to obtain and save two sets of four common cardiac images (subxiphoid, parasternal long axis, parasternal short axis, and apical four chamber), first at the beginning and then at the end of the period. All images were saved on a jump drive from each device and uploaded for grading by two faculty experts. All students received a generalized resource handout including instructions on the basics of cardiac image acquisition and using the ultrasound device. Thirteen students were given a handout with the details of the CLASS grading system, with examples of both high quality and poor quality images. Each student completed pre- and post-tests to determine their baseline ultrasound knowledge as well as how often they practiced with the device during the study period. All submitted images were graded using the CLASS rubric [Chirality (0 = wrong image orientation, indicator backward, 1= correct image orientation, indicator backward, 2 = correct image orientation, correct indicator placement) Location/Anatomy (0=wrong location/anatomy per view, 1= correct location/anatomy/view), Size/Shape (0 = wrong size or shape of structures/view, 1= correct/view), and Septum (0 = wrong orientation of interventricular septum, 1= correct orientation))] Each image could be scored from 0=5 and a set of four images received a score from zero to twenty). The data obtained was analyzed using student t-test and data from the pre-survey that was obtained using a Likert scale was converted into a numerical format and was also analyzed used student t-test.
Results: The average score for images obtained by students within the control group in their first set was 8.923, and the average for images obtained by students within the CLASS group in their first set was 9.154 (P = 0.907). The average score for images obtained by students within the control group in their second set was 9.833 and the average score for images obtained by students within the CLASS group in their second set was 11.083 (P = 0.587). Students were evaluated before the study began with a pre-test that tested their basic ultrasound knowledge pertaining to the four cardiac views (graded out of 10 points). The average on the pretest for the students in the CLASS group was 5.154, and the average within the control group was 4.5 (P = 0.513). Students also reported how comfortable they felt using an

ultrasound probe on a scale of 1 to 5 (1 being extremely uncomfortable and 5 being extremely comfortable). The average score within the CLASS group was a 2.462, and the average score within the control group was 2.167 (P = 0.518). Finally, students were asked to report how many ultrasound scans they had completed on a scale of 1 to 5 (1 being no scans and 5 being more than 6 scans). The average score within the CLASS group was a 3.154, and the average score within the control group was 2.333 (P = 0.126). **Conclusions**: Access to handheld ultrasound devices and early independent scanning opportunities for medical students can be beneficial yet more research is needed in optimizing learning when resources and expertise is limited. Grading rubrics like CLASS may be helpful with the education of novice learners yet this study failed to show statistical significance. Despite this, future studies using the CLASS rubric in a more controlled in person learning environment may demonstrate an impact of it as a teaching tool within medical education. In person and independent ultrasound education is evolving as our health systems adapt to limited access to resources and perhaps more at-home, hands-on experience. Self-guided rubrics such as CLASS may be types of tools that help students focus their attention on the key components of obtaining quality cardiac ultrasound imaging. **References**: Sassaroli E, Crake C, Scorza A, Kim DS, Park MA. Image quality evaluation of ultrasound imaging systems: advanced B-modes. J Appl Clin Med Phys. 2019;20(3):115-124.

Co-Authors: Alexia Markowski, David Bahner MD, Michael Prats MD

Poster 8: Impact of a Collaborative Approach to OBGYN Ultrasound Education Using a Community of Practice Model

Victoria El-Hayek, Medical Student, The Ohio State University College of Medicine, Columbus, OH

Introduction: Historically, medical school ultrasound education has provided a broad overview of ultrasound technology. Efforts have been made to refine this education through Community of Practice (COP) models, but specialty-specific training, such as in OBGYN, has faced limitations due to the knowledge base of medical students coordinating events. Consequently, opportunities for skill development in OBGYN ultrasound may be constrained by resources, mentorship, and organized learning methods. At our institution, we addressed this issue by establishing OBGYN Ultrasound Community of Practice Interest Groups (US COP IGs) that bring together students, residents, and faculty interested in expanding their ultrasound knowledge. Collaboration in developing scans and events is expected to create enriching learning opportunities, disseminate the latest information and innovations, and offer a more immersive educational experience for medical students interested in OBGYN. We hypothesize that this collaborative approach will lead to increased participation in ultrasound scans and higher interest in OBGYN. **Methods**: OBGYN faculty volunteer to proctor scans, give lectures, and provide guidance to the OBGYN COP. A milestone framework was utilized to arrange leadership positions within the COP and a schedule of events for the academic year. Goals and a budget were submitted to a University Digital Union to coordinate registration for this interest group. Recruitment of medical students, residents and a faculty advisor were necessary to organize group activities. Surveys are utilized to gauge interest and knowledge obtained from each experience. **Results**: A faculty advisor and medical student leadership team was formed along with leadership designation of roles and responsibilities for the upcoming year. Research in OBGYN US was organized over the past 5 years from a pubmed search and articles were chosen to host journal clubs to promote understanding of the OBGYN ultrasound literature. Ultrasound workshops aimed at medical students and advanced simulators were coordinated for the year. Budget and university resources were utilized to achieve OBGYN COP goals. **Conclusions**: Utilizing a university interest group mechanism, students interested in OBGYN and a faculty advisor were able to create an ultrasound ecosystem as a community of practice. With sim lab resources and a schedule of events for interested OBGYN practitioners, a community of practice was a mechanism to bring together individuals to help the next generation of OBGYNs who will utilize ultrasound in their practice. Future goals of the COP are to expand the administrative logistics of leadership and milestone achievements based on participation and recruitment of residents and faculty from the field. More research is needed to determine whether early exposure to ultrasound competencies in OBGYN US are beneficial to practitioner confidence and ultimately patient care.

References: NA

Co-Authors: Victoria El-Hayek MPH, Ivana DeVengencie, Jamie Cowen, Alyssa Thompson

Poster 9: Establishing an Application-Based Ultrasound Education Program to Improve Students' Clinical Skills

Zheng Hong Tan, Ph.D., The Ohio State University College of Medicine, Columbus, OH

Introduction: Because much of ultrasound education in medical school has been centered around pre-clinical education, there is a noticeable lack of opportunities for medical students to apply ultrasound skills in a clinical setting. Thus, we are developing an ultrasound education program that allows medical students and trainees to translate the ultrasound skills they have learned as part of their structured medical school education to the bedside. The importance of this program is that ultrasound is a hands-on skill, and it has been established that exposure to clinical presentation helps facilitate learning and mastery of clinical skill sets (1). **Methods**: The Ohio State University's four free clinics (Columbus Free Clinic, La Clinica Latina, Noor Community Clinic, and Asian Health Initiative) together see thousands of patients each year, some of whom require referrals for ultrasound scans. However, it can be difficult for patients to schedule these appointments due to long wait times, availability only during working hours, or limits in transportation. A monthly ultrasound specialty clinic will serve both patients and medical students, as this model will allow medical students to learn ultrasound in a clinical setting. In this program, we aim to have faculty facilitators walk medical students through performing scans that will be used in patients' care before performing the scan together. To access the effectiveness of the program, participants will fill out a survey before and after the clinic to determine their level of confidence in both performing the scan and using the results to guide patient care. Moreover, we will be tracking the number of scans and type of scans conducted to assess the need for ultrasound scans and which types of scans are highest in demand. **Results**: Ultrasound scans within free clinics had been offered at The Ohio State University in 2021 and 2022, which saw a total of 98 patients across the two years. Past clinics in 2021 and 2022 were run differently, with 2021 being conducted as a "consult" service, while 2022 ran in an outpatient model. While there are strengths to both models, they both had issues in terms of continuity of free clinic structure and leadership and were discontinued last year. We thus aim to address this by appointing an ultrasound free clinic coordinator to help ensure the continuity of the program moving forward. **Conclusions**: An ultrasound specialty clinic held in Ohio State's free clinics will increase the availability of imaging and expedite patient care, with the goal of scanning patients within one month of being referred. Further, this will enhance student learning by having them perform ultrasounds in a clinical setting. Hopefully, this model of clinical ultrasound education can be used as a template to be implemented at other institutions. **References**: Reed, T., Pirotte, M., McHugh, M., Oh, L., Lovett, S., Hoyt, A. E., Quinones, D., Adams, W., Gruener, G., & McGaghie, W. C. (2016). Simulation-Based Mastery Learning Improves Medical Student Performance and Retention of Core Clinical Skills. Simulation in healthcare : journal of the Society for Simulation in Healthcare, 11(3), 173–180. https://doi.org/10.1097/SIH.0000000000000154

Co-Authors: Emily Pfahl, Zheng Hong Tan, Carolina Brea, David Bahner, Summit Shah

Poster 10: The Dissemination of Undergraduate Ultrasound Education: 18 years of an Advanced Longitudinal Ultrasound Program

Sonya Sasmal, Medical Student, The Ohio State University College of Medicine, Columbus, OH

Introduction: Ultrasound training in the undergraduate medical curriculum has become more ubiquitous as the importance of early exposure to the imaging modality is recognized. Ohio State has have trained senior students through an advanced ultrasound elective for nearly two decades. Motivated students apply for this longitudinal course to engage in ultrasound lectures from specialty providers, hands-on scanning practice, journal clubs, and completion of an ultrasound project. These students ultimately continue their training in a variety of fields in geographically diverse regions of the country. We report on the outcomes of these students as one way to demonstrate the broad impact that undergraduate ultrasound training can have. **Methods**: Our institution has offered an advanced elective in ultrasound since 2006. Students can choose the Honors Ultrasound course as one of many year-long advanced electives offered during their fourth year. Accepted participants meet with course leadership to discuss career goals and hot to best incorporate point of care ultrasound (POCUS) into clinical practice. Students develop an ultrasound honors project that highlights their existing strengths and aligns with their career goals which is then integrated into the existing ultrasound ecosystem at Ohio State. The students' projects, matching medical specialty, and matching program location were recorded. **Results**: Over an 18-year period, 437 medical students have participated in the Honors Ultrasound elective. Students matched into a total of 19 different specialties. The most common specialties were emergency medicine (34.1%), internal medicine (10.1%), and anesthesia (8.9%). The residencies were most commonly in the Midwest but included all regions in the United States. The scope of student projects included neer-peer teaching of ultrasound as part of the medical school curriculum, volunteering at a free clinic, developing communities of practice surrounding ultrasound, and specialty specific areas related to the needs within their field of choice. **Conclusions**: Teaching ultrasound to 4th year students is a feasible construct that produces students well-versed in an advanced competency during medical school and beyond. Graduates from our advanced ultrasound longitudinal elective go on to practice in a variety of settings. As these students enter various residencies and use POCUS as a basic competency, other studies have shown that ultrasound in the undergraduate medical education can prepare them for those tasks. More research is needed to discern the optimal training for medical students entering various specialties and the parameters of ultrasound training in medical school to supplement education delivered in residency. Continued focus on ultrasound education at the undergraduate level can allow this valuable modality to benefit patient care in a diversity of settings.

References: None

Co-Authors: Sonya Sasmal MS4, David Bahner MD, Michael Prats MD

Poster 11: Improving the Ultrasound Research Process for Medical Students: The Ultrasound Research Interest Group

Sonya Sasmal, Medical Student, The Ohio State University College of Medicine, Columbus, OH

Introduction: Ultrasound in medical care has expanded dramatically in the 21st century since point of care ultrasound (POCUS) has become a part of many specialty practices. This expansion is reflected in the ultrasound ecosystem at Ohio State. Students are engaged in ultrasound leadership through an interest group infrastructure, advanced 4th year elective, and specialty specific communities of practice. These leadership and educational contributions by medical students often go unrecognized in academia although the potential exists. Administrating research teams across the medical education spectrum in a deliberate manner involves planning, coordinating, communicating, and tracking to ensure scholarly outcomes of projects. An Ultrasound Research Interest Group (USRIG) was designed to increase presentations and eventual publications of new ideas and innovation. **Methods**: USRIG was created with a clear goal to coordinate ultrasound projects along the timeline of 3 conferences this year. Organization of team-based project management, facilitating faculty mentorship of projects, and scheduling of virtual and in person meetings was the administrative task of USRIG. The organization of pre-conference workshops to craft abstracts and practice presentations serve as the independent variable. Student participation, number of abstract submissions, acceptance rates, and conference attendance serve as our primary outcomes. This information will be compared to historical data to determine the effectiveness of the newly established USRIG infrastructure. **Results**: A pre-conference abstract workshop for the 8th World Congress of Ultrasound Medical Education (WCUME) 2023 with submission guidelines, writing resources, and faculty guidance was heavily advertised and held one month prior to the abstract submission deadline. There were 30 students who attended this workshop in person or received the resources virtually and we are currently gathering data on abstract submissions and acceptances. Previous data from 2011-2019 at our institution displayed a maximum of 25 ultrasound focused abstracts with student authors to all conferences and journals during one academic year. **Conclusions**: Despite tremendous advancements in ultrasound technology, educational literacy in ultrasound competence and implementation of POCUS in medical specialties is heterogenous at each institution. Coordination of teams of students, physicians, and mentors to measure academic outcomes may be a method to improve ultrasound literacy and its impact on medical care. The USRIG administrative infrastructure served as a conduit to expand student desire to submit their scholarly pursuits in ultrasound with promising initial data for WCUME 2023. This USRIG structure could serve as a model at other institutions to improve communication, teambuilding, scholarly productivity, and advance the integration of ultrasound into academic systems.

References: None

Co-Authors: Sonya Sasmal MS4, David Bahner MD, Michael Prats MD

Poster 12: Impact of an anesthesiology focused ultrasound curriculum on undergraduate medical education

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Introduction: The use of ultrasound has revolutionized the field of anesthesiology and will continue to have a profound future impact. Anesthesiologists utilize ultrasound throughout their scope of practice, including regional nerve blocks, perioperative procedures, establishing secure airways, obtaining vascular access, and rapid identification of pathology. At the Ohio State University College of Medicine, students have the opportunity to learn the basics of ultrasound through the Ultrasound Interest Group curriculum. Students are not exposed to the field of Anesthesiology until their 1 week Anesthesiology rotation in their third year. It is known that early exposure promotes competency.1 To address the lack of early Anesthesiology specific ultrasound exposure, the Anesthesiology Community of Practice (COP) was founded to train medical students to increase their proficiency and comfort by residency. **Methods**: The scope of practice for anesthesia ultrasound included (1) procedural ultrasound (vascular access, nerve blocks, ETT confirmation), (2) cardiac ultrasound (TTE, TEE), (3) gastric ultrasound, and (4) critical care ultrasound (FAST/FATE). There were two lectures with associated hands-on sessions. The first was taught by a pediatric anesthesiologist and addressed scopes of practice (1) and (2) while the latter was taught by an anesthesiologist and addressed (3) and (4). Two in person journal clubs were additionally held. **Results**: Five events were held from August 2022 to May 2023, with an average attendance of 17.8 students (9-30). The most engaging event was the introduction meeting, where 30 participants attended to learn about ultrasound usage in anesthesiology. The first combined lecture and hands on session had 21 participants, while the second had 17. There were 12 participants in the first journal club and 9 participants in the second. Of note, there was 55% more engagement in the faculty lectures compared to the journal clubs, leading us to believe that more engaging events would result in greater student involvement. **Conclusions**: In conclusion, the Anesthesiology COP has taken steps in preparing the next generation of anesthesiologists by hosting journal clubs and guest lectures to foster proficiency and familiarity with ultrasound usage in the field. It was determined that there was a correlation between how engaging an event was to the turnout of the students. Given this finding, in order to promote more interest, more hands-on events should be hosted through the Anesthesiology COP. Future areas of research include comparing this year's events and attendance to the previous year and evaluating the efficacy of the curriculum by assessing student confidence and performance pre- and post- curriculum. **References**: Tarique U, Tang B, Singh M, Kulasegaram KM, Ailon J. Ultrasound Curricula in Undergraduate Medical Education: A Scoping Review. J Ultrasound Med. 2018 Jan;37(1):69-82. doi: 10.1002/jum.14333. Epub 2017 Jul 27. PMID: 28748549.

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Poster 13: Impact of COP involvement on ultrasound experience before Anesthesia residency

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Introduction: Objectives: Students going into Anesthesia must wait until day 1 of residency to get more ultrasound experience • State Problem: Current Medical Education across the country does not have a strong emphasis on hands on ultrasound experience. Students going into anesthesia often have to wait until starting residency programs to get more ultrasound experience. Of note, the Association of Anesthesiologists recommends standardized ultrasound-guided approaches be established for all basic block techniques1 highlighting the growing importance of US to the field. • Solution: We propose that the Ohio State Anesthesia Ultrasound Community of Practice (COP) will provide medical students with a structured group at each level of education to provide students interested in Anesthesia early US experience that will better prepare them for residency. COP's are student led organizations composed of attendings, residents and students designed to engage and educate participants in the field of US through the viewpoint of their desired specialty. The COP's are assessed through four milestone measurements: clinical patient care (C), Education (E), Research (R), and Administration (A). • What are you studying: We hypothesize that students who are a part of the Anesthesia COP will feel more prepared and comfortable using US in residency. **Methods**: • State Problem: Current Medical Education across the country does not have a strong emphasis on hands on ultrasound experience. Students going into anesthesia often have to wait until starting residency programs to get more ultrasound experience. Of note, the Association of Anesthesiologists recommends standardized ultrasound-guided approaches be established for all basic block techniques1 highlighting the growing importance of US to the field. • Solution: We propose that the Ohio State Anesthesia Ultrasound Community of Practice (COP) will provide medical students with a structured group at each level of education to provide students interested in Anesthesia early US experience that will better prepare them for residency. COP's are student led organizations composed of attendings, residents and students designed to engage and educate participants in the field of US through the viewpoint of their desired specialty. The COP's are assessed through four milestone measurements: clinical patient care (C), Education (E), Research (R), and Administration (A). • What are you studying: We hypothesize that students who are a part of the Anesthesia COP will feel more comfortable and prepared to use US in residency. **Results**: The milestone framework offers a comprehensive array of structured objectives to assess COP development. For first through third year medical students the role of the anesthesia COP will be education and exposure to the role of US in the field. Events planned include a scanning session of common nerve blocks. Fourth year medical students will have the opportunity to take part in a bootcamp consisting of common ultrasound techniques and practices relevant to the field of anesthesia. The bootcamp and nerve block scanning will address the Education (E) milestone measurement. **Conclusions**: The Anesthesia COP provides a novel approach to US skill acquisition relevant to the field of Anesthesia. More research is needed to evaluate the impact of anesthesia COPs in medical students' US preparedness before starting residency. **References**: 1. Turbitt LR, Mariano ER, El-Boghdadly K. Future directions in regional anaesthesia: not just for the cognoscenti. Anaesthesia. 2020 Mar;75(3):293-297. doi: 10.1111/anae.14768. Epub 2019 Jul 3. PMID: 31268173.

Poster 14: Development of A Radiology Ultrasound Community of Practice at The Ohio State University

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Introduction: Ultrasound (US) is an essential tool in radiology, and it is unique from other imaging modalities in that it allows radiologists to view and interpret imaging from various angles. US necessitates that the practitioners understand images from multiple oblique angles depending on probe position, unlike other imaging that are primarily obtained at right angles. Mastering US image acquisition and interpretation is crucial for medical students who are pursuing careers in various specialties including radiology. However, limited resources, mentorship, and structured opportunities within medical schools may hinder US skill development. At the Ohio State University (OSU), the radiology US community of practice (COP) interest group was developed to bring together motivated students, residents, and faculty interested in radiology US education. Here, we describe the establishment of a radiology COP and its role in coordinating, scheduling, and tracking academic US activities to further develop knowledge and skills in US. **Methods**: Medical students utilized an ultrasound interest group (USIG) and the COP committee to develop a radiology US COP. A framework based on milestones in research, education, administration, and clinical patient care was utilized to structure leadership positions within the COP and to create a comprehensive schedule of events for the academic year. The group submitted goals, objectives, and a budget to the University Digital Union to register this group with the university. Recruitment of students, residents and a faculty advisor were necessary to organize the group's activities. **Results**: A faculty advisor and medical student leadership team was formed, with designated roles and responsibilities for the upcoming year. Research in radiology US from the past 5 years was organized from a PubMed search, and relevant articles were selected to host journal clubs, promoting understanding of US literature. US workshops for medical students, along with advanced simulators, were coordinated for the upcoming year for hands on sessions. Access to a high-fidelity simulator enabled visualization of normal physiology and pathology from multiple angles. Budget and University resources were crucial in achieving radiology COP goals. **Conclusions**: By utilizing our University's interest group infrastructure and resources, motivated students interested in radiology and a faculty advisor were able to establish an ultrasound structure known as the radiology US COP. Leveraging simulators and educational resources at scheduled events, the radiology US COP developed a mechanism to bring together the next generation of radiologists who will utilize US in their practice. The COP's future goals include improving milestone achievements based on participation and recruitment of residents and faculty experts from Radiology. Further research is required to assess the impact of early exposure to radiology US competencies on practitioner confidence and, ultimately, patient care. **References**: None

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Poster 15: Growth of Ultrasound Communities of Practice at The Ohio State University

Jonathan Zhou, The Ohio State University College of Medicine, Columbus, OH

Introduction: The Ultrasound Interest Group (USIG) at The Ohio State University (OSU) is a student-led organization that is an early innovator in ultrasound (US) education. Without robust US resources, students often encounter barriers in exploring US in the specialty of their interests. As a result, USIG developed US Communities of Practice (COPs) to highlight specialty-specific use of US. COPs are groups of medical students, residents, fellows, and attending physicians that focus on US education in specific specialties. Each COP works to advance US in four aspects of academic medicine milestones: Clinical, Administration, Research, and Education. USIG COP coordinators help create the administrative infrastructure to facilitate COP development and self-sufficiency. **Methods**: To facilitate COP activities, USIG COP coordinators provide a COP starter pack which includes sample COP missions, roles, and responsibilities of members in the organization, and the resources USIG can provide, such as proctors and models for scanning sessions. COPs also receive instructions on how to register as official student organizations with the university to increase access to funding and institutional resources, and it requires annual registration, training, and a faculty advisor. COP coordinators send out a survey each semester to quantitatively assess and measure progress of COP milestones, along with the registration status with the university. Based on this data, each COP is classified as Exemplary, Active, On Probation, or Inactive. **Results**: There are total of 14 COPs at OSU, 2 (14%) have achieved Exemplary status, 9 (65%) are Active, and 3 (21%) are in the process of registering and developing goals. Several COPs have made progress in clinical (3), administrative (5), research (3), and educational (2) milestones since the previous academic year. Average COP milestones were a written scope of practice, an organized basic curriculum involving didactics and hands-on session, initiation of research projects, and successful transition of leadership, respectively. The COP with the highest milestone reached for each category was Internal Medicine, which developed programs for skill maintenance and quality control (clinical), supplied an annual report of progress to USIG board (administrative), catalogued the last five years of research (research), and integrated content into the medical school curriculum (education). **Conclusions**: COP coordinators successfully maintained communication and utilized organized toolsets to provide resources to COP leadership, increase official registration with the university, and further engage the OSU students in US learning in their specialty area of interest. Further steps include increasing engagement from residents and fellows and ensuring that all COP's have access to university funding, which will better position COPs to achieve milestones. Clinical and education milestones are the most challenging to achieve and should be a focus of support from USIG COP leaders. **References**: None

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Poster 16: Maximizing musculoskeletal (MSK) ultrasound (US) initiatives through a MSK US Community of Practice

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Introduction: Due to its easy accessibility, improved technology and reduced cost of use, ultrasound (US) use has increased by about 316% in recent years.1,2 Ultrasound offers numerous benefits in the medical field, especially when dealing with musculoskeletal (MSK) complaints. This imaging modality offers a safe and radiation-free way to visualize MSK structures, making it ideal for bedside diagnostic imaging and guidance of medical procedures.3 Its portability allows for bedside evaluations and its dynamic imaging capabilities provide immediate insights, aiding in quicker diagnosis and treatment.3 While US integration into medical school curriculum has become more common, there is still no nationwide standard set for US use and education.4 Increasing ultrasound education may lead to enhanced patient care, reduced risk and improved outcomes across several specialities. To help broaden the exposure and understanding of US amongst medical students, a Musculoskeletal Community of Practice (CoP), was established at The Ohio State University College of Medicine (OSUCOM). **Methods**: In order to increase the understanding and expansion of US education, a Musculoskeletal CoP was created. This CoP is composed of several attendings, fellows, residents and medical students. Milestone measurements of Ultrasound CoP were implemented with the goal to create a national standard of US medical education. These milestone measurements are used to gauge the growth and understanding of US across four domains; clinical, administration, research and education (CARE). Milestones are measured by level designation, with level 1 being contemplation and level 5 aspiration. CoPs are categorized based on their activity status: active (made progress in at least one of the CARE milestones each quarter), probation (failed to respond to at least one CARE milestone each quarter) or inactive (failed to maintain activity in at least one CARE milestone for a quarter). **Results**: Using the milestone framework we were able to successfully plan and map out goals for this year. To address the education category, we will be hosting quarterly hands-on sessions, including one with the Department of Orthopedics. This session will focus on US exams involving the shoulder, hips and knees. For the research category, we intend to have a quarterly scheduled journal club that will feature five articles, which will be analyzed and discussed each session. **Conclusions**: The MSK CoP is an innovative approach to bring members of each level (medical students to physicians) together to create a uniform US education modality at OSUCOM. It was shown to be effective at categorizing the education improvement using the Milestones measurements. While there was improvement from level 1 to level 2 in the Education category, future efforts should be directed towards reaching level 5, with the goal of implementing these guidelines on a national level. **References**: 1. Smith J, Finnoff JT. Diagnostic and interventional musculoskeletal ultrasound: part 1. Fundamentals. PM R. 2009;1(1):64-75. doi:10.1016/j.pmrj.2008.09.001 2. Sharpe RE, Nazarian LN, Parker L, Rao VM, Levin DC. Dramatically increased musculoskeletal ultrasound utilization from 2000 to 2009, especially by podiatrists in private offices. J Am Coll Radiol. 2012;9(2):141-146. doi:10.1016/j.jacr.2011.09.008 3. Moore CL, Copel JA. Point-of-care ultrasonography. N Engl J Med. 2011;364(8):749-757. doi:10.1056/NEJMra0909487 4. Tarique U, Tang B, Singh M, Kulasegaram KM, Ailon J. Ultrasound curricula in Undergraduate Medical Education: A scoping review. Journal of Ultrasound in Medicine. 2017;37(1):69-82. doi:10.1002/jum.14333

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Poster 17: Medical Student-Faculty Collaboration on Clerkship Ultrasound Curriculum Development in a Limited Resources Setting

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Introduction: Although ultrasound education has proliferated within medical school curricula, institutions are often faced with curriculum challenges resulting from limited faculty and technology resources(1). Our medical students identified the Obstetrics/Gynecology (OB/GYN) clerkship training as a high priority gap in ultrasound skills preparation and expressed a need for continuity of their pre-clerkship ultrasound education into clerkships. Three medical students proposed to assess the need for, and then develop, and implement a sustainable, standardized OB/GYN clerkship session based on APGO clerkship learning objectives with faculty guidance as part of their medical education extracurricular pathway research project. **Methods**: We recruited one OB/GYN faculty member and ten fourth-year medical students to facilitate a new OB/GYN clerkship ultrasound session, designed to be held for each cohort of students rotating through the clerkship every 6 weeks. The 90 minute session consists of three rotating ultrasound stations: a gynecologic case presentation, an obstetric case presentation, and a hands-on transvaginal station using SonoSite machines and two Blue Phantom female pelvis models, simulating an intrauterine pregnancy and ectopic pregnancy. The students completed a pre-session/post-session quiz and a post-session survey. **Results**: From May 2023 to August 2023, we implemented our session for three clerkship cohorts totaling 68 students. We observed a statistically significant difference (p<0.05) in student's pre-session (Mean=4.8, SD=2) and post-session quizzes (Mean=7.2, SD=1.7). Around 85% of students reported feeling more confident about ultrasound interpretation after the session. More than 96% of students believed that simulated transvaginal ultrasound helped develop their skills. Over 98% of students reported that the case vignettes were helpful, the session material complemented the clerkship curriculum, and felt more comfortable discussing ultrasound cases with resident/attending physicians. **Conclusions**: The session provided medical students with a OB/GYN clerkship-specific ultrasound education to prepare them for clinical encounters and established a longitudinal ultrasound curriculum. This was accomplished with collaboration of medical students, a medical education faculty member, and OB/GYN clerkship director. The session is implemented with continuity by a rotating cohort of 3 senior medical students and one faculty supervisor. We aim to have this ultrasound session become permanent within the OB/GYN clerkship curriculum to benefit future classes and to be continued by rising senior medical students recruited. Through a case-based approach and simulation, students integrated their clinical knowledge with dexterous usage of the ultrasound, improved their performance on ultrasound quizzes, and gained confidence in their interpretation skills. Lastly, this model provides senior medical students with a medical education opportunity to train for future professional roles as medical educators in residency and beyond. **References**: Russell FM, Zakeri B, Herbert A, Ferre RM, Leiser A, Wallach PM. The State of Point-of-Care Ultrasound Training in Undergraduate Medical Education: Findings From a National Survey. Acad Med. 2022 May 1;97(5):723-727. doi: 10.1097/ACM.0000000000004512.

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Poster 18: Fostering Sonic Scholars: Educating Medical Students using a Robust Student-Led Ultrasound Interest Group

Jordan Fry, Medical Student, The Ohio State University College of Medicine, Columbus, OH

Introduction: Ultrasound Interest Groups (USIGs) represent student-led entities that center their efforts on imparting and assimilating ultrasound knowledge within the realm of medical education. With the proliferation of extracurricular ultrasound initiatives like USIGs, especially within the context of integrating ultrasound into undergraduate medical education (UME), a necessity arises for a more intricate and sophisticated administrative framework to accommodate the multifaceted trajectories UME ultrasound has embarked upon. We describe the expanded governance of a sophisticated USIG organization to include an executive committee, committee chairs, and a regular transition of leadership that occurs on an annual basis. **Methods**: Utilizing an interest group infrastructure at our University, the USIG student leaders review applications for various USIG leadership positions each year. Each committee is composed of both seasoned and junior students, a stratagem designed to amplify the representation of students at every level, fostering a tiered mentorship architecture that promotes connectivity and ensures a seamless torch-passing of leadership. Each year, student leaders submit overall goals including education curriculum and engagement events as well as a budget developed to allocate funding to university leadership. Committee leaders follow suit and submit goals and plans for the year internally in coordination with advisors and the USIG executive committee. Executive group meetings take place monthly and programming is executed for the academic year before leadership is transitioned. **Results**: USIG is comprised of 375 student members spanning across all four years of medical school, rendering it one of the largest student run organizations at our university. The USIG executive board has 30 members, and they represent 11 key committees that cover basic, intermediate, and advanced ultrasound education curriculum design and delivery, community of practice, engagement, research, and Ultrafest to name a few. We also have key administrative roles including a trained simulated Ultrasound Patient Program (TSUP) and proctor coordinators who manage important logistics for large scale scanning and education sessions. Medical students from all four classes are represented in the USIG organization and tiered mentorship is emphasized to ensure longitudinal success of the interest group and education curriculum. **Conclusions**: The dynamic landscape of ultrasound education in UME and clinical practice remain in a state of continual evolution and expansion. Student organizations focused on ultrasound can help provide valuable leadership and educational experience while also providing tangible curricular support for programs looking to incorporate robust ultrasound education into UME. An executive committee and designated committee structure within an Ultrasound Interest Group can be designed to effectively leverage student commitment and interest to achieve academic outcomes. More research is needed in the optimal governance of USIG organizations and the leadership positions that impact the organizations achievement of goals. **References**: N/A

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Poster 19: Uniting Medical Specialties through a Dynamic Ultrasound-Centered Community of Practice Student Involvement Fair

Farhan Ilyas, Medical Student, The Ohio State University College of Medicine, Columbus, OH

Introduction: A Community of Practice (COP) represents a collaborative endeavor involving medical students, residents, and faculty to enhance specialty-specific ultrasound skills. At our institution, fifteen COPs span medical and surgical specialties, encompassing fields from dermatology to ophthalmology. These COPs facilitate diverse activities such as open scanning sessions employing specialized models or simulating pertinent procedures, relevant lecture series, and interactive group meetings. In recent times, establishing shared purpose and community among the various COPs has presented challenges. This study aims to provide an overview of the current state of COP infrastructure, delineate existing initiatives, and assess the necessity for an event to unify COP groups, thereby fostering increased engagement among medical students and physicians. The secondary objective is to organize a COP Student Involvement Fair to address areas where COPs can better align with the overarching mission of the groups. **Methods**: COP leaders participated in a comprehensive 21-question survey, covering aspects related to COP activities and membership regarding their respective COP. The survey encompassed both qualitative and quantitative questions, including multiple-choice queries, Likert scale assessments, and open-ended prompts. COP leaders shared insights regarding their group's active membership count, hosted events, and connections with specialized faculty. Survey data encompassed responses to the COP Involvement Fair as a concept, these questions are depicted in Figure 1. Open-ended inquiries solicited input on perceived obstacles to goals and strategies for enhancing engagement. Descriptive statistical analyses were employed tour data analysis. **Results**: Representatives from 15 diverse specialties contributed to the survey. Among these, 45.5% reported membership exceeding 10, an equivalent percentage reported 10-20 members, and only one group noted 20-40 members. Approximately 72.7% of the groups held official student organization recognition within the university. Qualitative insights provided by groups highlighted perceived advancements across clinical, educational, research, and administrative/executive domains. Initial Likert scale assessments gauging COP attitudes towards the planned outreach event demonstrated a positive skew, as visualized in Figure 1. **Conclusions**: Study outcomes underscore the inclination of most COP leaders toward a unifying event, affirming its potential to advance individual group goals. Armed with this insight, a COP Student Involvement Fair has been orchestrated to bolster engagement among COP members, harmonize diverse specialties, and augment ultrasound proficiency for participants. We plan to continue our commitment to understanding how we can optimize medical specialty specific ultrasound education through the use of COPs in future research endeavors. **References**: *Figure 1 not compatible with submission format N/A

Co-Authors: Jessica Zimmer, Jordan Fry, Creagh Boulger, David Bahner

Poster 20: Needs Assessment on a Point-of-Care Ultrasound Curriculum at the Frank H. Netter MD School of Medicine at Quinnipiac University

Edison Tenecela, Medical Student, Frank H. Netter MD School of Medicine at Quinnipiac University, North Haven, CT

Introduction: In a U.S. national survey conducted in 2020, 57% of U.S. accredited medical schools mentioned having point-of-care ultrasound (POCUS) as part of their curriculum (Russell et al., 2022). However, current literature describes only some comprehensive programs, with even fewer supported by learning theory and evidence-based approaches (Stone-McLean et al., 2017). Our research focuses on designing a comprehensive ultrasound needs assessment following Kern's six-step model of curriculum development for medical education (Thomas et al., 2016). **Methods**: We distributed a 25-question cross-sectional survey to university-affiliated stakeholders. Furthermore, we designed focus groups for medical students and university faculty to elaborate on needs assessment survey data. We used descriptive statistics to analyze the data using SPSS software and performed thematic analyses of qualitative data from the focus groups. **Results**: Ninety-seven survey participants comprising seventy-one medical students and twenty-six educators (local physician preceptors, clinical & basic science faculty, and medical school leadership members) completed the needs assessment survey with a 25% and 30% response rate, respectively. Most participants agreed that POCUS should be implemented in medical school, and the response was similar between students (92%) and educators (85%). A small percentage thought it would increase student load with somewhat higher endorsement by students (28%) compared to educators (15%). The ideal number of POCUS sessions per year was 4-6 sessions for students (52%) and 1-3 sessions for educators (58%). Approximately half thought POCUS should be an elective instead of mandatory (50% of students and 54% of educators). Our thematic analysis identified several potential barriers/challenges to a POCUS curriculum, including curricular time, educator experience/availability, a need for longitudinal practice, equipment, and a concern for student cognitive overload. **Conclusions**: Most stakeholders supported incorporating a POCUS curriculum at our medical school. Our needs assessment identified several barriers/challenges to consider, including curricular time, educator experience/availability, and a need for longitudinal practice. Our problem identification and needs assessment will direct Kern's subsequent steps of curricular goal and educational strategy development, implementation, and evaluation. This work will hopefully guide future undergraduate medical institutions with similar curricular interests. **References**:

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Poster 21: Impact of Resident-led Ultrasound Workshops on Medical Student Ultrasound Confidence and Competence

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Introduction: Extracurricular groups play an important role in facilitating skills workshops to supplement curricular coursework, especially in the wake of restrictions in hands-on learning that were implemented during the COVID-19 pandemic. We evaluate the efficacy of resident- and student-led ultrasound workshops to improve preclinical medical students' confidence and competence in performing point-of-care ultrasound (POCUS). **Methods**: 59 pre-clinical medical students underwent skills workshops on Knobology and/or the Focused Assessment for Sonography in Trauma (FAST) exam between 2021 and 2022, with each workshop including lecture and hands-on components led by residents and upper-level medical students. Participants completed pre- and post-surveys assessing confidence on pre-defined learning objectives and objective knowledge using multiple-choice questions. Summary statistics and a two-tailed t-test analysis for paired samples was performed to evaluate differences between pre- and post-survey responses. **Results**: For Knobology and FAST, there were improvements in average test scores from pre- to post-survey on knowledge-based questions (p=0.04, p<0.0001, respectively) and in average self-reported comfort with workshop material (p<0.001, p<0.001, respectively). Combined analysis for both workshops revealed an improvement in average test score for knowledge-based questions from 40% to 78% (p<0.001) and in self-reported comfort with workshop material. **Conclusions**: Resident-led skills workshops play an integral role in repairing knowledge gaps left by restrictions in hands-on preclinical education during the COVID-19 pandemic.
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Poster 22: Low-Cost Gelatin Models for Simulation of Ultrasound-Guided Amniocentesis

Emma Schindler, B.A., University of Miami Miller School of Medicine, Miami, FL

Introduction: Ultrasound skills are a key component of medical education in most specialties, especially obstetrics and gynecology (OB/GYN). The limited availability and expense of human models makes ultrasound simulation education in OB/GYN particularly challenging. To expose medical students to the applications of ultrasound in OB/GYN, we developed a novel, low-cost gelatin model to simulate ultrasound-guided amniocentesis. Our report aims to a) describe the development of our gelatin models and b) evaluate their educational value through a pilot workshop among medical students. **Methods**: Four amniocentesis models were made using low-cost supplies including gelatin, bulk laxative, balloons, and uncooked pasta, as detailed in the body of the text. Thirteen students underwent a one-hour amniocentesis workshop, including lecture and hands-on practice led by an OB/GYN resident, maternal-fetal medicine fellow, and senior medical students. Participants completed pre- and post-intervention surveys assessing subjective confidence with the learning objectives using a Likert scale ranging from 'not comfortable' to 'very comfortable', and objective knowledge using multiple-choice questions. Pre- and post- survey responses were analyzed using a paired t-test. **Results**: Participants (N=13, 85% female and 15% male) were predominantly first-year medical students with limited exposure to ultrasound techniques in OB/GYN. There was a statistically significant improvement in the average self-reported confidence with the learning objectives from 'somewhat uncomfortable' to 'somewhat comfortable' (p=0.004). There was also an improvement in the proportion of participants who answered knowledge-based questions correctly on three out of five items, though this difference did not approach significance (p=0.17). **Conclusions**: A one-hour simulation workshop on ultrasound-guided amniocentesis for medical students has the potential to improve learners' confidence and competence with ultrasound techniques. Our amniocentesis models show promise as a cost-effective strategy for exposing medical students to ultrasound applications in OB/GYN, as well as supporting OB/GYN residents to practice ultrasound techniques in a low-stakes setting. This report provides sufficient detail for the replication of this workshop in larger sample sizes of medical students and residents in the future. **References**: Nattagh K, Siauw T, Pouliot J, Hsu IC, Cunha JA. A training phantom for ultrasound-guided needle insertion and suturing. Brachytherapy. Jul-Aug 2014;13(4):413-9. doi:10.1016/j.brachy.2014.01.003 Urbina J, Monks SM, Crawford SB. Simulation in Ultrasound Training for Obstetrics and Gynecology: A Literature Review. Donald School Journal of Ultrasound in Obstetrics and Gynecology. 2021;15(4)doi:https://doi.org/10.5005/jp-journals-10009-1816

Poster 23: Efficacy of an Ultra Brief (One Slide) Presentation to Medical Students on Left Ventricular Ejection Fraction

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Introduction: Point-of-care ultrasound (POCUS) is standard of care in emergency medicine and is now a major educational competency in undergraduate medical education (UGME). Central to POCUS is the ability to visually estimate left ventricular ejection fraction (LVEF). Numerous studies have demonstrated the effectiveness of several educational sessions over multiple months and others have shown even one- or two-day training courses improve accuracy of LVEF visual estimation amongst learners of all stages. Given the finite amount of time available for UGME and the ever-growing knowledge base in medicine, efficiency of instruction is becoming increasingly important. This study sought to determine the effectiveness of a novel method to teach visual estimation of LVEF with a brief one-slide presentation. **Methods**: This controlled medical education study of third-year medical students included 111 participants in the intervention group and 245 participants in the control group, voluntarily enrolled by convenience sampling at two separate POCUS teaching sessions. Each group completed a pre-assessment and an identical post-assessment of 18 questions in which they were asked to visually determine whether the LVEF in parasternal long axis (PLAX) video clips was normal (>50%), 30-50%, or <30%. Video clips of which three Advanced Emergency Medicine Ultrasound fellowship trained physicians separately agreed upon the LVEF were utilized. Between assessments, the intervention group received a 5-minute presentation with a single slide displaying three separate PLAX video clips demonstrating normal, 30-50%, and <30% LVEF. Two methods for visually estimating LVEF were discussed: (1) observing the distance between the anterior leaflet of the mitral valve and the septum at end-diastole and (2) observing the motion and thickening of the left ventricle walls. The control group was shown a single slide displaying one PLAX video clip with normal LVEF and only the anatomy was discussed . **Results**: The pre-assessment scores for the intervention (63 ± 19%; mean ± standard deviation) and the control group (65 ± 18%) were not significantly different (p = 0.55; Wilcoxon signed-rank test). There were no significant differences in the percent correct by category of LVEF between the groups. The post-assessment scores improved for both groups (control: 71 ± 17%; intervention: 80 ± 17%, p<0.05). The percent correct for the LVEF <30% category on the post-assessment was not significantly different between the intervention and the control group (87 ± 22%; 81 ± 25%; p = 0.08). The percent correct was greater in the intervention group for the LVEF 30-50% category (71 ± 21%; 62 ± 23%; p < 0.05) and the normal LVEF category (83 ± 20%; 71 ± 22%; 83 ± 20%; p < 0.05). **Conclusions**: The ultra brief educational session improved the ability of the intervention group to visually estimate LVEF. Overall, the results support that very little training may be required for 3rd year medical students to determine a severely reduced LVEF. **References**: 1. Shahgaldi K, Gudmundsson P, Manouras A, Brodin L-Å, Winter R. Visually estimated ejection fraction by two dimensional and triplane echocardiography is closely correlated with quantitative ejection fraction by real-time three dimensional echocardiography. Cardiovascular ultrasound. 2009;7(1):1-7. 2. Ünlüer EE, Karagöz A, Akoğlu H, Bayata S. Visual estimation of bedside echocardiographic ejection fraction by emergency physicians. Western journal of emergency medicine. 2014;15(2):221. 3. Hope MD, de la Pena E, Yang PC, Liang DH, McConnell MV, Rosenthal DN. A visual approach for the accurate determination of echocardiographic left ventricular ejection fraction by medical students. Journal of the American Society of Echocardiography. 2003;16(8):824-31. 4. Anilkumar S, Adhiraja S, Albizreh B, Singh R, Elkum N, Salustri A. A teaching intervention increases the performance of handheld ultrasound devices for assessment of left ventricular ejection fraction. Heart views: the official journal of the Gulf Heart Association. 2019;20(4):133. 5. Hüppe T, Groesdonk HV, Volk T, Wagenpfeil S, Wallrich B. Image quality to estimate ventricular ejection fraction by last year medical students improves after short courses of training. BMC Medical Education. 2019;19(1):1-8. 6. Johri AM, Picard MH, Newell J, Marshall JE, King MEE, Hung J.

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Poster 24: Matching murmur to the Echo

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Introduction: POCUS is a valuable way to learn the murmurs. This lecture will go through an approach to teaching and knowing the various cardiac murmurs with findings on Echo. **Methods**: We will review various murmers and the echocardiographic findings. **Results**: Identify a murmur on auscultation and match to the echo findings **Conclusions**: Label murmur and findings on Echo **References**: Feinstat Echo

Poster 25: Sounds Like a Change of View: A Systematic Review of Ultrasound Training, Visuospatial Ability, and Psychomotor Ability

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Introduction: Psychomotor skills are essential in performing and learning medical ultrasound (US). Nicholls et al. described visuomotor and visuospatial skills as psychomotor skills involved in medical US scanning (1). Other skills-based medical areas like dental medicine (2) and surgery (3) have identified relationships between psychomotor skills and performance, the relationship between US outcomes with psychomotor skills and visuospatial skills have not been evaluated in a formal review. The aim of this study is to systematically review the literature regarding the relationship of visuospatial ability (VA) and psychomotor ability (PA) to US ability. **Methods**: A systematic review of PubMed, Eric, Cochrane, and Medline databases was conducted according to Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines. Two reviewers independently evaluated titles and abstracts of English-language articles published from January 1970 through December 2022 for identification, screening, and inclusion. The final full-text articles were assessed for quality with the Medical Education Research Study Quality Instrument (MERSQI) and a qualitative synthesis of the findings was produced. **Results**: Of 2405 unique citations obtained in database searches, 12 articles were eligible for inclusion. The mean MERSQI score was 11.5, range 9.0-14.5. All studies reported outcomes of knowledge or skills; few reported validity evidence for all data instruments (25%). The most frequently used instruments were Mental Rotation Test (MRT) for VA (58%), and Zigzag Tracking Test (25%) and Purdue Pegboard Test (17%) for PA. US assessment most frequently related to US guided regional anesthesia (50%). Of studies assessing PA (n=4), two studies found no relationship between PA and US ability; another found a weak positive correlation between dexterity scores on human volunteers and a simulator. Four studies reported MRT scores associated with better performance on US assessment, one study reported non-statistically significant improvement in MRT score with training, and one study found no correlation between VA and US assessment. **Conclusions**: The publications included in this systematic review were moderate quality based on the MERSQI. Weak positive or no correlation was found between PA and US ability. A relationship between VA and US may exist, but reports were variable. Standardization in research of the relationship between VA and PA to US ability is limited and prevents further quantitative analysis.
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Poster 26: Expanding Point-of-Care Ultrasound Education for Third-Year Medical Students on the Internal Medicine Clerkship

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Introduction: Point of care ultrasound (POCUS) is a clinical tool used in patient evaluation and clinical decision-making. The use of POCUS is highly operator dependent, so it is therefore essential to train medical students to become proficient in this skill. Our institution's medical school has a robust POCUS curriculum but has limited exposure in the clinical setting. Barriers, such as limited access to equipment and reliance on POCUS trained attendings and residents, hinder students from using POCUS. This is an ongoing medical education quality improvement project in the pilot phase aimed at addressing these challenges to enhance POCUS education for third-year medical students on their internal medicine (IM) clerkship. The goal is to increase the number of logged scans and improve student's proficiency in POCUS and for this program to officially get implemented into the Internal Medicine clerkship. **Methods**: This observational cohort study includes medical students from March 2021-May 2023. In March 2022, a supplemental POCUS training program was implemented in the core IM clerkship. This program provides students access to a comprehensive POCUS guidebook providing information on ultrasound machine locations, education on knobology, and structured exam modules with self-directed learning resources. Students were surveyed after completing the program to assess their experience. We compared the number of performed POCUS exams documented in the electronic student procedure log before and after the intervention. **Results**: A total of 276 students were analyzed during the study period (126 pre, 149 post). A total of 27 students opted into the supplemental POCUS training program (18% of the total students after implementation). There were 1585 tracked POCUS exams (749 pre, 836 post). Survey response data (n=11) showed that students felt POCUS is an important part of clinical education (100% agree), the guidebook was easy to access and use (54.5% agree, 45.5% neutral), and the optional curriculum was helpful in conducting more POCUS exams (45.5% agree, 54.5% neutral). **Conclusions**: These results did not show a change in the number of tracked exams after the program was implemented. While providing students with a comprehensive guidebook did not increase POCUS exams, it demonstrated potential in teaching interested students based off survey results and positive student experiences. **References**: None

Poster 27: A roadmap to Thoughtful and Deliberate Incorporation of the Handheld Ultrasound

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Introduction: Handheld ultrasound devices are proliferating with one Forbes article estimating its market value to reach 2.5 billion by 2026 (cite Forbes article below). The popularity of handheld ultrasound devices can further be seen in the literature by the drastic rise in number of publications during the advent of the first handheld ultrasounds in the 2010s (Wilkinson). Today, many providers are able to purchase devices on their own, often through the use of Continuing Medical Education (CME) funds. However, the increased access to these devices raise unique concerns for clinicians and institutions. Here we report a summary of potential pitfalls in the process of incorporating a handheld ultrasound device in clinical practice within an institution setting. **Methods**: We represent internal medicine providers across the inpatient and outpatient settings at an academic medical center with a robust Point-of-Care Ultrasound division and have formed a Handheld Ultrasound Policy working group with representatives from the Office of Chief Privacy Officer, Clinical Technology Services, and Healthcare Applications. We report on our shared experiences with addressing cybersecurity barriers including EMR integration, application log-in controls, storage of patient identifiers, device management protocols, and how devices can best be used for education, research, and clinical care. **Results**: N/A (Excluded this section as this is a non-research topic) **Conclusions**: As access to handheld ultrasounds continues to improve it is evident that safe guidelines as well as a framework for the incorporation of these devices into different clinical practices are needed. In this report, we provide a framework for approaching and addressing barriers in the fields of;

- Purchasing: Use of CME vs hospital funds, need for a Business Associate Agreement
- Equipment: Will a phone/tablet that pairs with a device be owned or managed by the institution
- Connectivity: Will devices link to PACS or an image archive
- PHI: Are patient identifiers stored, is this saved locally on devices or within apps, what are the log in controls
- Device management: How will devices be stored and signed out, will users be tracked, and what physical controls (locked drawers, sign-out sheet) can be used to protect PHI

We hope this guide may serve others in a variety of clinical settings to successfully incorporate the safe and responsible use of handheld ultrasounds. **References**: Wilkinson JN, Saxhaug LM. Handheld ultrasound in training - The future is getting smaller! J Intensive Care Soc. 2021 Aug;22(3):220-229. doi: 10.1177/1751143720914216. Epub 2020 Apr 15. PMID: 34422105; PMCID: PMC8373282.
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Poster 28: Point-of-Care Ultrasound (POCUS) Training and Personal Device Use During Medical School: Student Perceptions of Effect on Clinical Preparedness, Competitiveness in Residency Match and Future Ultrasound Use

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Introduction: Point-of-care ultrasound (POCUS) has gained prominence across diverse medical disciplines due to its safety, affordability, and real-time diagnostic capabilities. While the Liaison Committee on Medical Education (LCME) does not currently mandate ultrasound training in US medical schools, a growing number of institutions are integrating POCUS training into their curricula. **Methods**: This study was conducted at Touro University Nevada College of Osteopathic Medicine over a 2-year period for the first cohort of medical students to receive POCUS training to investigate the impact of the curriculum on perceptions of clinical readiness, residency competitiveness, and future ultrasound utilization. A comprehensive POCUS curriculum was integrated into the clinical skills courses and clinical rotations. The curriculum encompassed didactic lectures on ultrasound techniques and image interpretation, learning modules with USMLE type prep questions, coupled with hands-on training led by qualified educators. Personal handheld ultrasound probes were provided to students in their second year. A pre-training survey was administered at the start of the second year, followed by a post-training survey at the beginning of the fourth year, assessing students' perceptions regarding clinical preparedness, residency competitiveness, and future ultrasound use. **Results**: Of the 150 enrolled medical students, 119 (79.3%) responded to the pre-training survey. Among them, only 7 (5.9%) had personally used POCUS in clinical settings, while 112 (94.1%) believed POCUS proficiency would enhance their clinical rotations and future careers. Additionally, 86 (72.3%) students saw POCUS training as an advantage in residency applications. The post-training surveys were completed by 31 (20.7%) students. Sixteen (51.6%) indicated that the curriculum prepared them to perform ultrasound, 18 (58.1%) had utilized POCUS during clinical clerkships. A majority of respondents (27 students, 87.1%) deemed the POCUS curriculum beneficial for their residency, and 16 (38.7%) noted POCUS discussions during residency interviews. Notably, 25 (80.6%) students believed POCUS training would be valuable in their chosen specialties. Survey comments indicated that students wanted more practice sessions and training in ultrasound techniques and landmarks. **Conclusions**: This study highlights the limited prior exposure to ultrasound and POCUS among students, their strong desire for POCUS training, and their perception that it would augment clinical skills, medical knowledge, and residency competitiveness. Furthermore, students foresee POCUS as an invaluable asset throughout their medical careers.
In conclusion, integrating a POCUS curriculum into medical education can positively influence students' perceptions of clinical readiness, competitiveness in residency applications, and the utility of ultrasound in their future medical practice. **References**: Gilbertson EA, Hatton ND, Ryan JJ. Point of care ultrasound: the next evolution of medical education. Ann Transl Med. 2020;8(14):846. Nicholas E, Ly AA, Prince AM, Klawitter PF, Gaskin K, Prince LA. The Current Status of Ultrasound Education in United States Medical Schools. J Ultrasound Med. 2021;40(11):2459-2465. Alerhand S, Choi A, Ostrovsky I, et al. Integrating Basic and Clinical Sciences Using Point-of-Care Renal Ultrasound for Preclerkship Education. MedEdPORTAL J Teach Learn Resour. 16:11037. Filler L, Orosco D, Rigdon D, et al. Evaluation of a novel curriculum on point-of-care ultrasound competency and confidence. Emerg Radiol. 2020;27(1):37-40.

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Poster 29: Beyond the Basics: Navigating the Pros and Cons of Point-of-Care Ultrasound (POCUS) Education

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Introduction: As point-of-care ultrasound (POCUS) becomes an integral component of healthcare, both undergraduate and graduate medical POCUS education is urgently necessary in curricula. Despite the apparent need of POCUS curricula, there remains a lingering question: Are there evidence-based benefits to POCUS training in undergraduate and/or graduate medical education settings? **Methods**: This systematic review utilized PubMed, Google Scholar, and Scopus to identify articles of interest that met the inclusion criteria relevant to undergraduate and/or graduate medical education. Qualitative evaluation of research was conducted to identify common themes for benefits of POCUS and the requirements and/or characteristics for effective POCUS educational curricula. Results for undergraduate medical education were separated into pre-clinical and clinical education. **Results**: In pre-clinical POCUS education, POCUS education improves anatomy education and physical examination skills for sonographic assessment of abdominal, reproductive, cardiovascular, and renal structures. Further enhancement can be achieved via simulation devices that are generalized ultrasound simulation mannequins, one defined body region such as the abdomen, or local regions of interest such as the femoral triangle. In clinical undergraduate POCUS education, benefits involved greater performance on knowledge tests and general ultrasound competency in emergency medicine, surgical, family medicine, and physical medicine and rehabilitation clerkships. These studies also found improved comprehension of specific POCUS examinations such as those for ultrasound-guided injections, FAST, eFAST, and RUSH. Further integration of POCUS education into graduate medical education was found to successfully improve ultrasound knowledge and competency in both academic and military internal medicine residencies. **Conclusions**: One limitation of this study is that this article is a review resulting in no specific intervention being introduced. The resultant hypothesis of this systematic review cannot be tested; rather evidence-based recommendations are restricted to the currently available literature within the searched databases. From this review, it was found that the inclusion of a properly integrated POCUS curriculum can result in greater confidence in ultrasound use, increased knowledge of anatomy and basic sciences for various organ systems, improved ultrasound knowledge and performance in clinical clerkships, and offers improved confidence and knowledge in ultrasound during residency.
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Poster 30: Advancing Medical Education through International Collaboration: A Point-of-Care Ultrasound Symposium in Brazil

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Introduction: Point-of-care ultrasound (POCUS) has rapidly gained recognition as a valuable diagnostic and educational tool in modern medical practice. This abstract highlights the significance of international collaboration in advancing medical education, focusing on a symposium dedicated to POCUS held in Brazil. The symposium brought together physicians from diverse and international backgrounds to share insights, demonstrate applications, and describe the breadth of POCUS to sonography novices at all levels of practice (medical student through seasoned physician) and across specialties. The symposium aimed to address the growing demand for proficient POCUS practitioners and educators in Brazil and beyond. Presentations encompassed a wide array of topics, including case studies demonstrating POCUS's impact on patient outcomes; description of the use of POCUS in various specialties, countries, and cultures; and live demonstration of POCUS for assessing anatomy and pathology in the settings of primary care and emergency medicine. Keynote speakers from renowned international institutions shared their experiences, emphasizing the need for multidisciplinary collaboration to drive the global adoption of POCUS as a standard of care. To further increase access to content and spread the message of the utility and necessity of POCUS in medical practice, learners attended either in-person or virtually via simulcast. Two projections were shown at a time: a real-time look at the presenter(s) and live model on one screen and accompanying PowerPoint presentation on the second. When a presenter demonstrated an ultrasound application, a third screen was utilized to display to the audience what was visible on the ultrasound screen. The importance of international perspectives in medical education was evident throughout the symposium. Participants engaged in interactive workshops, and networking opportunities provided a platform for forging lasting connections, future research projects, and establishing POCUS curricula and utilization among educators, physicians, students, and researchers, with the common goal of enhancing POCUS use and education globally. The symposium's success highlights the pivotal role of international collaboration and collaboration with systems where POCUS is already well established in the acceptance of POCUS as a clinical tool and the advancement of medical education overall. It underscores the necessity of shared knowledge, expertise, and resources to bridge gaps in medical education and promote the widespread adoption of emerging technologies like POCUS. As medical practices continue to evolve, collaborative efforts between nations will remain essential in equipping healthcare professionals with the skills and knowledge necessary to provide the highest quality care to patients worldwide. **Methods**: N/A **Results**: N/A **Conclusions**: N/A **References**: N/A

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Poster 31: Assessing the Efficacy of PoCUS Training in the Republic of Somaliland and Identifying Areas for Improvement

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Introduction: The Republic of Somaliland is home to 5 million Somali people with a federal budget of 400 million dollars, only 6% of which is spent on healthcare. Due to this dearth of public resources, health outcomes are some of the worst in the world. Many regional hospitals lack access to CT and MRI imaging and, when available, advanced imaging is prohibitively expensive. The benefit of bedside point-of-care ultrasound (PoCUS) training programs in such resource-limited settings has been well described in the literature (1). Our team has now conducted 4 rounds of PoCUS training (2022-2023) for public sector general practitioners. In this study, we sought to assess the efficacy of this training and identify areas for improvement before national scale-up. **Methods**: The Ministry of Health Development (MoHD) was provided with 8 portable ultrasound probes that are currently in use at public hospitals in Hargeisa, Borama, and Erigavo. Somali general physicians participated in a four-week PoCUS training curriculum modeled on similar educational initiatives in Africa. Participants were provided with access to online courses and quizzes. Following completion, physician learners began employing PoCUS in real-world encounters within various clinical settings. Image studies were uploaded to a cloud network along with the learners' conclusions from the study using a standardized form. PoCUS experts then evaluated the accuracy of these studies and provided real-time feedback to learners through chat messaging forums. Studies were then analyzed for concordance between learner and expert assessment. **Results**: There was overall high concordance (94%, N = 125) between learner and expert interpretation of ultrasound studies acquired in the clinic (N = 24), emergency department (N = 61), and intensive care unit (N = 40). Concordance remained high when assessing abnormal findings only (90%). Concordance was highest for renal imaging (98%, N = 55), lung imaging (97%, N = 84), and hepatobiliary imaging (95%, N = 55) and lower for cardiac imaging (90%, N = 97) and DVT imaging (75%, N = 8). Imaging quality was higher for lung studies (99% pass rate, N = 84) than for cardiac studies (78% pass rate, N = 97). The majority of learners believed that employing PoCUS changed management in some way (78%, N = 18) and expedited diagnosis (100%, N = 12). **Conclusions**: These results indicate high concordance between learner and expert assessment of PoCUS studies in a variety of clinical settings. Images were of high quality and included many abnormal findings, some of which resulted in a change in management and expedited diagnosis. This suggests that current PoCUS training initiatives in Somaliland are effective and merit resources for expansion. Areas for improvement going forward include a further emphasis on lower extremity DVT and cardiac imaging, incentivizing more thorough and standardized form completion, and including more opportunities to solicit and incorporate learner feedback. **References**:

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Poster 32: Integrating POCUS, Sliding Lung Sign, Reactor Chest Drain Introducer, Manual Ventilation, and Dissection with Novel GAX Specimens versus Formalin-Fixed cadavers.

Judd Williams, COMP–Northwest, Western University of Health Science, Lebanon, OR

Introduction: Pneumothorax is common, yet potentially life threatening pathology from which we should expect accurate diagnosis and complete recovery with minimal morbidity. Pneumothorax is identified as second leading cause of preventable death from military active arenas behind exsanguination. Blast and blunt type injuries cause pneumothoraces, with penetrating injuries being most common. Pneumothorax was the most common thoracic injury affecting 52% of thoracic casualties. POCUS acquires diagnostic quality imaging, is handheld, wireless, mobile, cheap and safe. The study objective was to conduct POCUS using GE Vscan Air probe on sliding lung pleura, placing chest drains using Reactor technology during manual ventilation (MV) of novel GAX-specimens with BriteVu (BV) contrast MRI/CT imaging versus formalin fixed cadavers (FFC), learning sliding lung sign skills (SLSS) with subsequent dissection of the thorax. **Methods**: Literature search was conducted on performing POCUS revealing SLSS on cadavers during first year anatomy labs/workshops incorporating chest drain placement. CT/MRI imaging was acquired and POCUS was conducted with GE Vscan air probes during MV of GAX-specimens (n=6:12 sides;3-males:3-females) with BV and 33 FFC (66 sides; 25 males and 8 females) with chest drain placement using Reactor technology with subsequent dissections. **Results**: One previous study was identified using cart ultrasound for SLSS on FFC. Both specimen mediums (78-sides total) had chest drains placed via Reactor technology in less than 1-minute by novice first year medical students (range:14-56seconds, average 37 seconds).Thoracic wall and lungs were successfully dissected. GAX-specimens 12-sides(100%) with BV provided SLSS with striking lifelike palpation, chest movement, imaging, and surgical dissection. FFC sides 61 (92%) revealed visible but poor quality SLSS, were difficult to palpate, had minimal chest mobility with unrealistic dissection resistance. FFC had collapsed vessels. Only GAX-specimens with BV had patent vessels and enabled realistic invasive procedures. Ultrasound recently was reported to be taught in most medical schools (75%), but not simultaneously during anatomy lab courses. A strongly recognized trait to enable acquiring and assessing diagnostic quality ultrasound is the level of ones sonoanatomy (surface, 3D and 2D-screen anatomy) knowledge. It would be ideal to assess pneumothorax using SLSS with POCUS during MV on mobile, palpable cadavers with subsequent surgical standard dissection. This allows a learner to integrate imaging and clinical skills with basic science knowledge during a 3-hr lab/workshop. **Conclusions**: Based on 2 dissection mediums, this study consistently demonstrated the novel GAX-specimens were lifelike with innovative BV contrast enabling integration training of SLSS, MV skills, and sonoanatomy with subsequent impressive chest drain placement with Reactor technology for training novice healthcare professionals. **References**: Lichtenstein DA, Menu Y. A bedside ultrasound sign ruling out pneumothorax in the critically ill. Lung sliding. Chest. 1995 Nov;108(5):1345-8. doi: 10.1378/chest.108.5.1345. PMID: 7587439. Drumheller BC, Basel A, Adnan S, Rabin J, Pasley JD, Brocker J, Galvagno SM Jr. Comparison of a novel, endoscopic chest tube insertion technique versus the standard, open technique performed by novice users in a human cadaver model: a randomized, crossover, assessor-blinded study. Scand J Trauma Resusc Emerg Med. 2018 Dec 27;26(1):110. doi: 10.1186/s13049-018-0574-2. PMID: 30587216; PMCID: PMC6307118.

Co-Authors: Williams, Judd, Adam Garman, Chris Cariello, Sean Galka and Brion Benninger

Poster 33: Simulation Training of the Ultrasound Guided Erector Spinae Plane Block by Utilizing Fresh Cadavers for Emergency Medicine Residents

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Introduction: Every year, Emergency Medicine residents go through a cadaver procedure lab to gain realistic training in HALO (high acuity low opportunity) procedures. As the training of regional anesthesia within Emergency Medicine continues to evolve, adding an ultrasound guided regional anesthesia block to cadaver lab with handheld ultrasound devices increases utilization of the gift of a cadaver as well as exposure to simulated nerve blocks. On review of the literature, this training technique has not been previously described in Emergency Medicine to our knowledge for the Erector Spinae Plane (ESP) block. Since its initial description, numerous studies have reported safety and efficacy of this fascial plane block in numerous other clinical scenarios in the perioperative and Emergency Department settings to treat acute pain. Some of the described indications include rib fractures, lumbar fractures, postherpetic neuralgia, renal colic, back pain, burns and pancreatitis.1 The ESP block is performed by injecting local anesthetic under ultrasound guidance between the erector spinae muscle and the underlying transverse process. This deposits anesthetic into the erector spinae fascial plane which allows for vast spread in the cranio-caudal dimension to treat both somatic and visceral pathologies involving the trunk. Currently, simulation-based practice is the main way to supplement experience in these procedures. Unfortunately, most simulation-based practice models lack tissue fidelity which is essential when performing procedures. Here, we attempted to demonstrate increased utilization of the cadaver for training on the ESP block. **Methods**: At the end of the traditional cadaver procedure lab for rising PGY1 to PGY2 residents, we repositioned a cadaver prone. We utilized a Butterfly iQ+ handheld ultrasound connected to an iPhone all encased within a sterile probe cover (including the iPhone). Utilizing the handheld ultrasound we reviewed anatomy live, then the instructor performed the ESP block with next resident injecting. Then, all interested residents performed inline ultrasound-guided needle insertion and a second resident injected 5-10cc normal saline for the tactile feedback. The spread of saline was demonstrated, images and clips saved, and residents rotated. **Results**: . **Conclusions**: As ultrasound education continues to expand in Emergency Medicine training, regional anesthesia techniques are feasible options for managing patients in the Emergency Department. We demonstrated that adding ultrasound guided procedural training for ESP blocks to already established cadaver labs was practical without any increased cost or waste. Therefore, by continuing to utilize cadaver-based models we can improve training of new regional anesthesia techniques such as the ESP block to residents and faculty, as well as others in the future. **References**: Abdelhamid K, ElHawary H, Turner JP. The Use of the Erector Spinae Plane Block to Decrease Pain and opioid Consumption in the Emergency Department: A Literature Review. J Emerg Med. 2020 Apr;58(4):603-609.

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Poster 34: POCUS for Great Saphenous Vein Cut Down with Consistent New Distal Landmark Terminology and Crural Fascia Reinforcement from GAX-specimens & Formalin Fixed Cadavers

Christian Panaitescu, COMP-Northwest, Western University of Health Sciences, Lebanon, OR

Introduction: Venous access (VA) is paramount during resuscitation of traumatic, surgical and medically compromised patients. Successful VA enables fluid repletion, drugs administration, blood monitoring and transfusions. Classically VA is acquired when an individual is suffering from hypovolemia, has thready or nonpalpable veins in sick pediatric patients, compromised obese conditions, and variable anatomy. Venous cutdown exposing the great saphenous vein (GSV) is an important lifesaving skill set for today's healthcare provider, especially with the prevalence of IV drug abuse in cities and rural communities. GSV forms from the confluence of the dorsal vein of the first digit and dorsal venous arch of the foot and ascends anterior to the medial malleolus (some resuscitation manuals and experts teach 2-finger breadths or approximately 2cm from anterosuperior medial malleolus) in the distal tibial-soleal groove. The objective of this study was to dissect and analyze GSV from novel GAX-specimens with BriteVu (BV) contrast pre MRI/CT imaging versus formalin-fixed cadavers (FFC). **Methods**: Literature search was conducted regarding GSV cutdowns. Novel GAX-specimens (n=6, 3-Male:3-Female:12 sides) with innovative BV contrast prior to CT/MRI imaging and FFC (n=31, 22-Male:9-Female:58sides, 4 sides were excluded due to procedures) had POCUS conducted with subsequent dissection and analysis. **Results**: Literature search revealed no known GAX-specimen studies. Some literature refers to GSV cutdowns as a skill of the past. Contemporary anatomy texts described the ascending GSV within the ankle/leg region using terms of anterior and medial with no other landmarks which is unfortunately grossly vague and disappointing when describing an invasive potentially lifesaving procedure. POCUS easily identified BV filled GSV (12/12 sides) from GAX-specimens. FFC had collapsed GSV's superior to medial malleolus except (5/58-sides-8.6%) had a clot which improved the consistently poor-quality POCUS images. GAX-specimens (12:12 sides) and FFC (58:58 sides) dissections revealed GSV lying within 2mm of a groove termed the distal tibial-soleil groove (DTSG). FFC revealed GSV lying within 2mm of the DTSG amoungst dehydarted crural fascia. GAX-specimens (12:12 sides) also demonstrated GSV lying within 2mm of the DTSG except with hydrated compliant crural fascia forming 'tents' acting protective and functional. **Conclusions**: This study revealed a consistent landmark during venous cutdowns for the GSV termed the distal tibial-soleil groove-DTSG which would help clinicians palpate and conduct successful cut downs with and without POCUS. It also demonstrated crural fascia GSV support morphology warranting further studies. **References**: Varrias D, Palaiodimos L, Balasubramanian P, Barrera CA, Nauka P, Melainis AA, Zamora C, Zavras P, Napolitano M, Gulani P, Ntaios G, Faillace RT, Galen B. The Use of Point-of-Care Ultrasound (POCUS) in the Diagnosis of Deep Vein Thrombosis. J Clin Med. 2021 Aug 30;10(17):3903. doi: 10.3390/jcm10173903. PMID: 34501350; PMCID: PMC8432124.
William A. Smoot, Shelby L. Hopp, Brigham M. Barzee, Abigail J. Bardwell, Tobias Kummer, Ultrasound-Guided Great Saphenous Vein Access: Revisiting an Old Friend in a New Location, The Journal of Emergency Medicine,Volume 62, Issue 2,2022,Pages 191-199,ISSN 0736-4679, https://doi.org/10.1016/j.jemermed.2021.10.006.(https://www.sciencedirect.com/science/article/pii/S0736467921007526) All contemporary anatomy texts used by english speaking medical schools

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Poster 35: POCUS Identifies Hoffa's (infrapatellar) Fat Pad with Infrapatellar plicae from novel GAX-specimens versus Formalin-Fixed cadavers providing comprehensive training.

Luke Arsenault, COMP-Northwest, Western University of Health Sciences, Lebanon, OR

Introduction: Knee joint pathology is extremely common and debilitating. The knee has a known structure of fat named 'Hoffa's fat pad which has a characteristic shape and has been found to be associated with pain and knee deterioration which can result in osteoarthritis. Hoffa's knee disease/syndrome is a common condition and is a severe pathology of the knee joint in many subjects. POCUS ultrasound can be a convenient method of primary diagnosis of this pathology. However, in the literature only a single study provided an analysis of the characteristic ultrasound image of Hoffa's disease/syndrome regarding its most common and pathognomonic symptoms. The study objective was to identify Hoffa's fat pad with POCUS from GAX-specimens with BriteVu (BV) contrast and cross-sectional scanning versus formalin-fixed cadaver (FFC) with subsequent dissection of the fat pad assessing its morphology. **Methods**: Literature search was conducted on POCUS cadaver studies regarding Hoffa's fat pad and associated structures. Exclusion criteria included knee replacement and/or knee surgeries. Novel GAX-specimens (n=6:Male-3, Female-3, 12 knees) were scanned with MRI, CT and handheld GE Vscan Air probes, followed by open dissection versus FFC (n=26 knees from 15 bodies, M-9, F-6). Four knees from FFC were excluded for a total of 38 knees. **Results**: POCUS ultrasound identification of the fat pad was confirmed on all knees with the FFC knees having a broader range of poor image quality. 12 GAX-specimen knees had superior quality image acquisition versus the 38 FFC knees. GAX-specimen dissection revealed lifelike dermis during knee palpation and range of motion, knee fat pads and associated structures were realistic regarding texture, responsiveness to surgical tools, hydration, and appearance. FFC knees had hardened waxy dermis, essentially no range of motion which made palpation very difficult. Fat pads and associated structures were very firm and less compliant, decrease responsiveness to surgical tools with increased resistance, dehydrated and dull in color. **Conclusions**: Based on the two types of cadaver mediums, POCUS, MRI/CT imaging and dissection from this study, GAX-specimens versus FFC demonstrated superior POCUS image acquisition, identification and dissection of Hoffa's fat pad suggesting a fertile training medium integrating POCUS, sonoanatomy, clinical skills with quality structural orientation dissection. **References**: Vera-Pérez, E., Sánchez-Bringas, G., Ventura-Ríos, L., Hernández-Diaz, C., Cortés, S.D., Gutierrez, M., & Pineda, C. (2017). Sonographic characterization of Hoffa's fat pad. A pilot study. Rheumatology International, 37, 757-764. Mikkilineni H, Delzell PB, Andrish J, Bullen J, Obuchowski NA, Subhas N, Polster JM, Schils JP. Ultrasound evaluation of infrapatellar fat pad impingement: An exploratory prospective study. Knee. 2018 Mar;25(2):279-285. doi: 10.1016/j.knee.2018.01.008. Epub 2018 Mar 7. PMID: 29525550. Bianchi, S., Créteur, V., Moraux, A., Tamborrini, G. (2023). Ultrasound. In: Davies, M., James, S., Botchu, R. (eds) Imaging of the Knee. Medical Radiology(). Springer, Cham. https://doi.org/10.1007/174_2022_351

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Poster 36: POCUS, MRI/CT Imaging and Dissection of Parotid Gland Fascia from GAX-Specimens with BriteVu Contrast and Fresh Frozen Cadavers Supporting Revised Morphology.

Natalija Miller, COMP-Northwest, Western University of Health Sciences, Lebanon, OR

Introduction: The parotid gland (PG) is the largest slavery gland of the head and neck which is triangular shaped due to an inferior tail region. PG lies within 3D quadrangular parotid space sandwiched posterolaterally between the external and internal sides of the mandibular ramus creating superficial and deep lobes connected by an isthmus. The deep lobe may require POCUS curvilinear probe. Contemporary anatomy texts/atlases consistently describe the investing layer of deep fascia forming the parotid fascia/capsule. Surgical literature provides controversy regarding the morphology of the parotid gland fascia (PGF). The objective of this study was to conduct POCUS and MRI/CT imaging with dissection assessing the PGF from novel GAX-specimens with innovative BriteVu (BV) contrast and fresh frozen cadavers (FreshFC). **Methods**: GAX-specimens with BV contrast (n=6:3-Male:3-Female:12-sides) were MRI, CT scanned, followed by POCUS using GE Vscan Air probe and dissections. FreshFC (n=18,36-sides) had POCUS conducted then dissected to reveal PGF. **Results**: dissections. FreshFC (n=18,36-sides) had POCUS conducted then dissected to reveal PGF. RESULTS. Combined GAX-specimens and FreshFC sides (n=48) were dissected revealing anterolateral PGF as an extension of SMAS. The SMAS tissue was intimate with the anterolateral PG capsule. Facial surgeons often consider SMAS of facial subregions interconnected. The authors have conducted platysma dissection research recognizing a platysma-SMAS system within a common plane. Facial SMAS protected arteries and nerves creating grooves or partial tunnels and fused into nearby facial subregions. **Conclusions**: GAX-specimens demonstrated lifelike texture, colour, planes, structure orientation and decreased surgical dissection resistance of neck and facial structures with free range of motion at cervical vertebrae and atlanto-occipital joints for several months versus FreshFC and formalin-fixed cadavers. FreshFC provided similar experience with very limited ideal dissection time (1-2 days). This study suggests GAX-specimens provide lifelike POCUS imaging and dissection revealing SMAS being intimate with anterolateral PG capsule. Further GAX-specimen studies may improve PGF-capsule knowledge. **References**: Wu, W.-T.; Chang, K.-V.; Chang, H.-C.; Chen, L.-R.; Kuan, C.-H.; Kao, J.-T.; Wei, L.-Y.; Chen, Y.-J.; Han, D.-S.; Özçakar, L. Ultrasound Imaging of the Facial Muscles and Relevance with Botulinum Toxin Injections: A Pictorial Essay and Narrative Review. Toxins 2022, 14, 101. https://doi.org/10.3390/toxins14020101 Song Yang, Feifei Xia, Ruozhen Zhang, Xiao Ma, Jiawei He, Qi Zhang, Zhenzhou Sun, Bin Sun, The diagnostic efficacy of ultrasonographically-based measurements of minimum and maximum fascia-tumor distance in differentiating superficial from deep lobe benign parotid tumors, Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology, Volume 136, Issue 1,2023, Pages 112-117, ISSN 2212-4403, https://doi.org/10.1016/j.oooo.2023.02.013.

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Poster 37: Medial Meniscus Knee RAMP Lesion Training with POCUS of Distal Semimembranosus Attachment from Novel GAX-specimens versus Formalin-Fixed Cadavers.

Joshua McCluskey, COMP-Northwest, Western University of Health Sciences, Lebanon, OR

Introduction: Medial meniscus RAMP lesions are associated with anterior cruciate ligament (ACL) injuries and are notorious for providing false negative results from conventional MRI scans. Incidence of RAMP lesions has been studied to range from 16% to 24% from all ACL injuries. POCUS training recognizing the distal semimembranosus tendon (DST) as an important landmark is critical when developing a technique to assess RAMP lesions of the medial meniscus. Successful diagnosis of RAMP lesions require dynamic movement of the knee with isometric contraction. The DST has several attachments and is not taught, discussed, nor fully dissected to understand its sonoanatomy and orientation with other medial knee structures for successful POCUS imaging. DST with its multiple attachments has one reaching the posterior aspect of the medial meniscus requires POCUS practice and dissection to fully understand techniques and RAMP pathology. The objective of this study was to create a teaching medium of novel GAX-specimens with BriteVu (BV) contrast for POCUS, MRI/CT cross-sections, palpation, knee joint movement and dissection of the DST and medial meniscus versus formalin-fixed cadavers (FFC). **Methods**: Literature search was conducted regarding DST attachments and medial meniscus with GAX-specimens and POCUS studies. GAX-specimens with BV contrast (n=6:3-Male:3-Female:12-sides) had MRI/CT imaging versus FFC (n=15:9-Male,18 sides: 6-Female,12 sides; total 26 sides) with knee replacement and/or knee surgery exclusion criteria all had POCUS performed with GE Vscan Air probes and fully dissected. From prone position, the knee was flexed to approximately 70 degrees, GE Vscan Air probe was placed 10cm superior to DST. The foot/ankle complex was rotated into internal/external positions while POCUS imaging. **Results**: Literature search revealed no known studies. GAX-specimens enabled the knee joint to be mobile (flexion, internal/external rotation) for positional POCUS, also allowing movement observation of the DST attachments and meniscus during dissections unlike FFC. BV contrast cross-sectional imaging revealed detailed vessels and associated soft tissue structures. GAX-specimen tissues were notably more compliant and lifelike vs FFC dissections and revealed a consistent connection to the medial meniscus 12/12 sides-100% versus 4/26 sides-15% from FFC. POCUS identified the DST and medial meniscus 12/12 sides-100% of moderate to good quality vs poor quality from FFC's. **Conclusions**: This study demonstrated GAX-specimen tissue can be used as a training medium for POCUS identification of the DST and medial meniscus while providing full range of motion improving dissection quality and POCUS sonoanatomy ideal for clinical skills. **References**:
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Poster 38: Cubital Fossa, Integrating POCUS with Danger zone Teaching on Novel GAX Specimen and Formalin-Fixed Cadavers.

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Introduction: The most common clinical procedure practiced in healthcare is a venapunture (VP) from the cubital fossa (CF) with approximately 450 million episodes conducted annually in the USA with over a billion estimated worldwide. CF is associated as a safe place to withdraw or canulate venous blood due to the relatively consistent superficial trifecta veins (basilic-Bv, median cubital-MCv, cephalic-Cv) presence. However, deep to the trifecta veins are critical structures to avoid injuring during VP (median nerve-MN, brachial artery/vein-BA/V, cutaneous branch of musculocutaneous nerve-CMcN, radial nerve-RN). VP was the leading cause of nerve injury to the MN, CMcN and RN. POCUS of the CF is being taught to nurses, physician assistants and physicians. CF has an iconic midline landmark, distal biceps tendon (DBT) dividing CF into the medial danger and lateral safe zones. Medial side houses important neurovascular structures, BA/V, MN, and branches thereof. Lateral side houses CMcN and RN branches. Study objective was to assess POCUS imaging and dissections of CF from novel GAX-specimens and formalin-fixed cadavers (FFC). **Methods**: Literature search revealed no GAX-specimen studies. GAX-specimens (n=6:3-Male:3-Female:12-sides) were MRI, CT scanned with innovative BriteVu (BV) contrast and FFC (n=34:20-Male:14-Female:68-sides) all had POCUS (GE Vscan Air probe) imaging. A total of 80 CF was dissected. **Results**: GAX-specimen dissections were lifelike regarding movement, palpation, structure orientation, tissue resistance and color vs FFC. GE Vscan Air revealed Bv, McV, Cv, BA, nerves, and CF muscles on all 12 GAX-specimen sides unlike FFC where the vessels were collapsed, and tissue was not lifelike. POCUS and layered dissections of GAX-specimens with BV contrast enabled structural orientation for mental imaging and morphological measurements for ideal training. **Conclusions**: This study revealed novel GAX-specimens with BV contrast provides a more ideal training medium for POCUS clinical skills using GE Vscan air probes during ultrasound and sonoanatomy workshops/courses and for accurate macro and dynamic anatomy research. **References**: Mukai K, Nakajima Y, Nakano T, et al. Safety of Venipuncture Sites at the Cubital Fossa as Assessed by Ultrasonography. Journal of Patient Safety. 2020 Mar;16(1):98-105. DOI: 10.1097/pts.0000000000000441. PMID: 29140886; PMCID: PMC7046143. Standring, S., Borley, N. R., & Gray, H. (2008). Gray's anatomy: the anatomical basis of clinical practice. 40th ed., anniversary ed. [Edinburgh], Churchill Livingstone/Elsevier.

Co-Authors: Gray, Charlotte, Olivia Devalasco, Colorado Olson and Brion Benninger.

Poster 39: POCUS of Distal Sternocleidomastoid Muscle with GAX-specimens versus Formalin Fixed & Fresh Frozen Cadavers Reveals Clinical Triangle Deserving Formal Recognition with Internal Jugular Vein for Central Line Cannulation.

Brion Benninger, M.D., COMP-Northwest, Western University of Health Sciences, Lebanon, OR

Introduction: Academically, the neck is divided into classic anterior and posterior triangles by an iconic landmark, the sternocleidomastoid muscle. Clinically, there are additional important triangles identified within these paired triangles which are not typically taught to medical students. However, there is an intermediate triangle (IT) lying within this landmark formed from the distal sternocleidomastoid. Internal jugular vein (IJV) is identified within IT and canulated for central lines more than 5 million times annually. Anatomy atlasses/texts do not highlight nor discuss IT or (Sedillot's triangle). The objective of this study was to conduct POCUS and dissections identifying IT with the IJV on novel GAX-specimens having MRI/CT scans, versus fresh frozen cadavers (FreshFC) versus formalin-fixed cadavers (FFC). **Methods**: Literature search was conducted on POCUS GE Vscan Air probes with GAX-specimens and the IT triangle. Palpation and dissection were conducted on GAX-specimens (n=6:12 sides) post BriteVu contrast with MRI/CT imaging versus FreshFC (n=18:36 sides) versus FFC (n=15:30 sides). **Results**: Literature search revealed majority of texts/atlases do not acknowledge/discuss the IT with IJV and no studies with GAX-specimens versus FreshFC versus FFC. All specimen mediums (78-sides) dissected IT and IJV successfully. GAX-specimens provided lifelike palpation, cervical mobility, quality imaging, and dissection. FreshFC sides were palpable, lifelike, less mobile, with a limited 48-hour window. FFC were poorly palpable, immobile with increased dissection resistance. Only GAX-specimens with BV contrast had patent full IJV's which were relatively superficial within IT available for realistic clinical skills cannulation. **Conclusions**: Based on 3 dissection mediums, this study consistently demonstrated the IJV within the IT for central line POCUS training with a GE Vscan Air probe. GAX-specimens can be a realistic lifelike skill teaching medium. Finally, dissections demonstrated the IT or (Sedillots triangle) should be formally recognized in texts and atlases for training healthcare professionals. **References**: Amini, Richard & Ho, Hang & Ng, Vivienne & Tran, Melissa & Rappaport, Douglas & Rappaport, William & Dunleavy, James & Viscusi, Rebecca & Miller, Ryan & Dandorf, Stewart. (2016). Introducing a Fresh Cadaver Model for Ultrasound-guided Central Venous Access Training in Undergraduate Medical Education. Western Journal of Emergency Medicine. 17. 362-366. 10.5811/westjem.2016.3.30069. Standring, S., Borley, N. R., & Gray, H. (2008). Gray's anatomy: the anatomical basis of clinical practice. 40th ed., anniversary ed. [Edinburgh], Churchill Livingstone/Elsevier.

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Poster 40: Conducting POCUS on Thyroid Gland from novel GAX-specimens with MRI/CT Imaging versus Fresh Frozen and Formalin-Fixed Cadavers with Dissection.

Conor Davenport, COMP-Northwest, Western University of Health Sciences, Lebanon, OR

Introduction: Ultrasound is often the first option of imaging regarding the thyroid gland. Family practitioners are often first line providers examining patients with thyroid conditions and generally not comfortable performing ultrasonography. There is strong momentum in this community to be further trained with ultrasound. Surgical and internal medicine interns should have been exposed to thyroid ultrasound prior to residency. Many medical schools teach ultrasound in their curriculum but not during an anatomy lab course when they are learning surface and dissection anatomy. There is value linking ultrasound with anatomy lab cadavers and dissection. The study objective is to perform physical examinination, POCUS ultrasound, dissect novel preserved imaged specimens (GAX), fresh frozen cadavers (FFC) and formalin-fixed cadavers (F-FC) and analyze cross-sectional imaging (XSI). **Methods**: Literature search revealed one medical school simultaneously integrating anatomy dissection lab with ultrasound skills. Palpation, ultrasound, and dissection were conducted on GAX-specimens (n=6:12 sides with C-SI post iBV contrast), FreshFC (n=18:36 sides) and FFC (n=15:30 sides) had POCUS and dissection. **Results**: All cadaver mediums (78-sides) demonstrated thyroid ultrasound with different image qualities with varied lifelike dissections. GAX-specimens had full vessels from the BV contrast and demonstrated lifelike palpation, neck mobility, imaging, and dissection. FreshFC had lifelike palpation and dissection but were less mobile and had 48-hour window. FFC were poorly palpable, immobile with increased dissection resistance. Only GAX-specimens with BV contrast had patent full vessels revealing realistic structural orientation and ratios. **Conclusions**: All 3 dissection mediums demonstrated POCUS imaging of the thyroid gland with varying image qualities and lifelike dissection. GAX-specimens were most lifelike regarding palpation, physical examination, mobility, POCUS image acquisition and dissection quality. **References**: Carter JL, Patel A, Hocum G, Benninger B. Thyroid gland visualization with 3D/4D ultrasound: integrated hands-on imaging in anatomical dissection laboratory. Surg Radiol Anat. 2017 May;39(5):567-572. doi: 10.1007/s00276-016-1775-x. Epub 2016 Dec 1. PMID: 27909799; PMCID: PMC5406427. McCrary, H.C., Faucett, E.A., Hurbon, A.N., Milinic, T., Cervantes, J.A., Kent, S.L. and Adamas-Rappaport, W.J. (2017), A Fresh Cadaver Model for the Instruction of Ultrasound-Guided Fine-Needle Aspiration of Thyroid Nodules. Otolaryngology–Head and Neck Surgery, 157: 30-35. https://doi.org/10.1177/0194599817699596

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Poster 41: POCUS of Femoral Nerve using Novel GAX-specimens with BriteVu Contrast and MRI/CT Imaging with Dissection vs Formalin-Fixed Cadavers.

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Introduction: Patients with a multitude of issues are receiving POCUS femoral nerve blocks (PFNB) which appears to be increasing within Emergency departments including patients struggling with substance abuse. Typically, patients presenting with injuries requiring surgery or admission to hospital are candidates for PFNB. Pathologies such as hip and knee fractures, significant burns, and lacerations. PFNB aims to eliminate severe pain while waiting for surgical procedures or transported within and/or to another hospital. Circumflex artery level is considered a landmark demarcating where the femoral nerve (FN) splits into anterior and posterior divisions. The objective of this study was to conduct POCUS, MRI/CT imaging on FN's of femoral triangle from novel GAX-specimens with innovative BriteVu (BV) contrast versus formalin-fixed cadavers (FFC) with subsequent dissections. **Methods**: Literature search was conducted regarding FN analysis from GAX-specimens with BV. GAX-specimens with BV (n=6:3-Male:3-Female:12-sides) were MRI/CT scanned, and FFC (n=15:9-Male,18 sides: 6-Female, 12 sides; total 30 sides) all had POCUS with GE Vscan Air performed and dissected. FN measurements were taken from inguinal ligament to arborization. **Results**: No known previous GAX-specimen studies. FN from GAX-specimens (3-males:6-sides; average 2.2cm; range:1.8-2.9) and (3-females:6-sides; average 0.65cm: range:0.3-1.1). FN from FFC (Males:18-sides; average 2.35cm; range:1.8-3.15) and (6-females:12-sides; average 0.77cm: range:0.4-1.3) The difference between FN trunk length from the inguinal ligament of males versus females is consistent with larger studies by Benninger with formalin-fixed cadavers (FFC). Males consistently have longer trunks distal to inguinal ligaments before arborization. POCUS image quality was significantly better from GAX-specimens and BV versus FFC which were poor quality. GAX-specimens were overwhelming easier to palpate and dissect versus FFC. **Conclusions**: This POCUS study suggests GAX-specimens with BV contrast provide ideal clinical skills opportunities for ultrasound imaging with PFNB versus FFC. Shorter FN trunks distal to the inguinal ligament from females suggests PFNB techniques should place needles with anaesthetic deposit more proximal to the inguinal ligament.
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Poster 42: Knee POCUS Training, Identifying Distal Semimembranosus Tendon from Novel GAX-specimens with BriteVu Contrast MRI/CT Images vs Formalin-Fixed Cadavers

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Introduction: Comprehensive distal semimembranosus tendon (DST) attachments are generally not fully taught, dissected and/or discussed regarding its clinical value and orientation with other medial knee structures during healthcare anatomy courses. The medial aspect of the knee joint has critical structures providing stability and buttressing. Part of the DST attachment is often mistaken for a ligament and its importance in knee stability continues to increase and training healthcare providers should be exposed to its comprehensive dynamic and sonoanatomy. It can be injured and is associated with pathologies result from trauma to the anterior cruciate ligament. It may have greater stability importance and be associated with missed diagnosis then currently understand. The objective of this study was to image GAX-specimens with BriteVu (BV) contrast using POCUS, MRI/CT cross-sections and dissect the DST attachment to the anteromedial tibial plateau versus formalin-fixed cadavers (FFC). **Methods**: Literature search was conducted regarding DST attachment to the anteromedial tibial plateau of GAX-specimens with POCUS identification studies. Novel GAX-specimens with BV (n=6:3-Male:3-Female:total 12-sides) with BV MRI/CT imaging versus FFC (n=15:9-Male,18 sides: 6-Female,12 sides; total 26 sides) with knee replacement and or knee surgery exclusion criteria all had POCUS performed with GE Vscan Air probes with subsequent dissection. **Results**: Literature search revealed no known studies. GAX-specimens enabled the knee joint to be mobile for positional POCUS, also allowing movement observation of the DST attachment at the anteromedial tibial plateau throughout dissecting unlike FFC. BV contrast cross-sectional imaging revealed detailed vessels and associated soft tissue structures. GAX-specimen tissues were notably more compliant and lifelike vs FFC. DST layering dissections revealed a siginicant anteromedial arm deep to medial retinaculum, pes anserinus, its bursa and medial (tibial) collateral ligament. POCUS identified the DST at the anteromedial tibial plateau 12/12 sides-100% of moderate to good quality vs poor quality FFC's. **Conclusions**: This study demonstrated GAX-specimen tissues are lifelike and provide full range of motion ideal for POCUS and clinical skills training revealing the anteromedial arm of the DST not routinely dissected during healthcare anatomy lab courses which could improve sonoanatomy and knee clinical research. **References**: Knipe H, Hacking C, Feger J, et al. Semimembranosus muscle. Reference article, Radiopaedia.org (Accessed on 11 Aug 2023) https://doi.org/10.53347/rID-23308 Benninger B, Delamarter T. Distal semimembranosus muscle-tendon-unit review: morphology, accurate terminology, and clinical relevance. Folia Morphol (Warsz). 2013 Feb;72(1):1-9. doi: 10.5603/fm.2013.0001. PMID: 23749704.
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Poster 43: Assessing the Impact of a Longitudinal Ultrasound Curriculum for Emergency Medicine Residents

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Introduction: This quality improvement project examines the impact of adding one ultrasound shift each month to the second-year curriculum. In the past, the second-year schedule at Henry Ford Detroit was comprised of 3 intensive care unit (ICU) months and 9 Emergency Medicine (EM) months. Each EM month has approximately 20 shifts per month. In 2021, each PGY2 resident had an ultrasound shift replace a usual clinical shift. Each ultrasound shift focused on utilization of bedside point of care ultrasound (POCUS) for diagnostic and procedural benefit. Ultrasound faculty were available for teaching and guidance throughout each of these shifts. There is lack of standardization in ultrasound curriculum for emergency medicine residencies throughout the United States. ACEP released guidelines for emergency ultrasound education in 2009 recommending a minimum of 150 ultrasound scans for competency, but there is little information about the best way to accomplish this goal (American College of Emergency Physicians Use of ultrasound). **Methods**: Because POCUS is an essential aspect to emergency medicine education, it is important that all residents have protected time to apply the knowledge obtained in non-clinical settings, such as the skills lab during weekly lectures, to active patients for educational and diagnostic utility. This project investigates the change in quantity of ultrasound scans performed by the class of residents prior to the intervention compared to the class of residents after. The instillation of one ultrasound shift per EM month in 2021 allowed PGY2 residents 9 additional ultrasound shifts, totaling approximately 90 hours of additional dedicated ultrasound education. The ultimate goal of this QI project is to further solidify the utility of focused ultrasound education in every year of residency and to provide a potential framework for future standardization of ultrasound curriculum. **Results**: During the PGY-2 year of the class of 2022 (n=14) a total of 1066 scans were completed, averaging 76 scans/resident. Over all 3 years, a total of 3872 scans were completed, averaging 276 scans/resident. There were 11 residents who did an additional US elective their final year contributing an average of 173 scans/resident. The class of 2023 (n= 15), during the PGY-2 year with the new curriculum, a total of 2081 scans were completed, averaging 138 scans/resident. Over all 3 years a total of 5221 scans were completed, averaging 348 scans/resident. There were 9 residents who did an additional US elective their final year averaging 212 scans/resident. **Conclusions**: The addition of a longitudinal US elective resulted in more scans per resident on average, showing that each resident in the class of 2023 had more hands on ultrasound training than the class of 2022. Further studies are needed to assess the quality of ultrasound scans that were obtained as well as resident comfort with more ultrasound experience. **References**: 1. Ahern M, Mallin MP, Weitzel S, Madsen T, Hunt P. Variability in Ultrasound Education among Emergency Medicine Residencies. West J Emerg Med. 2010 Sep;11(4):314-8. PMID: 21079699; PMCID: PMC2967679. 2. American College of Emergency Physicians Use of ultrasound by Emergency Physicians. http://acep.org/practres.aspx?id=32882. 3. American College of Emergency Physicians, Policy Statement: Ultrasound Guidelines: Emergency, Point-of Care, and Clinical Ultrasound Guidelines in Medicine. Approved June 2016. ultrasound-guidelines---emergency-point-of-care-and-clinical-ultrasound-guidelines-in- medicine.pdf (acep.org) (Accessed 16 February 2023)

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Poster 44: Checking the Pulse on Ultrasound Education: Unveiling the Programmatic ULtraSound Evaluator (PULSE)

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Introduction: With the increasing integration of ultrasound technology in medical practice, there is a growing demand for standardized and comprehensive training in bedside ultrasound. However, the evaluation and quantification of the effectiveness and robustness of different ultrasound fellowship programs remain evasive. In response, our objective is to develop a uniform approach to address this gap and provide a standardized assessment tool for ultrasound education. **Methods**: We developed a metric tool, named Programmatic ULtraSound Evaluator (PULSE), specifically designed to evaluate four crucial components of ultrasound programs: administration, research, clinical practice, and graduate/post-graduate education. Each area is further subdivided, and a 0-2 scale is employed to calculate a comprehensive PULSE score for each program. The scoring criteria for each category includes education, encompassing medical student, resident, fellow, faculty, national/international, and online education, along with simulation training. Research involves assessing publications, posters, abstracts, and case reports. Clinical practice is evaluated based on factors such as the number of ultrasound machines available, the annual volume of ultrasound scans, the presence of credentialed bedside ultrasound modalities, and the percentage of credentialed faculty. The administration category considers billing practices, quality assurance measures, electronic medical records integration, and the role of the ultrasound director. The maximum attainable score on the PULSE metric tool is 38, with education (14), research (8), clinical practice (8), and administration (8). We applied this tool to assess 139 ultrasound fellowship programs using publicly available data from the EUSFellowships website August 2020 to March 2021. **Results**: The PULSE scoring method was utilized to evaluate 139 institutions listed on the EUSFellowships website. The mean score obtained across all programs was 23.26, with recorded scores from 0-30. There was a statistically significant correlation between program age and the PULSE score, with programs older than 5 years achieving notably higher mean score (18.12) compared to the mean score (14.72) of those less than 5 years old ($p=0.000002$). Additionally, program size demonstrated a similar correlation, as programs offering multiple fellowship positions per year obtained higher scores than those with a single fellow per year ($p=0.0006$). **Conclusions**: The implementation of an objective metric tool, like PULSE, facilitates a comprehensive evaluation of the strengths, weaknesses, and overall quality of ultrasound education programs. Larger and older programs tended to exhibit higher PULSE scores. The PULSE data was limited to the public domain EUSFellowships website. Future endeavors include updating data to include the most recent information from 2023 and assessing the external validity and reliability of the tool. Furthermore, efforts will be made to extend the applicability of the PULSE metric to other training programs, including medical student and resident curricula. We believe that this novel metric can serve both applicants and administrators in quantifying differences between programs and identifying areas for growth. **References**: NA

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Poster 45: Implementation of point-of-care ultrasound in faculty training for academic primary care clinics

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Introduction: A recent survey of VA Medical Centers highlighted that few outpatient clinics use point-of-care ultrasound (POCUS). Common barriers to outpatient POCUS use include lack of trained providers, ultrasound equipment, and funding for training (Nathanson et al., 2023). While outpatient clinics aspire to use POCUS more broadly, there are significant shared concerns around implementation including faculty time, training, and funding (Capizzano et al., 2022; Smith et al., 2022). Outpatient clinics face different clinical questions, scheduling constraints, varied resource access, and supervision challenges that impact POCUS training and implementation compared to Emergency Department, Intensive Care Unit, and inpatient wards settings. One specific challenge in the academic teaching setting is developing adequate training for faculty who supervise residents with POCUS skills and experience that eclipse those of their supervisors. Implementing a flexible, cognitive-focused (rather than skills-focused) curriculum was effective in building capacity among hospital faculty (Anstey et al., 2022), but this approach has not been explored or implemented in outpatient settings. **Methods**: Our POCUS team works across three separate clinical settings: an academic Internal Medicine clinic, a federally qualified health center, and five Family Medicine clinics. Each setting has unique needs, resources, priorities, faculty training, and degrees of ultrasound implementation. Across the Family Medicine clinics, we completed mixed-methods evaluation of a longitudinal POCUS curriculum, using Likert scale evaluation and qualitative feedback to assess barriers and facilitators towards POCUS implementation. In Internal Medicine, we conducted an initial needs assessment (an electronic survey distributed to primary care faculty prior to a POCUS lecture) to guide future development of POCUS curricula for internal medicine faculty. **Results**: We had 25 responses from outpatient academic Internal Medicine faculty. Among these, 76% had no more than intermittent POCUS instruction and 76% never used POCUS in the care of patients. 50% wanted to learn cognitive and hands-on technical skills to perform POCUS, while another 45% wanted to also learn how to teach residents basic POCUS. **Conclusions**: Results from this initial Internal Medicine needs assessment suggest strong outpatient faculty interest in both cognitive and skills focused POCUS training alongside an interest in being competent teachers of basic POCUS skills in the outpatient. Drawing upon lessons learned from a successfully implemented longitudinal faculty POCUS training within FM, we will discuss key considerations for building and implementing a robust, setting-tailored IM faculty POCUS training which responds to the stated needs and baseline competencies of faculty. We will discuss approaches to cognitive and psychomotor teaching, as well as ways to provide quality assurance and feedback as a means to build faculty confidence. **References**: Anstey J, Jensen T, Lalani F, Conner SM. Teaching the Teachers: A Flexible, Cognitive-Focused Curriculum in Point-of-Care Ultrasound Education for Hospital Medicine Faculty. J Ultrasound Med. 2022 Dec;41(12):3103-3111. doi: 10.1002/jum.16091. Epub 2022 Sep 5. PMID: 36063066. Capizzano, J. N., O'Dwyer, M.-C., Furst, W., Plegue, M., Tucker, R., Theyyunni, N., & Harper, D. M. (2022). Current State of Point-of-Care Ultrasound Use Within Family Medicine. The Journal of the American Board of Family Medicine, 35(4), 809–813. https://doi.org/10.3122/jabfm.2022.04.220019 Nathanson, R., Williams, J. P., Gupta, N., Rezigh, A., Mader, M. J., Haro, E. K., Drum, B., O'Brien, E., Khosla, R., Boyd, J. S., Bales, B., Wetherbee, E., Sauthoff, H., Schott, C. K., Basrai, Z., Resop, D., Lucas, B. P., & Soni, N. J. (2023). Current Use and Barriers to Point-of-Care Ultrasound in Primary Care: A National Survey of VA Medical Centers. The American Journal of Medicine, S0002934323001080. https://doi.org/10.1016/j.amjmed.2023.01.038

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Poster 46: A pilot longitudinal POCUS pathway for internal medicine residents

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Introduction: A 2017 survey found that only 37% of internal medicine residencies had a formal POCUS (Point-Of-Care Ultrasound) curriculum, increased from years previous. Most of these programs have created electives or held workshops. It's been shown that longitudinal POCUS training increases knowledge and skills retention among residents better than stand-alone workshops, but few currently offer longitudinal training. One program conducted an observational cohort study of interns where one group was randomly assigned to a longitudinal ultrasound curriculum. This group was more likely to correctly identify ultrasound images. This is a pilot longitudinal POCUS pathway initiated at the beginning of the 2023-2024 academic year to determine the feasibility of integrating a formal track into the upcoming residency curricular update by using a standardized grading system. **Methods**: Acceptance into the program was based on an application sent to rising second year internal medicine residents and determined by a committee of general medicine ultrasound faculty and fellows. Participants will complete ACP POCUS modules. Monthly noon report sessions led by either POCUS trained faculty or general medicine ultrasound fellows will focus on clinical application, image review, and case presentations. There will be monthly supervised scanning sessions of hospitalized patients. Residents will collect a portfolio with a goal of 75 examinations over the year. Studies will be reviewed weekly via a quality assurance process and receive a score for formative feedback. Residents will complete a POCUS elective and obtain EPAs (entrustable professional activities) following scanning sessions that will be assessed on at least three POCUS applications. **Results**: Five residents applied for four open positions; four residents are currently enrolled and are actively completing the ACP modules. **Conclusions**: This pilot pathway will assess the feasibility of a longitudinal POCUS curriculum. Participants will have frequent supervision of scanning in addition to a portfolio of examinations and formative feedback with POCUS trained experts. We will present the findings of the program architecture. **References**: Nicholas E, Ly AA, Prince AM, Klawitter PF, Gaskin K, Prince LA. The current status of ultrasound education in United States medical schools. J Ultrasound Med . 2021;40(11):2459–2465. doi: 10.1002/jum.15633. Reaume M, Siuba M, Wagner M, et al. Prevalence and Scope of Point-of-Care Ultrasound Education in Internal Medicine, Pediatric, and Medicine-Pediatric Residency Programs in the United States. J Ultrasound Med. 2019;38(6):1433–1439. doi: 10.1002/jum.14821. Kelm DJ, Ratelle JT, Azeem N, et al. Longitudinal Ultrasound Curriculum Improves Long-Term Retention Among Internal Medicine Residents. J Grad Med Educ. 2015 Sep;7(3):454-7. Kelm DJ, Ratelle JT, Azeem N, Bonnes SL, Halvorsen AJ, Oxentenko AS, Bhagra A. Longitudinal Ultrasound Curriculum Improves Long-Term Retention Among Internal Medicine Residents. J Grad Med Educ. 2015 Sep;7(3):454-7. doi: 10.4300/JGME-14-00284.1. PMID: 26457155; PMCID: PMC4597960.

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Poster 47: Integration of Ultrasound in Neuroanatomy Education: Two-year Experience

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Introduction: Despite the importance of ultrasound in clinical practice, organized ultrasound education is rarely integrated into the curricula of medical colleges or schools especially in Korea. To introduce ultrasound to the first-year medical students who were learning brain and head/neck anatomy, ultrasound principles and hands-on examinations were provided. **Methods**: Immediately after cadaver dissection for brain and head/neck anatomy, ultrasound sessions followed respectively.
These sessions included principles of ultrasound, ultrasonic anatomy, location of landmarks and the visualization of carotid and vertebral artery, jugular vein, and transcranial Doppler. After ppt & video clip classes, all the students participated to demonstration and thereafter hands-on examinations were provided on a living human for some volunteers. A questionnaire survey for ultrasound session was evaluated through on-line learning management system (LMS) of Chungnam National University Medical College. **Results**: Over 60% of students had no experience of ultrasound education. About 90% of students replied that ultrasound session was helpful for understanding the anatomy of brain and head/neck. 80% of students replied that they satisfied for the ultrasound session and 80% of students wanted further ultrasound classes. **Conclusions**: These data indicate that integrating ultrasound sessions to anatomy class are feasible. The expectable limitations include faculty passion and skill, level of participation, initial costs of ultrasound equipment, the cooperation of college leadership, and already saturated medical school curriculum. **References**: Smith CF, Barfoot S. Implementation of Ultrasound in Anatomy Education. Adv Exp Med Biol. 2021;1317:111-130. So S, Patel RM, Orebaugh SL. Ultrasound imaging in medical student education: Impact on learning anatomy and physical diagnosis. Anat Sci Educ. 2017 Mar;10(2):176-189. Chen WT, Kang YN, Wang TC, et al. Does ultrasound education improve anatomy learning? Effects of the Parallel Ultrasound Hands-on (PUSH) undergraduate medicine course. BMC Med Educ. 2022 Mar 27;22(1):207. Konge L, Albrecht-Beste E, Bachmann Nielsen M. Ultrasound in Pre-Graduate Medical Education. Ultraschall Med. 2015 Jun;36(3):213-5. Feilchenfeld Z, Dornan T, Whitehead C, Kuper A. Ultrasound in undergraduate medical education: a systematic and critical review. Med Educ. 2017 Apr;51(4):366-378. Hoffmann B, Blaivas M, Abramowicz J, et al. Medical Student Ultrasound Education, a WFUMB Position Paper, Part II. A consensus statement of ultrasound societies. Med Ultrason. 2020 May 11;22(2):220-229.

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Poster 48: Transcranial sonography for mesencephalic midline measurement in patients with Parkinson's disease

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Introduction: Depression is a common non-motor symptom in Parkinson's disease (PD), affecting almost half of patients. It can also precede the motor symptoms of PD and is more prevalent in those with a history of depression. The brainstem raphe (BR) is a cluster of neurons in the midline of the brainstem that releases serotonin and has been associated with mood disorders like depression. Transcranial sonography (TCS) is a non-invasive imaging technique that has identified decreased echogenicity of BR in depressed PD patients. TCS findings of hypoechogenicity in the BR may indicate a reduction of the serotonergic neurotransmitter system. The study aims to determine the feasibility of using TCS for mesencephalic midline measurement in PD patients. **Methods**: B-mode ultrasound measurements of the BR were conducted with a 2.0-3.5 MHz transducer on a Siemens Acuson S1000 scanner. BR echogenicity was evaluated semi-quantitatively using a three-point scale, and three different observers graded the severity to estimate interobserver variability. The echogenicity of the BR was assessed by comparing it to the adjacent highly echogenic red nucleus. The evaluation system of BR employed in this research had three tiers. A rating of Grade I meant that the BR was not discernible, whereas Grade II denoted a BR that was somewhat echogenic or intermittent. Grade III was allotted when the BR exhibited normal or higher echogenicity. As the transtemporal windows are not always symmetric, the subjects were examined on both sides, and the grade of BR echogenicity was determined as the higher score of the two bilateral measurements. **Results**: The study enrolled 200 PD patients, with a mean age of 68.2 years and 58.5% being women. Among them, 24.5% had a poor TW bilaterally, and this condition was significantly more common in women. The reliability of the assessment in the BR was analyzed using the kappa statistic, and the overall kappa value was found to be excellent. Intra and inter-observer agreement was very good, with values of 0.842 and 0.821, respectively. **Conclusions**: The results of our research indicated that TCS measurements of echogenicity in the BR are reliable and have high consistency between different observers in PD patients. Our findings suggest that the BR echogenicity could be a valuable diagnostic marker for PD. Additionally, TCS measurements of BR echogenicity may provide evidence for the association between depression and PD, and future investigations are warranted to probe this relationship. **References**: 1. Reijnders JS, Ehrt U, Weber WE, Aarsland D, Leentjens AF. A systematic review of prevalence studies of depression in Parkinson's disease. Mov Disord 2008;23:183-189; quiz 313. 2. Ishihara L, Brayne C. A systematic review of depression and mental illness preceding Parkinson's disease. Acta Neurol Scand 2006;113:211-220. 3. Becker T, Becker G, Seufert J, et al. Parkinson's disease and depression: evidence for an alteration of the basal limbic system detected by transcranial sonography. J Neurol Neurosurg Psychiatry 1997;63:590-596. 4. Stankovic I, Stefanova E, Ziropadja L, Mijajlovic M, Pavlovic A, Kostic VS. Transcranial midbrain sonography and depressive symptoms in patients with Parkinson's disease. J Neurol 2015;262:689-695. 5. Krogias C, Walter U. Transcranial Sonography Findings in Depression in Association With Psychiatric and Neurologic Diseases: A Review. J Neuroimaging 2016;26:257-263. 6. Cho JW, Baik JS, Lee MS. Mesencephalic midline change on transcranial sonography in early Parkinson's disease patients with depression. J Neurol Sci 2011;310:50-52. 7. Hughes AJ, Daniel SE, Kilford L, Lees AJ. Accuracy of clinical diagnosis of idiopathic Parkinson's disease: a clinico-pathological study of 100 cases. J Neurol Neurosurg Psychiatry 1992;55:181-184. 8. Ghourchian S, Zamani B, Poorkosary K, Malakouti SK, Rohani M. Raphe nuclei echogenicity changes in major depression. Med J Islam Repub Iran 2014;28:9. 9. Walter U, Hoeppner J, Prudente-Morrissey L, Horowski S, Herpertz SC, Benecke R. Parkinson's disease-like midbrain sonography abnormalities are frequent in depressive

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Poster 49: Feasibility of Transcranial Doppler for Implementation of Endovascular Therapy in a Patient with Basilar Artery Tip Thrombosis

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Introduction: Acute basilar artery (BA) occlusion is a devastating form of posterior circulation stroke with high risk of long-term disability or death, if not recanalized early. We report the feasibility of transcranial Doppler (TCD) in a patient with clinically minor neurological symptom and BA tip thrombus who benefited from receiving endovascular thrombectomy. **Methods**: A 72-year-old man was brought to our emergency department due to sudden onset dizziness which developed right after going to the bathroom in the middle of the night (onset time to arrival time: 66 minutes). Upon arrival, his blood pressure was 140/92 mmHg. Two hour 10 minutes after symptom onset, he further developed dysarthria, left facial palsy, and left side motor weakness and sensory numbness. He has been a current 15 pack-year smoker. He was diagnosed with hypertension, dyslipidemia, benign prostate hypertrophy, and gout. **Results**: Brain diffusion-weighted image underwent 2 hour 50 minutes after onset reveal faint high signal intensities at the right-side pons, right middle cerebellar peduncle, and right superior cerebellum. His neurological symptom was left facial palsy and mild dysarthria (NIHSS 2) and brain MRA nine hours after onset showed occlusion at the BA tip, but flow patency of both posterior cerebral arteries (PCAs) was preserved. TCD demonstrated prominent flow reversal along the BA and left vertebral artery due to distal BA occlusion, but his neurological symptom remained unchanged. Two days after symptom onset, and transfemoral cerebral angiography showed the presence of BA tip thrombus which blocked the orifice of right PCA, but its distal flow was maintained via ipsilateral posterior communicating artery. Thrombus was retrieved at once by suction thrombectomy and recanalized by TICI 2b. His neurological symptom gradually disappeared and follow-up TCD 4 day after thrombectomy showed near normal flow pattern and direction over the vertebrobasilar track. Three-month follow-up brain MRA showed complete recanalization state of the BA tip and he was neurologically free of symptom. **Conclusions**: TCD is a feasible, and valid non-invasive bedside method for evaluating the cerebral hemodynamics in acute stroke setting, particularly for clinicoradiological dissociation as minor neurological symptom and large vessel occlusion. **References**: Alemseged F, Nguyen TN, Alverne FM, Liu X, Schonewille WJ, Nogueira RG. Endovascular Therapy for Basilar Artery Occlusion. Stroke. 2023 Apr;54(4):1127-1137.

Poster 50: Correlation between carotid atherosclerosis on carotid ultrasound and the coronary artery calcification

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Introduction: Carotid artery atherosclerosis and coronary artery calcification has been suggested as a predictor of future coronary artery disease. The association between carotid ultrasound and coronary artery calcium score (CACS) has not been investigated. The aim of this study is to investigate the correlation between the carotid artery atherosclerosis and CACS. **Methods**: We retrospectively gathered patients who had both carotid ultrasound and cardiac computed tomography as part of health examinations. Subjects were categorized into four groups according to CACS as assessed by cardiac computed tomography: zero (0), low (1-99), intermediate (100-399), or high (≥400). Then, the presence of the carotid plaque and the mean of carotid intima-media thickness (IMT, mm) in each CACS group was assessed. The presence of calcified plaque which was defined as any carotid plaque with acoustic shadowing and the plaque score which was calculated to describe carotid plaque burden of the 12 segments of common carotid artery, carotid bulb, internal carotid artery were also analyzed. **Results**: Total 2,941 subjects (mean age: 55.0 ± 9.9 years) were included for analysis. Carotid plaques were detected in 1006 subjects (34.2%). The presence of carotid plaque and the mean IMT significantly increased as the CACS increased (21.4%, 46.3%, 68.1%, 79.9%, respectively, p for trend < 0.001; 0.64±0.23, 0.74±0.33, 0.77±0.37, 0.83±0.42, respectively, p for trend < 0.001). Also, the presence of the calcified plaque and plaque score increased as the CACS increased (39.8%, 42.3%, 57.8%, 65.8%, respectively, p for trend < 0.001; 1.97±1.27, 1.47±0.79, 1.93±1.14, 2.54±1.54, respectively, p for trend < 0.001). Multivariable linear regression analysis showed the IMT, the presence of the plaque, the presence of the calcified plaque and the plaque score increased as the CACS increased (p for trend <0.003, <0.0001, 0.002, <0.0001 respectively). **Conclusions**: A high CACS was associated with the increased IMT, the presence of carotid plaque, the presence of calcified plaque and the plaque score. **References**: Early atherosclerosis detection in asymptomatic patients: a comparison of carotid ultrasound, coronary artery calcium score, and coronary computed tomography angiography. Can J Cardiol. 2013;29:1687-94.

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Poster 51: Detecting Intracranial Cerebral Atherosclerosis in Transcranial Doppler Using a Convolutional Neural Network

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Introduction: Intracranial atherosclerotic stenosis (ICAS) is a major cause of ischemic stroke worldwide, with the middle cerebral artery (MCA) being the most common site of ICAS. Ultrasound detection of ICAS is useful in identifying at-risk patients, and transcranial doppler (TCD) can reliably rule out ICAS. However, manual interpretation of TCD data can be subject to inter- and intra-observer variability. **Methods**: To address this issue, we developed an automated method using neural networks to detect MCA stenosis from TCD audio signals. Specifically, we used a convolutional neural network (CNN) trained on a dataset of TCD and corresponding ICAS degrees generated by a panel of experts. We evaluated the performance of the CNN using receiver operating characteristic (ROC) analysis. **Results**: The CNN achieved an area under the ROC curve (AUC) of 0.92, indicating high accuracy in assessing ICAS. In fact, the CNN outperformed individual experts in terms of accuracy and agreement with the consensus scores. Specifically, the accuracy of MCA stenosis was 0.95, the precision was 0.93, the recall was 0.91, and the f1 score was 0.92. **Conclusions**: Our results suggest that CNN-based deep learning methods can be a reliable and efficient tool for ICAS assessment in TCD. This approach has the potential to reduce inter- and intra-observer variability and improve the diagnostic accuracy of ICAS assessments. Nonetheless, further studies are needed to validate the use of this approach in a larger and more diverse patient population. **References**: 1.Transcranial Doppler: examination techniques and interpretation Annals of Clinical Neurophysiology 2019.21(2).Youngrok Do; Yong-Jae Kim; Jun Hong Lee 2.Detection Of Cerebral Artery Vasospasm In Transcranial Doppler Using Artificial Intelligence Based On Convolutional Neural Network. Stroke 2023-02 suppl_1.Yong-Jae Kim; DongWoon Go; Ilwoong Kim; Joohwan Kim; Yosub Park

Co-Authors: Chloe Jiwon Kim, Dong-Woon Ko, Yosep Park, Yong-Jae Kim

Poster 52: The sonographic appearance of the collateral circulation in occluded common carotid artery

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Introduction: When the common carotid artery (CCA) gets occluded, it is usually assumed that blood flow past the blockage is impeded. Yet, in some instances, the collateral circulation can sustain the vessels distal to the blocked CCA. The occipital artery can function as a backup route between the carotid and vertebral arteries in case of occlusion. Color duplex sonography is a precise diagnostic tool to recognize a CCA occlusion (CCAO) and can also reveal the open distal vessels past the blocked CCA. In this case report, we present a patient with CCAO where the internal carotid artery (ICA) and external carotid artery (ECA) remained unobstructed, and we illustrate the sonographic manifestation of the collateral circulation. **Methods**: A 65-year-old man presented to the hospital with complaints of decreased vision in her right eye. Upon initial examination, she exhibited counting finger-level visual acuity in her right eye, while her left eye had a best-corrected visual acuity of 6/9. Aside from a relative afferent pupillary defect in the right eye, the results of slit lamp biomicroscopy and intraocular pressure tests were normal. An in-depth evaluation of the right fundus showed retinal whitening, a cherry red spot at the macula, and narrowed arterioles, suggesting a diagnosis of central retinal artery occlusion. **Results**: During a color duplex sonography, it was detected that the right CCA was occluded, but collateral flow was seen beyond the point of blockage, showing that blood flow was reestablished at the carotid bulb. A retrograde collateral filling of a branch vessel supplied the ICA and ECA beyond the occluded CCA, while VA flow remained unaffected. Further examination through cerebral angiography demonstrated the presence of right CCAO, with the hypertrophied occipital artery originating from the cervical part of the right VA serving as the branch vessel that delivered blood supply to the ICA and ECA. **Conclusions**: In conclusion, when performing cerebral angiography for focal neurological symptoms, CCA occlusion occurs in 1% to 5% of cases. The occipital-vertebral anastomosis is a crucial arterial network that links the external carotid and vertebral systems via the occipital artery. Our case report demonstrates that color duplex sonography effectively and sensitively examines artery patency and collateral flow beyond the occluded CCA. **References**: 1. Dermitzakis I, Minardos I, Kampanarou M, Mitakou D. Color duplex sonography of occlusion of the common carotid artery with reversed flow in the extracranial internal carotid artery. J Clin Ultrasound 2002; 30:388–391. 2. Miyachi S, Negoro M, Sugita K. The occipital-vertebral anastomosis as a collateral pathway: hemodynamic patterns—case report. Surg Neurol 1989; 32:350–355. 3. AbuRahma AF, Pollack JA, Robinson PA, Mullins D. The reliability of color duplex ultrasound in diagnosing total carotid artery occlusion. Am J Surg 1997; 174:185–187.

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Poster 53: Point-of-care ultrasonography for defecation care by nurses at a homecare setting after an educational program

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Introduction: Many countries have witnessed a trend toward home medical care considering the advanced aging society. Defecation care is one of the essential components impacting the quality of life. Fecal retention in the colorectum can be visualized using ultrasound. A previous study suggests that ultrasonographic assessment-based defecation care by nurses in homecare settings may improve identifying constipation symptoms and reduce laxative use. This study explored the impact and perceptions of point-of-care ultrasonography (POCUS) for defecation care by home-visit nurses in Japan. **Methods**: Four nurses without prior ultrasound experience were invited to ultrasound training program for continence and defecation care, comprising e-learning and onsite one-day hands-on lecture. After the program, participating nurses were provided handheld ultrasound devices and instructed to apply POCUS to patients with suspected functional constipation for their physical assessment while nursing visits. The obtained images were reviewed monthly by a supervised physician familiar with POCUS. In addition, a semi-structured questionnaire evaluated the impact and perceptions of the exam towards defecation care by nurses. **Results**: Three nurses performed twenty POCUS exams from December 2022 to June 2023. The median patient age was 76; all were diagnosed with chronic functional constipation. No adverse events were observed. In 80% (n=16) of the exams, the nurse successfully visualized the rectum and interpreted the findings at the bedside. Two findings influenced the subsequent interventions to defecate: the crescent-shaped hyperechoic area suggesting fecal retention in the rectum, and the acoustic shadow behind the hyperechoic area implying hardness of the stool. In four cases, the nurses contacted their physicians to discuss options for further pharmacological management. In 45% (n=9) of the exams, nurses reported that POCUS changed their approach to defecation care. Overall, the participating nurses' perceptions of the usefulness of POCUS in defecation care was 4.45 on the 5-point Likert scale. **Conclusions**: Colorectal ultrasonography can assist home-visit nurses with on-the-spot decision-making for defecation care. In addition, it is an obtainable skill requiring only brief training for novice learners. However, continuous multidisciplinary support is required to ensure the exam quality and alleviate nurses' anxiety. **References**: Matsumoto M, Yoshida M, Miura, et al. Feasibility of the constipation point-of-care ultrasound educational program in observing fecal retention in the colorectum: A descriptive study. Jpn J Nurs Sci. 2021 Jan;18(1):e12385. Matsumoto M, Yoshida M, Yabunaka K, et al. Safety and efficacy of a defecation care algorithm based on ultrasonographic bowel observation in Japanese home-care settings: a single-case, multiple-baseline study. Geriatr Gerontol Int. 2020 Mar;20(3):187-194.

Poster 54: Comparison of Different Standoff Pads During Ocular Ultrasound Training Sessions

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Introduction: Bedside ocular ultrasound is a fast, non-invasive, and cost-effective diagnostic tool. Ocular ultrasound typically involves large amounts of ultrasound gel placed over the eye to minimize pressure placed on the eye by the ultrasound probe. During training sessions, the eye being imaged must be change frequently, so using large amounts of gel is messy and wasteful. In this study, we compared different standoff pad options during ocular ultrasound education sessions. **Methods**: Small groups of medical students practiced ocular ultrasound on standardized patients (SP) under direction of faculty members. There were 3 standoff pad options: gel placed over saran wrap, gelatin pads, and water-filled balloons. Each SP, student, and faculty completed a survey regarding their preference and the pros and cons of each option. They also rated the quality of the standoff pads on a 3-point Likert scale. The responses were then compiled and examined for common themes. **Results**: Out of 13 SPs, 6 (46%) favored gelatin pads, 4 (31%) gel, and 3 (23%) balloons. Out of 15 faculty, 11 (73%) favored gelatin pads, and 4 (27%) gel. Out of 104 students, 50 (48%) favored gel, 43 (41%) gelatin pads, and 10 (10%) balloons. Gelatin pad advantages were that it felt comfortable for the SPs, yielded clear images, and was quick, neat, and easy to use. However, it broke easily and had to be replaced often. Advantages of the gel were that it was comfortable for the SPs, easy to use, and yielded clear images. However, it was also messy and constantly slipped off. The balloon was noted as neat and interesting to use but yielded poor images and it was difficult to maneuver probes. **Conclusions**: Overall, gelatin pads were most preferred, followed by gel. Given the desire to find a medium that is neat and easy to use, comfortable for SPs, and yields clear images, gelatin pads would likely be the best option for ocular ultrasound training sessions amongst these choices of standoff pads. **References**: 1. Lyon M, Blaivas M. Ocular ultrasound. In: Emergency Ultrasound. 2nd ed. New York: McGraw Hill; 2008: 449-462. 2. Blaivas M, Theodoro D, Sierzenski PR. A study of bedside ocular ultrasonography in the emergency department. Acad Emerg Med. 2002;9(8):791-799. 3. Roth KR, Gafni-Pappas G. Unique Method of Ocular Ultrasound Using Transparent Dressings. The Journal of Emergency Medicine. 2011;40(6):658-660.

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Poster 55: Hepatomegaly and liver fatty infiltration among a sample of pediatric patients in Puerto Rico

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Introduction: In Puerto Rico, 46% of the pediatric population are overweight or obese (unhealthy weight) according to their Body Mass Index (BMI). Pediatric obesity is a global public health crisis. It is associated with several comorbidities such as early onset diabetes mellitus 2, dyslipidemia, hypertension, and the development of liver complications such as Non-alcoholic fatty liver disease (NAFLD)1. Currently, in the USA, NAFLD is the most common liver disease in children and is becoming the leading cause of chronic liver disease and liver failure requiring transplantation in this population2. The prevalence of NAFLD differ by ethnicity, sex, and age. This study aims to determine the association between body weight and liver size and texture in a sample of pediatric patients in Puerto Rico. **Methods**: Forty-three (n=43) pediatric patients between 7 and 19 years underwent a craniocaudal (CC) panoramic ultrasound view of the right liver lobe (RLL)3. Craniocaudal RLL length and liver texture, classified according to severity, were evaluated. BMI was calculated using the CDC BMI Percentile Calculator for Child and Teen. BMI and waist circumference (WC) were also compared. Shapiro-Wilk test, student's t-tests, ANOVA single factor, and Post Hoc Tukey HSD were attained with significance at p < 0.05. **Results**: We found differences in the liver size and texture between healthy weight and unhealthy weight pediatric patients: (1) RLL craniocaudal length (p=0.003); (2) Waist Circumference (p < 0.0001); and (3) BMI (p < 0.0001). The RLL and WC of the obese patients were significantly larger compared to the healthy-weight group (p=0.02; p<0.001). Unhealthy-weight pediatric patients have a greater number of livers with hepatomegaly (n=12) and fat infiltration (n=15). **Conclusions**: Large liver size and NAFLD were frequent among overweight and obese patients in our sample of Puerto Rican pediatric patients. Our study suggests that liver changes associated with obesity occur early in our children's development. Whether these findings translate to the development of chronic liver disease and failure in younger ages warrants further investigation. There is vast information about the physical, psychological, and economic burden associated with obesity-related comorbidities and the increased risk of cardiometabolic disease, morbidity, and mortality. Such comorbidities can be preventable with early evaluation and intervention. Strategies to prevent unhealthy weight in our children are essential to avoid the burden associated with young adults with chronic diseases and potential disabilities.

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Poster 56: POCUS Imaging of the Bifurcate Ligament Could Improve Ankle Ligament Outcomes

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Introduction: Excessive plantar flexion with inversion of the foot/ankle complex describes the common every day sprained ankle often with an outcome of an injured ATFL ligament. The same mechanism of injury can and does injure the Y-shaped bifurcate ligament (BL) which is responsible for stabilizing the calcaneocuboid (CC), calcaneonavicular (CN) and midtarsal joints. For this, the BL has been considered the cornerstone of the transverse tarsal joint. Authors of this region believe those who have an ATFL injury may also have a subsequent BL injury which can be identified with ultrasound. The objective of this study was to conduct POCUS on the BL, acquire cross-sectional imaging and dissect the BL from novel GAX-specimens with BriteVu (BV) contrast versus formalin-fixed cadavers (FFC). **Methods**: METHODS. Literature search was conducted regarding POCUS of BL and cross-sectional imaging from GAX-specimens with BV versus FFC studies. GAX-specimens (n=6:3-female:3-male,12 sides) with innovative BV contrast and CT/MRI imaging with dissection versus FFC (n=17,34 sides). BL subsections are the CC-L/CN-L ligaments which will be identified via POCUS GE Vscan Air and dissection. **Results**: RESULTS. CN-L was identified and dissected in 46:46 sides-100%. CC-L was identified and dissected in 11:12 GAX-specimens-91.67% and 32:34 FFC-94.1%. Ultrasound revealed acceptable images from all GAX-specimens but was marginal to poor with FFC-9:34 26.47%. GAX-specimens CT/MRI with BV contrast provided impressive images. BL is demonstrated in anatomy atlases, but little is discussed in contemporary anatomy texts. François Chopart recognized the significance of stability the BL provides the transverse tarsal joint. Lateral ankle sprains are extremely common and very widely with degree of injury. The authors believe a relationship between the severity of an ATFL injury is accompanied with a concomitant BL injury. **Conclusions**: CONCLUSION. This study revealed GAX-specimens with BV contrast allowed dynamic BL examination due to tissue compliance and joint mobility. POCUS, cross-sections, and dissections were superior quality versus FFC demonstrating GAX-specimens are a better medium versus FFC for POCUS/surgical/radiological skills training, sonoanatomy and clinical anatomy research.
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Poster 57: Gallbladder Point of Care Ultrasound (POCUS) use in Metastatic Pancreatic Adenocarcinoma: A Case Report

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Introduction: Physical examination and ultrasound are necessary for assessing gallbladder disease. Gallbladder ultrasound is most beneficial in the detection of gallstones or acute cholecystitis.1 There are many physical exam findings that correspond to different disease processes. A well-known physical exam finding is Courvoisier's sign, which is the presence of jaundice as well as an enlarged gallbladder or right upper quadrant mass with the absence of right upper quadrant pain.2 Courvoisier signifies that there is a chronic obstruction that is likely due to obstruction by a malignant process as it occurs slowly over time, not causing pain for the patient.2 Another ultrasound finding representing outlet obstruction is hepatization, which is seen when another organ (like the gallbladder) looks similar to the consistency of the liver. The liver is a very dense organ; therefore, when the gallbladder becomes dense due to outlet obstruction, it becomes to look like the liver. **Methods**: Case Presentation The patient is a 45-year-old man with a history of portal vein stents, biliary stent, and stage IV pancreatic adenocarcinoma with lungs and liver metastasis presented to the ED for signs of septic shock. He was found to have spontaneous bacterial peritonitis and appropriate treatment were started. Labs were notable for hyperbilirubinemia of 1.63, high normal alkaline phosphatase. On abdominal exam, the liver was significantly enlarged. An abdominal ultrasound was performed, revealing an edematous, enlarged (Figure 1) thickened gallbladder wall with hepatization and layering sludge (Figures 2 and 3) and pericholecystic fluid. Considering the patient did not have right upper quadrant pain, the findings of elevated bilirubin and an enlarged gallbladder on ultrasound are consistent with derivative of Courvoisier sign, indicating a more chronic obstruction likely from the pancreatic cancer. Figure 1: Sagittal view of enlarged gallbladder measuring 6.4 cm with the wall measuring 1.0 cm. (Unable to attach image) Figure 2: Sagittal view of liver and gallbladder with gall bladder showing hepatization and sludge. (Unable to attach image) Figure 3: Transverse view of gallbladder showing hepatization. (Unable to attach image) **Results**: Refer to discussion portion under conclusions. **Conclusions**: Discussion In this case, the use of an ultrasound to assess the elevated bilirubin finding led to the discovery of a chronic obstruction of the biliary tree, leading to an enlarged gall bladder likely due to malignant obstruction rather than gallstones. The distention of the gallbladder occurs due to progressive backpressure from the obstruction. With gallstones, the obstruction is intermittent, therefore less likely to cause a chronic rise in pressure.2 Also, gallstone obstruction causes frequent episodes of infection causing fibrosis, leading to the gallbladder shrinking.2 On the other hand, an obstruction due to malignancy has a progressive course, leading to a slow and constant increase in backpressure to the gallbladder, resulting in gallbladder enlargement. Hepatization is another sign of obstruction, as the gall bladder is not able to release its products, it becomes engorged and edematous, looking similarly to the liver on ultrasound. As in this case, the use of ultrasound is essential as it gives you a fast real time picture of the underlying pathologies without the use of more expensive, time consuming, and radiologically harmful imaging modalities. **References**: 1. Becker BA, Chin E, Mervis E, et al. Emergency biliary sonography: utility of common bile duct measurement in the diagnosis of cholecystitis and choledocholithiasis. J Emerg Med 2014; 46:54. 2. Fitzgerald JE, White MJ, Lobo DN. Courvoisier's gallbladder: law or sign? World J Surg 2009; 33:886.

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Poster 58: Accuracy of Point-of-Care Ultrasound (POCUS) in Diagnosing Pulmonary Contusion on Blunt Chest Trauma Patients Compared to Trauma CT Thoracic Imaging

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Introduction: Pulmonary Contusion is a condition characterized by the bruising of the lungs which can cause bleeding and swelling. It is commonly diagnosed following blunt chest trauma, occurring in 25-30% of blunt trauma cases.1 Pulmonary contusion is associated with a 10-25% mortality rate because it is an independent risk factor of long-term respiratory failure; therefore, prompt diagnosis and treatment of pulmonary contusion is crucial to minimize preventable injuries and ensure the patient's recovery.2 Currently, the gold standard technique to detect pulmonary contusion is a computed tomography (CT) scan of the thoracic region. CT chest scans locate the size and distribution of the pulmonary injury but require the patient to be exposed to harmful radiation and may be inaccurate for determining the presence of pulmonary contusions during their early stages of development. However, Point-of-Care Ultrasound (POCUS) is increasingly being used as a standard technique in many Emergency Departments (ED) for detecting pulmonary contusions. This study aims to discover whether lung POCUS may be able to replace CT chest scan as a better standard diagnostic technique for pulmonary contusion by comparing the precision of ultrasound examinations with CT thoracic scans. **Methods**: For this study, undergraduate research associates utilized Epic Software to screen for eligible patients who present to the Emergency Department as a moderate trauma with blunt chest trauma and a CT thoracic scan. Once patients were approached and consented, a licensed physician performed a four-lung field bedside POCUS, taking note of pneumothorax, hemothorax, hemoperitoneum, pleural effusion, B-lines, and pleural thickening. A total of six B-Lines across all four zones indicated pulmonary contusion. **Results**: At this time, 24 patients have been enrolled into this study with 98.5% of enrolled patients initially triaged as a moderate trauma. CT scans detected 5 patients to have pulmonary contusion whereas POCUS detected 2 patients with pulmonary contusion. For both male and female patients, there were no statistically significant differences in pulmonary contusion. In patients with CT scans that showed "slight" pulmonary contusions as per radiologist notes, <6 B-lines were observed on their POCUS. **Conclusions**: Ultimately, POCUS may be an accurate and efficient method for diagnosing pulmonary contusions, but more research with a larger patient population is necessary for drawing definitive conclusions. **References**: 1. Stolz A, Schützner J, Lischke R. Plicní kontuze [Pulmonary contusion]. Rozhl Chir. 2017 Winter;96(12):488-492. Czech. PMID: 29320209. 2. Rendeki S, Molnár TF. Pulmonary contusion. J Thorac Dis. 2019;11(Suppl 2):S141-S151. doi:10.21037/jtd.2018.11.53

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Poster 59: Enhanced Peritoneal stripe sign (EPSS), is it really a specific sign?

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Introduction: Pneumoperitoneum is the presence of air in the abdominal cavity (1) mostly caused by the perforation of a hollow viscus. It is typically diagnosed by using x-ray, computerized tomography (CT scan) or ultrasounds. In 1999, D. Muradali et col. (2) described the enhanced peritoneal stripe sign (EPSS), on animal models and patients who had undergone laparoscopy, by using ultrasound guidance and performing ecographic examinations. Ever since EPSS was described, it has been known as an accurate, reliable and reproducible sign of pneumoperitoneum (2, 3), as well as a useful diagnostic tool in patients with acute abdominal pain (4). The purpose of this study is to evaluate the feasibility and accuracy of the EPSS sign identifying it on healthy volunteers. **Methods**: An observational study was conducted on seventeen healthy volunteers (n=17). Mean age was 22.5 years old. None of them had a medical history of pneumoperitoneum and had not undergone laparoscopy recently. Sonographic images were obtained from the anterior abdominal wall using a “lawnmower method”. The presence of the enhanced peritoneal stipe sign (EPSS 1) and its absence (EPSS 0) were noted. Hours of fasting were also registered for further analysis. **Results**: A compatible image with EPSS was detected in seven out of the seventeen volunteers. Suspiciously, the different locations in which the EPSS was found draw the colonic shape. No direct links could be established between the hours of fasting and the presence of the sign. **Conclusions**: According to the results, EPSS can be found in healthy volunteers, suggesting that it may appear regardless of the patient's health status. In addition, the finding of sonographic images compatible with EPSS in the 41% of the sample of healthy volunteers should make us question the values of sensibility and specificity described in the bibliography. **References**: (1): Sureka B, Bansal K, Arora A. Pneumoperitoneum: What to look for in a radiograph? J Family Med Prim Care. 2015 Jul-Sep;4(3):477-8. doi: 10.4103/2249-4863.161369. PMID: 26288798; PMCID: PMC4535122.
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Poster 60: Do experts use M-Mode for lung ultrasound? A survey.

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Introduction: The use of M-Mode to examine the lung is apparently very common, especially for evaluating different lung sliding patterns. There is some evidence of its usefulness amongst novice users. However, we suspect a common relation between elevated lung ultrasound expertise and a less use of M-Mode, due to its lack of clinical added information and the possibility of leading to clinical errors. **Methods**: We conducted a brief online anonymous survey to different experts around the world, asking them about different aspects of M-Mode usefulness in lung ultrasound. The collected data is expressed in medians (data didn't follow normal distribution) and percentages. **Results**: We sent 55 surveys and received 39 responses (response rate 70.9%) from 16 countries including USA, UK, Spain and Italy. Experts had 14.5 median years of experience and were mainly Emergency Physicians (57%) but we got responses from PICU, ICU, Internal Medicine, Nephrologists and Cardiologists. Overall, the usefulness score of M-Mode was 2 points (0 points=not useful; 5 points=extremely useful).
For the evaluation of stable pneumothorax:
- 36.8% never use M-mode
- 28.9% use it for less than 25% of patients
- 23.7% use it in half of the patients
- 2.6% use it in 75% of the patients
- 7.9% use it in all patients

In the setting of an unstable pneumothorax:
- 46.2% never use M-mode
- 23.1% use it for less than 25%
- 17.9% use it in half of the patients
- 0% use it in 75% of the patients
- 2.8% use it in all patients

For the lung pulse evaluation:
- 41.0% never use M-mode
- 28.2% use it for less than 25% of the patients
- 12.8% use it in half of the patients
- 10.3% use it in 75% of the patients
- 7.7% use it in all patients

5.3% of the experts never used M-Mode in their teaching slides, 36.8% used it in the past but not currently and 57.9% are still using M-Mode in their teaching slides. In a real clinical environment, M-Mode never clarified a diagnosis for 33.3% of experts, 33% responded that only a few times during their careers, 28.2% from time to time and 5.1% said quite often. Main uses of M-Mode were documentation (6 responses), teaching basic users (4) and the only clinical related responses were assessment of hypoventilation / poor sliding, lung sliding assessment in irregular pleura and distinction between pneumothorax and atelectasis from intubation. We also received other responses like echo, IVC or diaphragm evaluation which were not actually related to lung ultrasound. **Conclusions**: Despite expert users still teaching M-mode for lung ultrasound, due to its potential usefulness for archiving/documentation purposes and the impact for beginners, its clinical usefulness seems unclear, since the significant majority of them don't use it for lung sliding patterns assessment in their daily practice due to the inability of clarifying actual diagnosis. **References**: A survey to different professionals with ultrasound expertise

Poster 61: POCUS Leading to a Diagnosis of Paradoxical Air Embolism in Cardiac Arrest

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Introduction: Introduction Vascular air embolism occurs when air enters a patient's venous or arterial circulation. These events present anywhere from completely asymptomatic, to stroke, complete cardiovascular collapse, and even death.1 Case Presentation A 59 year-old male with a history of tracheostomy, stroke, and renal failure on intermittent hemodialysis (HD) was admitted to our hospital for necrotizing pneumonia. On hospital day three, he underwent bedside HD, after which he was found unresponsive. A non-contrast head CT showed diffuse air within the brain's venous circulation. The team suspected retrograde venous air embolism as a complication of hemodialysis and he was sent for hyperbaric oxygen (HBO) treatment. Just prior to initiation of therapy in the HBO unit, the patient went into pulseless electrical activity arrest, and two rounds of CPR were delivered with return of spontaneous circulation. Point of care ultrasound (POCUS) at the time of arrest demonstrated innumerable air bubbles throughout both the left and right sided cardiac chambers, suggesting persistent venous and paradoxical air embolism as a cause (or result of) his arrest. Ultimately, he developed rapidly escalating vasopressor requirements and suffered further cardiac arrests leading the family to opt for DNR. **Methods**: - **Results**: - **Conclusions**: Venous air embolism (VAE) is an uncommon, but potentially fatal complication of endovascular or procedures.1,2 Central venous catheters are a common cause of VAE due to air entrainment in a closed circuit, or when the tubing is damaged. 1,3,4 While small volumes of air can be cleared by the pulmonary circulation, larger volumes result in pulmonary arterial vasoconstriction, right ventricular dysfunction/failure, acute outflow obstruction, or cardiovascular collapse. Occasionally, migration of venous air into the systemic arterial circulation occurs via intracardiac and intrapulmonary shunting (i.e. patent foramen ovale, or dense pulmonary consolidations). This "paradoxical" air embolism can result in stroke, diffuse endovascular injury with organ ischemia, multi-organ failure.1 A volume as little as 100 mL is considered grave, and 3-5 mL/kg is considered a lethal dose in humans.1,2 The rapid detection of air bubbles in circulation is paramount to preventing morbidity and mortality from this condition. POCUS can be a valuable tool in the evaluation for intracardiac air in unstable patients, given that as little as 0.05 mL/kg can be detected.5–7 TTE can evaluate for RV failure and screen for paradoxical (left-sided) air emboli.5 Once diagnosed, a combination of rapid positioning in Trendelenburg and left lateral decubitus, termed "Durant's maneuver", should be initiated, in addition to continued supportive care with 100% oxygen, ventilatory support, vasopressors, and volume resuscitation.2,5 Hyperbaric oxygen therapy is indicated in hemodynamically unstable patients, those with end-organ damage or neurologic deficits, which can be delivered even after significant delay.2,5 **References**: Brull SJ, Prielipp RC. Vascular air embolism: A silent hazard to patient safety. J Crit Care. 2017;42:255-263. doi:10.1016/j.jcrc.2017.08.010 2. Rahman ZU, Murtaza G, Pourmorteza M, et al. Cardiac Arrest as a Consequence of Air Embolism: A Case Report and Literature Review. Case Rep Med. 2016;2016:1-4. doi:10.1155/2016/8236845 3. Sahutoglu T, Sakaci T, Hasbal NB, et al. Air embolism following removal of hemodialysis catheter. Hemodial Int. 2017;21(1):29-34. doi:10.1111/hdi.12456 4. Wong SSM, Kwaan HC, Ing TS. Venous air embolism related to the use of central catheters revisited: with emphasis on dialysis catheters. Clin Kidney J. 2017;10(6):797-803. doi:10.1093/ckj/sfx064 5. Ruiz Avila HA, García-Araque HF, Acosta-Gutiérrez E. Paradoxical venous air embolism detected with point-of-care ultrasound: a case report. Ultrasound J. 2022;14(1):19. doi:10.1186/s13089-022-00265-7 6. Aquino-Jose VM, Johnson S, Quinn M, Havryliuk T. Arterial Gas Emboli Secondary to Portal Venous Gas Diagnosed With Point-of-Care Ultrasound: Case Report and Literature Review. J Emerg Med. 2020;59(6):906-910. doi:10.1016/j.jemermed.2020.06.060

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Poster 62: Institutional Point of Care Ultrasound Disinfection Practices

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Introduction: Consistently following proper ultrasound disinfection protocol is often difficult due to a variety of institutional and individual factors. The current literature shows a common theme of noncompliance with protocols (1-4). This is problematic as it can increase the risk of iatrogenic infections in patients. Our objective is to gain an accurate assessment of protocol compliance at a large academic medical center to identify areas of potential future improvement. **Methods**: To assess disinfection compliance, a commercial third-party vendor was brought in to complete an assessment of the academic center's ultrasound devices and compliance rate in relation to established disinfection guidelines. This was accomplished by determination of use, level of disinfection required, and in-person examination and evaluation of equipment. Each machine was then marked as compliant or non-compliant. After the data was received, it was separated into groups to compare compliance across different hospitals and healthcare settings. Data that was assessed was overall compliance rate, compliance specifically for low-level disinfection (LLD) and high-level disinfection (HLD) probes, and compliance between probes used by sonographers and non-sonographers. **Results**: The total number of ultrasound probes assessed throughout OSUMC were 334. The overall compliance rate was 51%, with a specific breakdown of a rate of 100% for LLD probes and 26% for HLD probes. For HLD probes, sonographers had a compliance rate of 55% and non-sonographers had a rate of 15%. Compliance also varied among sonographers using HLD probes in different hospitals and patient settings from 0% at one hospital to 100% at an outpatient clinic. **Conclusions**: Our findings indicate a significantly suboptimal rate of noncompliance with high-level ultrasound disinfection protocols. Although our data does show a slightly better compliance than that seen in national surveys, future steps need to be taken in order to increase the safety and quality of care provided to our patients with this modality. While training the next generation of sonographers, placing an emphasis on disinfection practices during introductory demonstrations can promote positive ultrasound disinfection practices. **References**: 1. Improperly sterilized or HLD equipment – a growing problem. 2017 [cited 2022 8/7/2022]; Available from: https://www.jointcommission.org/-/media/tjc/documents/newsletters/qs_33a_2017pdf.pdf. 2. Sartoretti, T., et al., Bacterial contamination of ultrasound probes in different radiological institutions before and after specific hygiene training: do we have a general hygienical problem? Eur Radiol, 2017. 27(10): p. 4181-4187. 3. M'Zali, F., et al., Persistence of microbial contamination on transvaginal ultrasound probes despite low-level disinfection procedure. PLoS One, 2014. 9(4): p. e93368. 4. Carrico, Ruth M., Stephen Furmanek, and Connor English. "Ultrasound probe use and reprocessing: results from a national survey among US infection preventionists." American Journal of Infection Control 46.8 (2018): 913-920.

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Poster 63: POCUS Reverse Pericardiocentesis using Novel Subxiphoid-right Sternoclavicular Joint Approach with GAX-specimen and BriteVu Contrast for Medical Student and Resident Training

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Introduction: In 1979 echocardiograph revolutionized elective pericardiocentesis (PC). POCUS is now accessible in the 'field' with wireless, waterproof and shock resistant handheld probes for emergency lifesaving what was blind techniques with serious side-effects (SE). There are two recognized classic approaches, subxiphoid to left axilla/shoulder and direct left transthoracic. Recently, Benninger developed a successful blind subxiphoid-right sternoclavicular joint approach (SRSJa). SRSJa appeared anatomically safe and technically simple. However, there have been no follow-up studies. POCUS GE Vscan air probes are being used by the authors teaching medical skills during formal medical school ultrasound curriculum. Donor cadavers are an ideal medium to practice reverse pericardiocentesis which requires the same end result, entering the pericardial space. The objective of this study was to investigate POCUS performing SRSJa to successfully conduct a reverse pericardiocentesis with medical students practicing on novel GAX-Specimens with innovative BriteVu (BV) contrast versus Formalin-fixed cadavers (FFC) in an anatomy dissection lab. **Methods**: Literature search was conducted regarding PC approaches taught during routine dissection. Medical students (n=4 1st years) with no PC experience but have attended a cardiac ultrasound workshop. They were informed how to perform SRSJa on GAX-specimens (n=6:3-Male:3-Female) and FFC (n=30:17-Male:13-Female) injecting approximately 50-80mls of fluid into the pericardial space (PS) followed by clamshell dissection to assess fluid placement. **Results**: Literature search revealed no anatomical description of PC techniques in anatomy textbooks. The two classic techniques were explained in specialty texts, atlases, and websites. SRSJa was developed and described in 2011 by Benninger. Dissection revealed students (4/4-100%) using SRSJa were successful placing PC needle into the PS (video and dissection proof) with GE Vscan Air and no obvious injury to other structures post clamshell dissection. FFC (30/30-100%) revealed poor ultrasound cart images. Blind PC was limited versus GAX-specimens due to increased tissue resistance. POCUS and blind emergency PC remain an important lifesaving skill. There is need to have multiple techniques and/or approaches to improved POCUS and blind approach success. Students with no previous PC experience performed SRSJa successfully on novel lifelike cadavers prepared as GAX-specimens. **Conclusions**: This study revealed the SRSJa for PC using POCUS Vscan Air probes could be conducted successfully with minimal training and injury to relevant structures on a GAX-specimen of BV contrast prior to clamshell thoracotomy procedure. **References**:

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Poster 64: POCUS and Macroanatomy of Distal Radial Artery Canulation Technique with GAX-specimen and BriteVu Contrast

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Introduction: Of the 3 vascular hand arches (2 palmar, 1 dorsal) the superficial palmar arch has received significant attention due to the varied number of clinical skills and invasive procedures associated with 3 segments of the radial artery (RA1, RA2, RA3). The authors delineate the segments as RA1-8cm length pre styloid process, R2-Distal to styloid process and/or where superficial palmar artery branches from radial artery at the styloid process site inferiorly through anatomical snuffbox, R3-Distal to outer border of anatomical snuff box along extensor pollicis longus. RA1 segment is used for pulse monitoring, arterial blood gas draw, renal dialysis autogenous fistula, forearm grafting and harvesting. RA1 was initially the alternative site for angiography of coronary vessels versus femoral artery, but now is the gold standard. However, during the past decade RA2 and RA3 segments are popularly referred to as the distal radial artery (DRA). Studies demonstrated RA access in ST-elevation myocardial infarction patients had decreased risk of local complications and systemic bleedings. Providing detailed descriptive anatomy of RA1, RA2, RA3, Radial superficial palmar artery (RSPA) is important for invasive procedures using POCUS revealing structural morphology. Study objective was to investigate POCUS imaging and dissections of RA1, RA2, RA3 segments and RSPA from novel GAX-specimens with BriteVu contrast (BVc) versus formalin-fixed cadavers (FFC). **Methods**: Literature search revealed no GAX-specimen with BVc of RA1, RA2, RA3, RSPA studies. GAX-specimens (n=6:3-Male:3-Female:12-sides: average age 67) were MRI/CT scanned with BVc and FFC (n=15:9-Male:6-Female:30-sides: average age 78) all had POCUS (GE Vscan Air probe) imaging. A total of 42 sides was dissected assessing RA1, RA2, RA3, RSPA. **Results**: GAX-specimen with BVc demonstrated lifelike palpation and full range-of-motion of wrist and 1st MCP joints leading to successful POCUS with GE Vscan Air of RA1, RA2, RA3, RSPA (12/12-100%). GAX-specimen dissections demonstrated lifelike structural orientation, tissue resistance, color, and texture of RA1, RA2, RA3, RSPA vs FFC. RSPA branched within 2mm of styloid process on both GAX-specimens and FFC (42/42 sides-100%). FFC had minimal joint movement, increased tissue resistance, collapsed vessels revealing poor quality RA2, RA3 POCUS images (30/30-100%). FFC RA1 (16/30-53%) were identifiable with POCUS. Despite collapsed vessels from FFC, RA1 POCUS images could be identified probably due to atherosclerotic plaque causing vessel rigidity. GAX-specimens and FFC (42/42 sides-100%) confirmed RA1, RA2, RA3, RSPA segment borders. **Conclusions**: This study using GAX-specimens with BVc demonstrated the RA1, RA2-RSPA, and RA3 segments excellent lifelike dissections with successful POCUS imaging from GE Vscan Air probes while positioning the joints of the wrist and thumb for ideal imaging and canulation thus an excellent medium for training. The RSPA was identified to branch within 2mm of the styloid process from all 42 sides of GAX-specimen and FFC dissections which is consistent with current studies. FFC was a poor medium for POCUS imaging of the RA1, RA2-RSPA, and RA3 segments. **References**:

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Poster 65: POCUS on Novel GAX-Specimens with Innovative BriteVu Contrast Delivers Lifelike Sonoanatomy for Clinical Skills and Procedures

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Introduction: A bottleneck in the paradigm shift of ultrasound education for medical students and residency training programs exists despite tremendous advances in low and high-fidelity simulation technology. Anatomical accuracy required for lifelike procedures is grossly lacking on essentially all simulation models. Graciously donated cadavers are commonly formalin-fixed (FFC) rendering them extremely difficult to palpate, with minimal movement at all synovial joints while providing unnatural resistance during the dissection experience. FFC embalming process essentially causes all vessels to collapse thus distorting cross-sectional and sonoanatomy structural orientation eliminating landmarks for POCUS assessment. The objective of this study was to assess novel GAX-specimen preparation technique with innovative BriteVu (BV) contrast to perform lifelike palpation, allow maximum joint range-of-motion (JROM), conduct physical examinations, acquire POCUS imaging, and identify sonoanatomy structures for medical student and residency trainees. **Methods**: Literature search was conducted regarding GAX-specimen with BV contrast studies. GAX-specimens (n=6:3-males:3-females,12 sides) with BV contrast received CT/MRI and radiograph imaging. GAX-specimens and FFC (n=17:9-Male:6-Female,34 sides) all had synovial joints assessed for JROM and analyzed against normal human JROM tables. Synovial joints/articulations included temporomandibular, cervical spine, glenohumeral, acromioclavicular, subacromial, scapulothoracic, elbow, wrist, thumb, fingers, hip, knee, ankle, midfoot, and great toe. **Results**: No known studies were identified using GAX-specimens with BV contrast. CT/MRI demonstrated small-caliber vessels rarely seen on live human cross-sectional imaging. All GAX-specimens (12/12-100%) synovial JROM matched JROM tables of live humans allowing physical examination and POCUS positioning to be conducted. FFC had significantly less JROM, essentially rigid at all large/medium joints (34/34 rigid sides-100%), although, 1st MCP/MTP were diminished but mobile versus live tables. POCUS imaging revealed patent fluid occupied vessels with acceptable image quality for scanning and invasive procedures. Tissue quality dissection was lifelike regarding consistency, color, texture, tissue dissection resistance and surgical planes. FFC play an important role as first patients for many medical students and provide variations and anomalies which are far more common than contemporary atlases can reveal. The kinesthetic sense and time required to dissect F-FC adds to the depth of learning. GAX-specimen with BriteVu contrast enables a plethora of skills and learning/teaching opportunities not matched by anything previously. **Conclusions**: This study successfully identified a safe chemical profile technique with novel BriteVu contrast allowing lifelike palpation, physical examination, extraordinary cross-sectional imaging, POCUS image acquisition and procedural skills with accurate sonoanatomy. Surgical quality tissue preserved structures often not seen with F-FC. GAX-specimens with BriteVu should augment medical school anatomy and be the gold standard for residency program training. **References**:

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