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MEDICAL EDUCATION: PART I

TEACHING ULTRASONOGRAPHY TO FIRST-YEAR MEDICAL STUDENTS

Cory A.B. Gritton, MS

Mrs. Gritton (Cory.Gritton@cuanschutz.edu) is an instructor of anatomy, Modern Human Anatomy Program, Cell & Developmental Biology, University of Colorado.

Over the last few decades, ultrasonography (US) has been increasingly utilized across numerous medical specialties due to the relatively lower cost and safety of this imaging modality. Additionally, the development of hand-held, portable US equipment (point-of-care-ultrasonography [POCUS]) has made bedside diagnosis more accessible. The expanding use of POCUS across medical specialties has prompted the inclusion of early hands-on US training.

To accommodate the need for early US education, multiple medical schools have included POCUS training into the undergraduate (UME) and graduate medical (GME) curricula to varying degrees. Some institutions have fully integrated US into all four years of medical school[1,2], whereas others have incorporated training into portions of the undergraduate[3] or graduate[4,5] coursework.

At the University of Colorado School of Medicine (CUSOM), formal US training has been included in the UME as part of the first-year dissection-based gross anatomy course since 2014. US is integrated throughout the course as hands-on scanning sessions where students scan each other while utilizing the gross anatomy they are currently learning. These US sessions allow them to build a familiarity with the US machine and transducers, review anatomy pertinent to the gross anatomy course, view structures and anatomical relationships that are often disrupted during dissection, and understand the clinical relevance of gross anatomy and US to diagnose and treat (i.e., bedside procedures) patients. For example, while scanning the right upper quadrant of the abdomen, students will identify specific liver and kidney structures as well as the hepatorenal recess or Morison's pouch which is often difficult to conceptualize in 2D images and after cadaveric dissection. Once these structures are located, students can discuss how ultrasound is used to detect the presence of fluid within this space. US sessions are an excellent opportunity to integrate clinical skills training with the basic sciences.

Within the CUSOM gross anatomy course, there are five, 50-minute scanning sessions that align with the regional anatomy lectures and dissections. Before US sessions, students complete pre-session content explaining the US and anatomy relevant to the scanning session. Over the years, this pre-session content has been in various formats including video, iBook, and interactive online learning modules. During the sessions, small groups of 3-4 students use a laptop-based US machine and written instructions to obtain the same US images and identify the same anatomical structures addressed in the pre-session content. Students in each group alternate between manipulating the transducer and volunteering as the scan model. Additionally, a pair of student groups will have a clinical facilitator (e.g. clinical faculty, resident, or 3rd/4th year medical students) and a graduate student teaching-assistant familiar with anatomy and trained in US. Together, the clinical facilitator and graduate teaching-assistant, guide student groups through the US sessions providing additional anatomy review and clinical examples. This combined facilitator effort has been perceived effective in this setting.[6]

By requiring students to complete the pre-session content prior to class, as a flipped classroom format, students are able to have a hands-on experience. Additionally, the pre-session content and the session instructions are both aligned to include directions for

continued on page 15

CONTENTS

BEAM ME UP, SCOTTY!!

Joseph Conigliaro, MD, MPH, Editor in Chief, SGIM *Forum*

"I'm a doctor, not an *engineer*."
—Dr. McCoy, *Star Trek: The Original Series*

This month's SGIM *Forum* is dedicated to the subject of point-of-care ultrasound (POCUS) and how internists teach and use it. I don't know how to use an ultrasound. But I do know how to use a stethoscope! I have often thought that the stethoscope was the ultrasound of my age or at least the age of providers who were around when it was introduced. The stethoscope was invented in Paris, France, in 1816 by René Laennec[1,2] because he was not comfortable placing his ear directly onto a woman's chest to listen to her heart. One hundred and sixty-eight years later, in fall 1984, I bought my first stethoscope as a second-year medical student. I remember agonizing over whether I should pay the extra money for the Littman "Cardiology,"® or the Hewlett Packard Sprague Rappaport® (yes, Hewlett Packard made stethoscopes back then). I opted for the "Cardiology" and still use it today, 35 years later.

In many ways, the stethoscope symbolizes our craft and has become an iconic symbol of how we examine patients. It was immortalized by Norman Rockwell's "Doctor and Doll' printed on the March 9, 1929 cover of *The Saturday Evening Post*. We internists use it to listen to the sounds made by the heart, lungs, or intestines as well as blood flow in arteries and veins. We can discern if a heart valve is stenotic or regurgitant, if the lungs are fluid filled, or if the bronchi spasmodic. It's even a fashion statement.

The first use of ultrasound in the medical field occurred in the early 1940s by Dr. Karl Theodore Dussik in Austria and has evolved as a ubiquitous tool for healthcare providers.[3] During my training, I remember large bulky units with cathode ray monitors attached to VCRs used to examine and record the ultrasound images of human organs, including the heart, the uterus, and abdomen.

Over the last 10-20 years, we have seen the evolution of electronic devices becoming more powerful, more affordable, and small enough for personal use. How much more powerful is my iPhone than the first desktop computer I bought back in 1995? This explosion in miniaturization and increase in power of everyday items has also occurred with ultrasound technology. As a result, we have seen a plethora of small or hand-held devices that are affordable enough for any physician to use. Like the stethoscope, the ultrasound has become an essential part of medical training. Many medical school and residency

continued on page 7

HOLDING ON TO THE HUMANITY IN MEDICINE

Karen DeSalvo, MD, President, SGIM

This experience (of poll watching) has been making me think a lot about our shared humanity and the importance of seeing it not only in special moments like Election Day but also in every day. And not only as we navigate our democracy but also in how we navigate our work in medicine. As part of staying in touch with our shared humanity, doctors will need to stay in touch with their own. This doesn't come easily. We get busy in our work and become transactional, rather than relational, in our interactions with our teams and patients.

I have a friend who ran for Louisiana legislature and it drew me in to our democratic process in a way that my prior tours of public service did not. In support of his campaign, I had the chance to go door to door, canvassing his district in New Orleans. I met people from all walks of life. We talked about their concerns and hopes for their neighborhood and kids. Sometimes, we just talked about simple things like the weather or the Saints. It was a granular, rewarding experience that reminded me how diverse our humanity is, yet how much we all have in common.

Also, as part of my volunteer experience with his campaign, I *poll watched* on Election Day. I suspect most people haven't done this, and it was my first time. It means sitting in the polling station from its opening until early afternoon to record who is voting so the candidate can track which supporters are and are not coming to the polls. I was so moved by the experience and saw so much kindness that my heart is full of joy for a long time to come. I saw humanity helping one another. Showing respect. Treating each other with dignity. It made me so glad to be a part of my community and of our shared humanity.

It started with the poll workers and leaders who were boundlessly cheerful, helpful, yet also serious about their work. They reminded me of the highest-performing medical team I have ever seen. They worked together to solve problems (and a lot come up) without ego or hierarchy. More experienced members helped the new team members. And they were intentional about making eye contact with each other, listening, and respecting input even from the first timers.

continued on page 12

CONSIDERATIONS WHEN ACQUIRING POINT-OF-CARE ULTRASOUND (POCUS) EQUIPMENT: ADVICE FOR GENERAL INTERNISTS

Mike Wagner, MD, FACP

Dr. Wagner (sonointernist@gmail.com) is the director of Internal Medicine Ultrasound for Prisma Health-Upstate, overseeing POCUS activities in the Department of Medicine at the CME, GME, and UME level.

Why Is This Topic Important?

First, while it is true that we are entering the brave new world of affordable, personal ultrasound machines, there is a wide range of equipment cost and functionality. The general internist should be familiar with their options before settling on one device or company. Second, one's ultrasound equipment needs may change considerably over time, particularly if one is planning to integrate POCUS into a clinic, hospitalist group, residency, or student training program. Knowing how to scale an equipment purchase over time can help jumpstart a stalled program or avoid the need for rapid equipment replacement and unnecessary costs. Third, many factors now and on the horizon will make learning and integrating POCUS easier than ever before. Still, many doctors aren't "techies" and potentially unanticipated equipment considerations can ensnare and frustrate the busy clinician/educator. Ensuring your POCUS equipment will fit your practice and goals prior to purchase will save you time, money, and heartache.

How Do I Know What Type of Ultrasound Equipment I Need?

Three main factors are important in this decision: transducer type, screen size, and portability.

Transducers (commonly referred to as *probes*) determine the POCUS applications for which one can use an ultrasound machine. If interested only in "core" IMPOCUS applications (namely cardiac, pulmonary, and abdominal scanning), you should invest in a low-frequency sector probe (also referred to as a *phased array* probe). This ensures cardiac imaging is optimal but will also support most lung and abdominal imaging as well. If interested in "extended" IMPOCUS applications (namely, scanning superficial structures of the extremities and head/neck) or if the equipment will be used for real-time procedural guidance, you will need a high-frequency linear probe. In fact, 95% of IMPOCUS scanning in my practice (mixed inpatient/outpatient) can be accomplished with the combination of sector and linear probes. Low-frequency convex probes (also referred to as *curvilinear* probes) provide the widest field of view which improves abdominal and pelvic imaging and allows for soft-tissue and musculoskeletal scanning in larger patients.

Cart-based ultrasounds (CBU) with high resolution and large screens are important when guiding invasive procedures with real-time needle visualization. They are also helpful for meaningful hands-on instruction of more than two learners at a time. However, their reduced portability can result in lower use. Distance between physician and POCUS equipment can be a significant barrier when on the other side of the clinic or a different hospital floor. Highly portable, pocket-sized ultrasounds (PSU) enhance availability and improve utilization by the general internist for most practice workflows. If portability is key or CBUs aren't yet attainable, PSUs can be augmented to increase functional screen size in some settings. Remember that increased portability also increases the probability machines are misplaced or become "lost," particularly as the number of shared users goes up. Having accountability policies and some technological solutions prior to widespread dissemination is key to protect your investment.

Which Types of Technical Specifications Should I Know About?

Screen casting.

All devices that utilize smartphones and tablets should allow this capability when paired with inexpensive casting hardware. This can be a great enhancer for teaching, as a pocket-sized screen can become large enough to support group teaching when transmitted to a projector or large TV. This usually doesn't improve resolution, however.

Functional scan time/battery life.

Unlike CBUs, PSUs can't scan while charging. While clinical use is characterized by short, intermittent scanning periods, educational use often requires scanning for an hour or more. Some PSUs have significant overheating issues and/or short battery life during continuous scanning. In some cases, this can be mitigated by having extra batteries.

continued on page 5

Image archiving and uploading capabilities.
This is where the Information Technology (IT) issues will crop up around any device that is used in the clinical spaces, particularly if personal phones/tablets are being used. While most new devices allow for image uploading for online archiving, it is essential to recognize that on some devices, images and videos are actually stored in the cloud, not locally on the device. The default setup where the physician does not actually "own" the images he captures and must pay a fee to maintain access to them may rightfully raise concerns. Special arrangements between a device company and medical institution may be able to be worked out, but may be less likely with a small clinic or individual user.

Which Types of Non-Technical Specifications Are Most Important to Think About?

For CBUs, ensure you consider the size of the footprint of the cart, and whether it can easily get into the clinical spaces (e.g., around exam tables or hospital beds). While the biggest screen may be a desirable feature, it will be useless if it can't reach the bedside of your patients.

For PSUs, consider what environments you will be scanning in and whether the device is easily cleaned. There are numerous advantages to smartphone ultrasound devices, but there are many circumstances (e.g., contact precautions) when having a stand-alone machine is preferable.

If unsure whether the equipment is right for your practice, remember that most companies will arrange for demonstrations at your site or offer a risk-free trial period. POCUS courses often provide a "no pressure" opportunity to try a variety of equipment as well. MY ADVICE: DON'T BUY AN ULTRASOUND DEVICE UNLESS YOU HAVE TRIED IT FIRST.

How Much Does Ultrasound Equipment Cost?

Single-probe PSUs can be obtained for approximately $1,200-13,000, with at least two companies offering single-probe PSUs for <$5,000. PSUs with both high and low-frequency capabilities range between $2,400-18,000, with at least 3 companies making a device for <$5,000—CBUs range in the $20,000s through the $70,000s.

The following are additional considerations about costs that may not be advertised:

- **Many companies offer significant *medical education discounts* (up to 50% off list price) which are worth inquiring about.**
- **Some features of CBUs that are included in the initial quote may not be necessary for the practice of a general internist and can often be removed to decrease cost.**
- **Some devices require annual subscription fees which, depending on the number of users, can add unexpected costs.**
- **Be sure to include the cost of the *compatible* smartphones and/or tablets in your budgeting unless you already have what you need. Depending on your practice, budgeting for gel and cleaning wipes may also be necessary.**

How Do I Pay for Ultrasound Equipment?

First, it is important to determine who should pay for ultrasound equipment, and, in most cases, it should be the department, office, or hospital, not the employed physician. While this is almost always the case with CBUs due to their higher cost, it is likely the best route for PSUs as well. This helps ensure you stay compliant with institutional policies on medical imaging devices (if present) and facilitate integration with image archival and quality assurance systems (if desired). Furthermore, if the intention is to recoup purchasing costs by billing, who purchased the equipment can significantly affect reimbursement. A potential pitfall for the generalist buying their own ultrasound device is to spend thousands of dollars only to be told by IT or biomed that they cannot use it in clinical spaces.

For equipment under $5,000, departments often have operational funds with much less red tape than capital funding. With the rapid development of portable ultrasound technology, in some situations leasing equipment may make more sense than purchasing, particularly when first starting out. Asking about under-advertised payment plans, including lease-to-own options, may provide the fiscal flexibility needed to get a program off the ground.

If you decide to buy your own personal device, you may want to see if using continuing medical education (CME) funds is an option. If electronic stethoscopes, laptops or tablets are covered at your institution, a PSU may be too. A coordinated purchase by altruistic IMPOCUS faculty champions can make a small pool of machines available to a program. Again, spaced-out payment arrangements with a device company can potentially give you more buying power. Note this route should only be to support educational efforts. Using tax-exempt CME funds to generate revenue from billing can be seen as a form of tax evasion, so check with your billing and compliance officers prior to going down this road. Finally, while many pilot grants preclude the purchase of medical equipment, some allow it. If starting an IMPOCUS curriculum, consider making it part of a research project and apply for grant funding to get equipment. While reviewers who "get it" can be rare, their numbers may grow with increasing visibility of IMPOCUS. Many positive changes are already here!

Note: this perspective piece was based on material prepared for a presentation at the APDIM National Meeting in April 2019. This topic and several others will be covered in more detail at the SGIM National Conference Pre-Course on Internal Medicine POCUS (IMPOCUS) in May 2020. To share your own experience and learn from the perspective of many others, join us at the SGIM IMPOCUS Pre-course in 2020! SGIM

TEACHING BEDSIDE PHYSICAL EXAMINATION WITH ULTRASOUND: AN OPPORTUNITY TO RE-ENGAGE AND INVIGORATE LEARNERS

Kang Zhang, MD, FACP; Irene Ma, MD, PhD, FRCPC, FACP, RDMS, RDCS

Dr. Zhang (Kang.Zhang@providence.org) is associate program director, Internal Medicine Residency Spokane, and clinical instructor and internal medicine clerkship director, University of Washington School of Medicine-Spokane. Dr. Ma (ima@ucalgary.ca) is associate professor, Division of General Internal Medicine, director of ultrasonography and procedural skills, Internal Medicine Residency Program, University of Calgary.

The bedside physical examination is an integral component of the clinical encounter. However, with decreased time spent teaching at the bedside,[1] there has been a notable decline in physical exam skills among medical trainees. In the past decade, there has been increasing literature supporting the use of point-of-care ultrasound (POCUS) to augment the physical exam to better guide physicians with clinical decision making.[2] In this article, we describe a strategy to teach bedside physical examination skills by incorporating POCUS, which provides immediate visual feedback to the learners. More specifically, we will highlight how POCUS can be incorporated into two prototypical physical examinations: the examination for pleural effusion and the jugular venous pulse (JVP) examination. Pedagogical concepts discussed can be readily applied to other physical examinations.

Pleural effusion commonly occurs in patients with congestive heart failure, pneumonia and malignancy. The presence and absence of pleural effusion can help narrow differential diagnosis and/or guide management in patients presenting with dyspnea. For example, patients with congestive heart failure with pleural effusions may need intensified diuretic therapy. New pleural effusion in a patient with lung cancer may have prognostic implications (e.g., potential for stage IV disease). A careful physical examination is essential for the detection of pleural effusion. Specific findings such as asymmetrical chest expansion, diminished vocal fremitus and dullness to percussion have positive likelihood ratios that may significantly change the post-test probability of detecting pleural effusion. Conversely, normal breath sounds and conventional percussive sounds strongly argues against pleural effusion.[3] However, accuracy of the examination is limited by patient characteristics and size of the effusions. POCUS offers direct visualization of the pleural effusion, confirming not only of its presence, but also allows for a visual estimation of its size. Bedside rounds is an excellent way to illustrate ultrasound augmented physical examination to learners. As the patient is sitting upright, learners are asked to determine if pleural effusion is present or absent by the traditional physical exam on both hemithoraces. A mark is made at the first area of dullness that either represents the diaphragm or top of the pleural effusion. Using a low-frequency transducer, the posterolateral chest is scanned from the level of the liver or spleen and moved cephalad. For the presence of pleural effusion, an anechoic space between the visceral and parietal pleura can be easily recognized. Real-time confirmation and feedback can then be provided to the learners.

In a similar fashion, POCUS can assist in teaching the JVP exam. Examination of the neck veins provides an estimate of the patient's central venous pressure, and abnormalities in its waveforms can provide additional information on cardiac abnormalities.[3] Despite the importance of this examination, skepticism abounds regarding trainees' ability to learn this skill.[4] POCUS provides learners with immediate visual feedback on the location of the top of the internal jugular vein by visualizing where it tapers in the longitudinal view, using a linear high-frequency transducer, with the transducer marker pointing towards the patient's head (see photo). Visualization of internal jugular vein can also be confirmed in the transverse view. For educational purposes, additional features of the JVP exam that can be visually demonstrated with ultrasound at the bedside include the following:

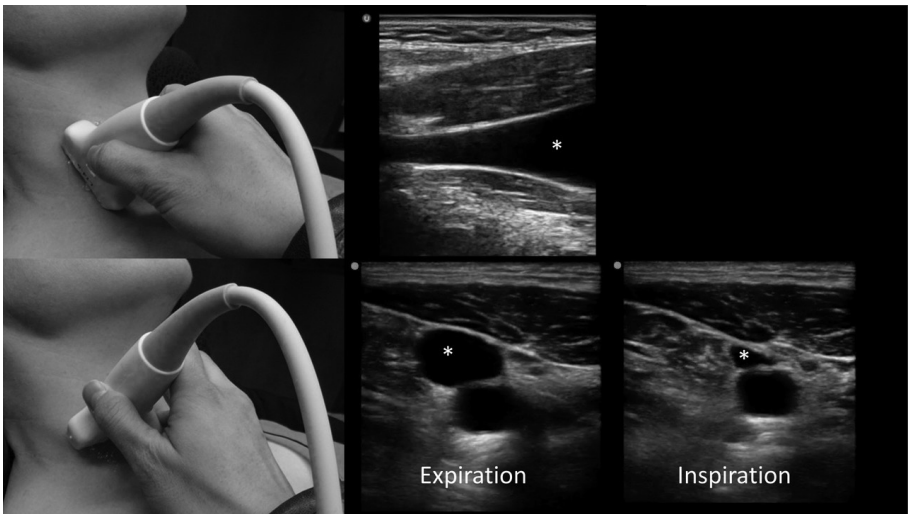
1. its location between the two heads of the sternocleidomastoid muscles;
2. changes with respirations, where the size of the internal jugular vein can be seen to decrease upon inspiration (see photo);
3. changes with positioning of the angle of the head of the bed;
4. compressibility;

continued on page 7

5. **double waveform;**
6. **changes with abdominojugular test.**

The non-palpability of the vein can also be demonstrated to the learners by having learners palpate where the transducer is centered over the internal jugular vein, compared to palpating where it is centered over the carotid artery.

The bedside physical examination remains a cornerstone of clinical medicine. POCUS-augmented physical examination offers several distinct advantages for learners and educators. From a learner's perspective, it provides immediate feedback of their physical examination skills. As a result, this increases learner confidence and opportunities to seek improvement. For clinician educators, POCUS augmented physical examination offers the opportunity to reinforce existing examination techniques while role-modeling examination-related skills such as exemplifying physician-patient communication. From our experience, POCUS augmented physical exam re-engages and reinvigorates our learners about bedside medicine.



(Longitudinal [top] and transverse [bottom] imaging of the internal jugular vein [asterisk] demonstrating top of the vein and respiratory variations, respectively.)

References

1. Gonzalo JD, Masters PA, Simons RJ, et al. Attending rounds and bedside case presentations: Medical student and medicine resident experiences and attitudes. *Teach Learn Med.* 2009, 21(2): 105-110. DOI: 10.1080/10401330902791156.
2. Kimura BJ. Point-of-care cardiac ultrasound techniques in the physical examination: better at the bedside. *Heart.* 103(13):987–99.
3. McGee S. *Evidence-Based Physical Diagnosis. 4th ed.* Philadelphia: Elsevier Health Sciences; 2018.
4. Economides E and Stevenson LW. The jugular veins: Knowing enough to look. *Am Heart J.* 1998;136(1):6-9. DOI: 10.1016/s0002-8703(98)70174-7.

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training programs have required courses in ultrasound use and incorporate ultrasound into other areas of education. Societies, including SGIM and SHM, offer courses and workshops in ultrasound so those of us not part of the current wave may get up to speed. Indeed, the standard of care now is to use ultrasound to determine where to put the paracentesis needle on the abdomen or thoracentesis needle on the chest wall instead of using a stethoscope or an even more old school method, percussing it out with your fingers.

So, has the ultrasound replaced the stethoscope as the iconic tool for physicians? I don't think so. But just like the medical tricorder was the essential tool that Dr. Leonard "Bones" McCoy used in *Star Trek* (come to think of it I never saw him use a stethoscope), we may soon see the day where providers all have an iPhone sized unit in our pockets to record and evaluate images that are automatically uploaded to the cloud and part of the medical record.

This issue covers medical education around POCUS including how we teach it as well as how it can augment teaching about the physical exam. We also cover advice for general internists when acquiring equipment. A Morning Report case illustrates how POCUS helps hone the physical exam. Finally, Dr. Ankita Sagar lays out the important issues around women and healthcare access that we need to know about when we cast our vote in the 2020 elections.

Live long and prosper!

References

1. Laennec R. *De l'auscultation médiate ou traité du diagnostic des maladies des poumon et du coeur.* Paris: Brosson & Chaudé, 1819.
2. Laennec RTH, Forbes J, Sir. *A Treatise on the Diseases of the Chest and on Mediate Auscultation.* New York: Samuel Wood & Sons; Philadelphia: Desilver, Thomas & Co., 1835.
3. BMUS. The history of ultrasound. www.bmus.org/about-ultrasound/history-of-ultrasound. Accessed November 15, 2019.

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INTEGRATION OF POINT-OF-CARE ULTRASOUND CURRICULUM IN THE INTERNAL MEDICINE CLERKSHIP

David Giovannini, MD; Andrew Sides, MD; Emily Cox, PhD; Kang Zhang, MD, FACP

Dr. Giovannini (David.Giovannini@uscmed.sc.edu), assistant professor of internal medicine, University of South Carolina School of Medicine-Columbia. Dr. Sides (asides@uscmed.sc.edu), associate professor of internal medicine, University of South Carolina School of Medicine-Columbia. Dr. Cox (Emily.Cox@providence.org), scientific writer and project manager, Providence Medical Research Center. Dr. Zhang (Kang.Zhang@providence.org), associate program director, Internal Medicine Residency Spokane, clinical instructor and internal medicine clerkship director, University of Washington School of Medicine-Spokane.

Ultrasound is rapidly being integrated into undergraduate medical education. A survey of medical schools accredited by the Liaison Committee on Medical Education found that 62% and 50% of medical schools in the United States and Canada, respectively, reported an integrated ultrasound curriculum.[1,2] Unlike traditional ultrasound applications, to which medical students are more likely to be exposed during their clinical training in radiology and obstetrics/gynecology, exposure to point-of-care ultrasound (POCUS) is likely to happen during the emergency medicine clerkship. However, POCUS is increasingly used in internal medicine as well, to a degree that may necessitate instruction of POCUS skills during the internal medicine clerkship.[3,4] Integration of POCUS training into internal medicine clerkships remains relatively new, and curriculum strategies are undefined. Thus, the aim of this article is to describe how two different internal medicine clerkships at the University of Washington School of Medicine (UWSOM) in Spokane and the University of South Carolina (UofSC) in Columbia have operationalized POCUS training, and how trainees have responded to the curriculum.

At UWSOM in Spokane, an integrated POCUS curriculum during the internal medicine clerkship was established in 2017. During the 12-week internal medicine clerkship, medical students now have two three-hour sessions focusing on the application of point-of-care ultrasound in general internal medicine. Instructors are often faculty experts and senior residents who are considered POCUS champions, and the instructor to learner ratio is usually 1:4—approximately one-third of session time is didactic while two-thirds is hands-on training.

A cart-based ultrasound machine and one or two handheld ultrasound machines are used for the hands-on portion, which is conducted in teams with designated roles to enhance team-based learning. For example, student #1 scans, student #2 optimizes the image, and students #3 and #4 describe normal and pathological findings as well as identify surrounding anatomical structures.

Two major areas are emphasized during the UWSOM POCUS curriculum. First, limited cardiac and pulmonary ultrasound are taught to answer focused clinical questions. Students are instructed to obtain the following windows: parasternal long axis view, anterior apical lungs, right/left upper quadrant views, and subcostal/IVC views. While these views provide valuable clinical information, they are combined to form a framework to the cardiopulmonary limited ultrasound examination, which is a systematic and hypothesis-driven approach of using POCUS to evaluate dyspneic patients.[5] The second area of emphasis is utilizing POCUS as a tool to augment the traditional physical exam. As students learn specific cardiac and pulmonary ultrasound views, instructors highlight opportunities to use the immediate feedback POCUS provides to enhance the physical examination. Formal evaluation of a student's performance during the POCUS portion of the curriculum does not contribute to a student's clinical grade.

At UofSC in Columbia, ultrasound training begins in the first year of medical student education. By the time students reach the internal medicine clerkship as third-year medical students, they have completed two years of ultrasound training integrated into the basic sciences curriculum, mainly anatomy, physiology, and pathology. All of the hands-on scanning in preclinical years is done on standardized patients or simulators. The third-year IM clerkship takes advantage of this prior experience by simply providing online video tutorial reviews on the basics of ultrasound, such as machine operation and exam techniques. This allows faculty to spend more time scanning real patients in the clinical setting. The clerkship itself lends well to an extended ultrasound curriculum, as it is 12 weeks in duration. The most intense ultrasound training of the rotation takes place during the four weeks that each student spends on the inpatient medicine teaching service, which is where most of the hands-on experience takes place.

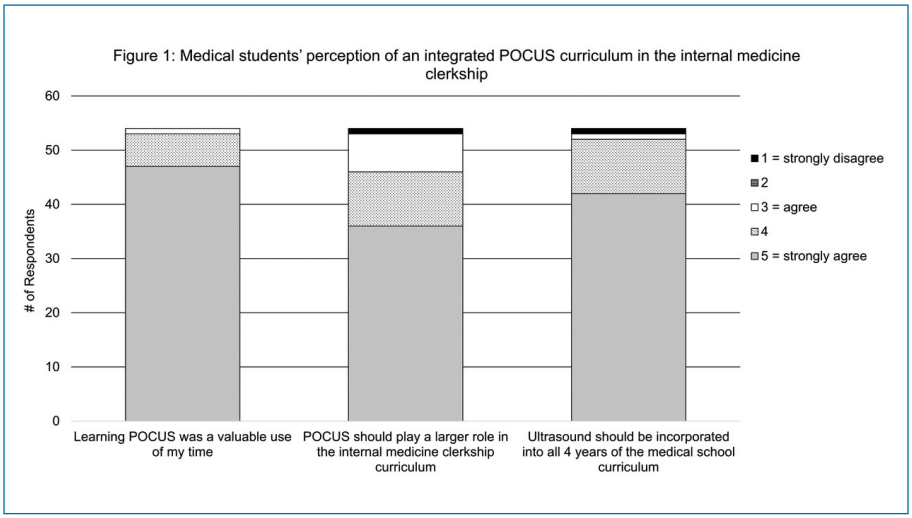
Students on the inpatient portion of the rotation are assigned a portable, handheld ultrasound device, allow-

continued on page 9

ing uninterrupted access to scan patients as indicated. Additionally, during these four weeks, on one day per week, the students spend up to one hour on "gel rounds" with trained faculty or ultrasound fellows. These sessions provide students the opportunity to scan patients with pathological findings under close supervision, strictly for educational experience. Students may ask questions and receive feedback on exam technique and image interpretation.

At the end of the rotation, ultrasound skills are assessed in two ways. Each student is required to submit both normal and abnormal ultrasound clips focusing on the exams that are practiced during the gel rounds sessions: parasternal long axis, longitudinal IVC, anterior apical lungs, and bilateral upper quadrants. Although these images can be obtained during any portion of the 12-week rotation, they are usually submitted after completion of the four-week inpatient block. Included in the end-of-rotation Observed Standardized Clinical Exam (OSCE), one standardized patient station involves obtaining these same views under direct observation from ultrasound institute staff or faculty who assesses the image technique and quality in real time. Both the submitted exams and the OSCE utilize the same grading scale for image acquisition and contribute a small percentage of the student's overall clerkship grade.

To assess trainees' responses to the UWSOM and UofSC POCUS curriculums, an anonymous survey was administered to trainees who had completed internal medicine clerkships at either institution. On a 5-point Likert Scale (1= strongly disagree, 5 = strongly agree), 100% of students agreed that learning POCUS was a valuable use of their time (see figure). Only one respondent did not agree that POCUS should play a larger role in the internal medicine clerkship. It was not surprising to see that all but one of the medical students surveyed agreed that ultrasound should be integrated into the four-year medical school curriculum.



These two clerkships illustrate different ways of successfully incorporating POCUS training into the internal medicine clerkships. Both clerkships focus the training on high-yield topics that a student might encounter in the clinical setting while on an internal medicine clerkship. The UWSOM provides both didactic and hands-on learning in extended sessions and UofSC focuses solely on scanning real patients, benefited mostly by a robust hands-on training during the first and second years of medical school. Despite differing amounts of ultrasound training prior to the rotations, trainees from both institutions found value in POCUS training during the internal medicine rotation and reported that POCUS training should play a larger role in the clerkship. Even students who are not applying for positions in internal medicine acknowledge the importance of POCUS training during the rotation. Interestingly, in our survey, students indicated a strong preference for incorporating ultrasound into all four years of the medical school curriculum. Given the emphasis on POCUS in GME programs and internal medicine, incorporating POCUS during internal medicine clerkships will become a critical component of training. Results from these two programs, which have used different strategies to expose students to POCUS during the rotation, suggest that both brief lecture-based training and extended hands-on training are successful and well-received by trainees.

References

1. Bahner DP, Goldman E, Way D, et al. The state of ultrasound education in U.S. medical schools: Results of a national survey. *Acad Med*. 2014;89(12):1681-1686.
2. Steinmetz P, Dobrescu O, Oleskevich S, et al. Bedside ultrasound education in Canadian medical schools: A national survey. *Can Med Educ J*. 2016;7(1):e78–e86.
3. Soni NJ, Schnobrich D, Matthews BK, et al. Point-of-Care ultrasound for hospitalists: A position statement of the Society of Hospital Medicine. *J Hosp Med*. 2019 Jan 2;14:E1-E6.
4. ACP. ACP statement in support of point-of-care ultrasound in internal medicine. https://www.acponline.org/meetings-courses/focused-topics/point-of-care-ultrasound-pocus-for-internal-medicine/acp-statement-in-support-of-point-of-care-ultrasound-in-internal-medicine. Accessed November 15, 2019.
5. Kimura BJ, Shaw DJ, Amundson SA, et al. *J Ultrasound Med*. 2015 Sep;34(9):1683-90.

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LOOKING BEYOND MATERNAL MORTALITY—A HEALTHIER FUTURE FOR U.S. WOMEN DEPENDS ON ACCESS TO CARE

Ankita Sagar, MD, MPH, FACP

Dr. Sagar (ASagar@Northwell.edu) is the director of ambulatory quality for the Internal Medicine Service Line at Northwell Health and assistant professor of medicine at the Donald & Barbara Zucker School of Medicine at Hofstra/Northwell. She completed the Leadership in Health Policy program (LEAHP) in 2018.

"For the first time in history, maternal health is at the forefront of discussion in a presidential election in the United States".[1] It is true—this is a hallmark moment for health policy and women's health advocacy.

The Commonwealth Fund published a study to understand women's perception of care delivery and the results showed that "U.S. women report the least positive experiences … greatest burden of chronic illness, highest rates of skipping needed health care because of cost, difficulty affording their health care."[2] Only 1 in 4 U.S. women rate their medical quality as "excellent or very good."[2] While cost and restricted access to care may potentiate this perception among U.S. women, there are other factors to consider.

As the presidential candidates are being featured in the news cycle, when we hear about women's health, the topic is often isolated to women's reproductive health. I wonder though: does women's health stretch beyond reproductive health? Yes. Women's health is a conglomeration of physical, emotional, and behavioral wellness. The implications of proposed plans are considerable, especially when compounded by recent federal/state policy changes. And, in order to improve women's health and the respective healthcare delivery system, we must especially address cost of care, maternal mortality, lack of medical care before/beyond maternity, threats to coverage for pre-existing conditions, Title X Program, and family medical leave (or lack thereof).

Cost of Health Care

More than 7 million working-age women have gained insurance since the implementation of the Affordable Care Act, however cost of care remains a significant barrier.[2] A recent survey highlighted that healthcare costs dominated healthcare decisions for individuals and families.[3]

a. More than 1 in 3 U.S. women report skipping health care due to cost, especially noting: 1) having a medical problem but did not visit a doctor; 2) skipped a medical test, treatment, or follow-up recommended by a doctor; or 3) did not fill or collect a prescription for medicine, or skipped doses of medicine, due to cost in the past 12 months.
b. More than 1 in 4 U.S. women report their annual family out-of-pocket* spending for medical treatments or services was $2,000 or more. (*costs of services not covered by public or private insurance)
c. Almost 1 in 2 U.S. women reported medical bill problems in past 1 year, including: 1) serious problems paying or were unable to pay medical bills; 2) spent a lot of time on paperwork or disputes related to medical bills; or 3) insurance denied payment or paid less than expected.

Maternal Mortality

Maternal mortality has been a highlighted topic over the past few months, and for good reason. Data from the CDC reveals:[4]

1. U.S. pregnancy-related deaths more than doubled in less than 30 years: steady increase from 7.2 deaths per 100,000 live births (in 1987) to 17.2 deaths per 100,000 live births (in 2015)
2. Racial/ethnic disparities exist in pregnancy-related mortality: approximately 42.8 per 100,000 black non-Hispanic women die of pregnancy-related outcomes, compared to 13 per 100,000 white non-Hispanic women. That is almost three times higher mortality rate for black non-Hispanic versus white non-Hispanic women. American Indian/Alaskan Native non-Hispanic women had a mortality rate which was second highest at 32.5 per 100,000 women.
3. Cardiovascular conditions are responsible for more than 33% of pregnancy-related deaths including cardiomyopathy, other cardiovascular conditions, and cerebrovascular accidents. Other leading causes of pregnancy-related death include non-cardiovascular medical conditions (14.3%), infection (12.5%), and obstetric hemorrhage (11.2%).
4. Almost 60% of pregnancy-related deaths were

continued on page 11

thought to be preventable: Of the 232 pregnancy-related deaths assessed for determination of preventability, 139 were deemed preventable.

Access to Medical Care Before, During, and Beyond Maternity

A recent evaluation of short-term insurance products marketed in 45 states found that only 57% of plans covered Mental Health services, 38% covered Substance Abuse Treatment services, and 21% covered outpatient prescription medications. However, none of the plans covered maternity care.

Across the nation, Medicaid programs provide coverage for women to 60 days post-partum. States with expanded Medicaid coverage have noted expanded the number of days covered, however a large variability remains in Medicaid coverage for post-partum mothers.

Pre-existing Conditions and Women's Health

Cuts on protections for pre-existing conditions may adversely affect women's health status. The Affordable Care Act provided protection to women with preexisting conditions. The current climate in which individual's right to access to insurance regardless of their health status is at risk, concerns about adverse effects on women's health status have risen considerably.[2] For example a diagnosis of pre-eclampsia or gestational diabetes may restrict options for a patient to a higher tier coverage plan. Ironically, with access to care a patient may be able to moderate her risk factors and decrease her risk of future chronic diseases. In restricting coverage for pre-existing conditions, policies create barrier to care and only increase the risk of future chronic disease burden.

Title X Program

Title X Program may adversely affect women's health status. Women receive routine primary care and behavioral health services at women's health centers. The Title X program restricts funding for women's health centers offering family planning services and counseling. It has been widely cited that cuts in funding may adversely affect women's healthcare delivery, including access to care such as time to appointment for routine exams and cancer screenings.[2]

Family Medical Leave

The United States remains the only country in the developed world that does not guarantee paid family medical leave. There is momentum to make paid family medical leave a reality—82% of voters are in favor of maternity leave while 69% are in favor of paternity leave.[6] There is a distinction between paid family medical leave in comparison to maternity/paternity leave. Family medical leave allows family members to take partial paid time to care for a family member—parent, sibling, child, spouse, etc. Caregiver burden is a known risk factor for stress, worsening chronic illnesses in caregiver, and overall financial instability. Given that women tend to be the primary caregivers, paid family leave may significantly mitigate stress from care giving, thus decreasing morbidity among female caregivers.

Looking Towards the 2020 Presidential Elections

Women's health and maternal mortality are important topics for 2020 presidential candidates. Many candidates have a structural program or legislative plan to tackle of U.S. maternal mortality rates cited by publications such as Health Affairs Blog.[1] While it is exciting to have presidential candidates address maternal mortality, I hope that their respective plans go beyond the access to maternal health and addressing cognitive bias for physicians. Women's health encompasses services beyond the pregnant state—it includes childhood—obesity, cardiovascular disease, access to good nutrition, and preventive care. It includes young adulthood—vaccination against preventable diseases, access to an OB/GYN, family planning, equal pay, and access to childcare. And, it certainly continues into adult and senior years—access to behavioral health, good continuous preventive care, equal pay, family medical leave protections, and workforce equality. Protection from emotional and physical stressors such as harassment, assault, and poverty, at all ages must be embedded into any women's health plan being considered as "comprehensive." If we hope to address U.S. maternal mortality rates and work towards a healthier future for U.S. women, we *must* seek a plan that allows comprehensive access to care—from childhood to adulthood to senior years.

References

1. Peahl, A, Kozhimannil KB, Admon LK. Addressing the US maternal health crisis: Policies of 2020 presidential candidates. *Health Affairs Blog*. https://www.healthaffairs.org/do/10.1377/hblog20190625.583781/full. Published June 26, 2019. Accessed November 15, 2019.
2. Gunja M, Tikkanen R, Seervai, S, et al. What is the status of women's health and health care in the U.S. compared to ten other countries? *Commonwealth Fund*. https://doi.org/10.26099/wy8a-7w13. Published December 19, 2018. Accessed November 15, 2019.
3. Kirzinger A, Muñana C, Wu B, et al. Date note: Americans' challenges with health care costs. *Kaiser Family Fndn*. https://www.kff.org/health-costs/issue-brief/data-note-americans-challenges-health-care-costs Published June 11, 2019. Accessed November 15, 2019.
4. Centers for Disease Control and Prevention. Pregnancy mortality surveillance system. https://www.cdc.gov/reproductive-

continued on page 16

Their spirit of respect and humanity spilled over into the mood of the entire day. I watched hundreds of people file in to vote. They came alone but often were with their kids, moms, siblings, neighbors, and friends. People from across the political, social, and economic spectrum. It was a sea of diversity. Young, old, mobility challenged, priests, nuns, jocks, hipsters (not that these are mutually exclusive categories). Neighbors greeted each other with warm hugs. There were first-time voters like a young girl who had just turned 18 who came in with her dad. The volunteers make a big "to do" about first-time voters with congratulatory shouts.

This experience has been making me think a lot about our shared humanity and the importance of seeing it not only in special moments like Election Day but also in every day. And not only as we navigate our democracy but also in how we navigate our work in medicine. As part of staying in touch with our shared humanity, doctors will need to stay in touch with their own. This doesn't come easily. We get busy in our work and become transactional, rather than relational, in our interactions with our teams and patients. Maintaining a focus on shared humanity also means we will need to respect the time and emotional space of our patients.

To me, understanding the humanity of our patients is the same as our more wonky way of describing their humanity—as their social determinants of health. Sometimes we don't want to ask about a patient's social determinants, the daily circumstances of his humanity, because we don't know what to do with the information. It isn't that we don't want to understand and appreciate him as a person, as a human being, it is just that we feel ill-equipped to support him in addressing challenges in a "person context," like food insecurity. We are much more comfortable addressing shared clinical goals, such as an HgbA1c of 7.0%. Achieving a clinical goal of controlled A1C takes more than giving the right drug at the right time—it also means our patient needs access to affordable, healthy food. This latter "social goal," access to affordable healthy food, is likely to be a priority for our patients over a medical approach to achieving diabetes control. In addition to being a barrier to disease management, our exclusive focus on clinical goals may cause patients to think we are looking at them as only a disease, and not as human beings.

Antoinette Schoenthaler, a qualitative researcher at New York University, has done work looking at the importance of relationship-centered conversations in the clinical environment that help connect with the humanity of our patients. This means asking people about their lives, social situations, and the context in which they live, learn, work, and play. In her work, she is reminding us of something more powerful than structured approaches, like surveys that query our patients about domains of social determinants of health. Dr. Schoenthaler is reminding us that simply treating our patients like people, asking about their humanity and not only their disease can have an impact on their health. For example, her research has shown that talking to our patients improves their sense of agency and ability to follow their agreed-upon care plan for high blood pressure.[1] She is telling us in her research what we intuitively know: our patients understand if we can't solve every challenge they face. They just want us to care. Francis Weld Peabody said it well, "*The secret of caring for the patient is caring for the patient*".

Years ago, when I was in the Robert Wood Johnson Generalist Physician Faculty Scholar Program, one of my colleagues was Med/Peds physician Dr. Saul Weiner who was looking at the issue of "failure to contextualize" our patient's as a medical error. Prescribing insulin to someone for uncontrolled diabetes may seem like the right clinical choice—unless the doctor understands the patient's context—that they are homeless. He was ahead of his time in many ways, since medicine had not yet begun to embrace the concept of understanding and addressing the social determinants of health. Over the years, Saul has done extensive research that has led to the development of strategies for helping us to heed William Osler's call for us to "treat the patient with the disease" and not only the "disease." He has created a framework that defines failure of the physician to contextualize care plans as a medical error. His work includes a set of resources for physicians and learners as they navigate their busy clinical work.[2]

I don't want to oversimplify how challenging it is to maintain our own humanity as we navigate our responsibilities as physicians, leaders, educators and researchers. Physician stress and burnout is real. But if we look to the science, it is telling us that a pathway forward for us as individuals and as a profession is that being intentional about looking at the humanity of our patients, understanding their context, their social goals in addition to their medical ones, will help us be in touch with our own humanity. Just as in our democracy, it will take all of us, doing our part to keep the humanity in medicine.

References

1. Schoenthaler A, Knafl GJ, Fiscella K, et al. Addressing the Social Needs of Hypertensive Patients: The Role of Patient-Provider Communication as a Predictor of Medication Adherence. *Circ Cardiovasc Qual Outcomes*. 2017 September; 10(9): doi:10.1161/CIRCOUTCOMES.117.003659.
2. Weiner S, Schwartz A. Contextualizing care. http://www.contextualizingcare.org/resources/. Accessed November 15, 2019.

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COUGH IN A PATIENT WITH HEART FAILURE: TO B OR NOT TO B (LINES)

Michelle Fleshner, MD; Steve Fox, MD; Thomas Robertson, MD; Sanjay A. Patel, MD, FACP, FHM

(Discussant text in italics)

Dr. Fleshner (fleshnerm@upmc.edu; @Mfleshner301) is a chief medical resident at the University of Pittsburgh Medical Center. Dr. Fox (foxs2@ccf.org; @FoxStevenW) is a pulmonary/critical care fellow at The Cleveland Clinic, Dr. Robertson (Thomas.robertson@ahn.org; @trobertson8) is an associate program director at Allegheny Health Network. Dr. Patel (Sanjay.Patel@ohiohealth.com; @buckeye_sanjay) is an academic hospitalist/associate program director at OhioHealth Riverside Methodist Hospital.

Case

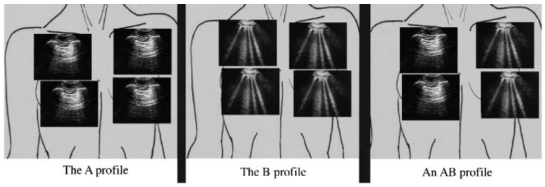
A 50-year-old man with heart failure (HF) presents with cough and generalized malaise for two days.

In a patient with a history of HF, initial diagnoses to entertain for cough and malaise include infectious and cardiopulmonary etiologies (i.e., pulmonary edema). Further history and physical exam in conjunction with point of care ultrasound (POCUS) will help hone this differential diagnosis.

The patient was in his baseline state of health until he started to feel "terrible." He reports mild dyspnea, difficulty tolerating a diet, nausea without vomiting, nonproductive cough, and fevers. He denies chest pain, palpitations, orthopnea, paroxysmal nocturnal dyspnea or weight gain. He is on multiple medications including bumetanide, but he has not taken his medications for two days. His other medical history is significant for coronary artery disease (CAD), coronary artery bypass grafting (CABG), HF with an ejection fraction (EF) of 30%, mechanical mitral valve repair, hypertension, hyperlipidemia, and type 2 diabetes mellitus. There is no family history of heart disease. He is a former smoker with no alcohol or drug use.

The presence of subjective fevers, generalized malaise, and cough suggests an infectious etiology, particularly pneumonia. In patients with HF, it may be difficult to distinguish between pneumonia and pulmonary edema. The physical exam for this patient will be important to assess for focal lung pathology or volume overload. POCUS is an adjunct to the physical exam to guide diagnosis and management by answering targeted clinical questions.[3] The image demonstrates characteristic findings on lung POCUS.

The patient has a temperature of 102°F, blood pressure of 150/90 mm/Hg, heart rate of 77, respiratory rate of 22, and oxygen saturation of 94% on ambient air. He is in no acute distress, but appears uncomfortable. His cardiac exam is unremarkable. Jugular venous pressure is difficult to appreciate. On lung exam he has crackles in the left lower base, with other fields clear to auscultation. He has trace pedal edema bilaterally. Labs reveal a leukocyte count of 15,000 cells/µL, a troponin of 0.47 ng/mL and a normal lactate. Renal function and coagulation studies are normal. Chest radiograph reveals an opacity of the left middle lung, cardiomegaly and mild pulmonary congestion. The patient is started on intravenous (IV) antibiotics for community acquired pneumonia (CAP) and admitted to the hospital.



(Left: The A profile is predominant A lines—horizontal reflections of the pleura. Middle: The B profile is predominant B lines—vertical hyperechoic lines. Right: The AB profile represents focal B lines in only a distinct lung zone. *Image adapted from Lichtenstein, et al, 2008.*)

The fever, crackles, leukocytosis and CXR findings are most concerning for CAP. Regardless of what we find on cardiopulmonary POCUS, this patient should receive antibiotics considering the high pre-test probability for pneumonia. The next management decision in this patient with HF is how to manage his intravascular volume. Options include IV fluids, holding of diuretics, continuing diuretics or IV diuresis. Without POCUS, we may argue for diuresis with the elevated blood pressure and crackles on pulmonary exam. Before performing our POCUS exam, it is important to consider our clinical questions and how POCUS may change diagnosis and/or management (table 1). This illustrates the concept that POCUS is only one piece of clinical decision-making. It is important to consider our focused pre-scan questions in order to apply and integrate clinical reasoning. Additionally, if all anticipated POCUS findings would not result in a change in diagnosis or management, one might put less priority on the POCUS exam or might elect not to perform the POCUS exam at all.

Lung POCUS was performed at the bedside demonstrating a B-profile in the left apex, A-profile in the

continued on page 14

Table 1

POCUS Question	POCUS Findings	Interpretation	Management
Lung Profile?	A profile	Dry, aerated lungs	Fluids or diuretics
	B profile	Diffuse interstitial process	Diuresis
	Focal B or AB profile	Focal interstitial process	Fluids or hold diuretics
Consolidation?	Air bronchograms	Pneumonia, atelectasis	Antibiotics (likely)
	Subpleural consolidation	Pneumonia	
IVC size/ compressibility	IVC <2cm + < 50% collapsibility	Low/normal CVP	Fluids or hold diuretics
	IVC >2cm + > 50% collapsibility	High CVP	Diuresis
LV Function?	Low/Normal	Known HF	No Change
	Severely low	Worsening HF	Hold fluids or diuresis

(An example of the pre-POCUS clinical reasoning process. It is important to consider the POCUS question, potential findings and how they may be interpreted as part of the clinical picture and how they may change management.)

other visualized lung fields with no pleural effusions. Cardiac POCUS was technically difficult due to body habitus. The subcostal view revealed a decreased EF with evidence of an IVC diameter <2 cm with respiratory variation >50%.

These findings indicate the patient is volume tolerant. The presence of focal B-lines with an otherwise A-profile indicates that the primary lung pathology is a focal process (i.e., CAP), rather than a diffuse interstitial process (i.e. pulmonary edema). Respiratory variation of the IVC estimates a low/normal central venous pressure (CVP) and further supports fluid administration if clinically necessary. It is important to note that if fluids are otherwise not felt to be clinically indicated, POCUS finding of a small and collapsing IVC alone should not prompt fluid administration.

The patient was admitted to the hospital and his home diuretics were held. He was not administered IV fluids as he was tolerating oral fluids and vital signs remained stable. The patient improved symptomatically with antibiotics. On hospital day two, his maintenance diuretics were restarted and patient was discharged home with close follow-up.

DiscussionPOCUS is an excellent tool to assist in the diagnosis and management of patients with shortness of breath. Its use is increasing in Internal Medicine, with support from multiple professional societies.[1,2] The key to using and integrating POCUS effectively is thinking about it as one piece of the clinical picture—similar to a physical exam finding or lab test. Among patients presenting with acute dyspnea or a clinical suspicion for HF, greater than or equal to three B-lines in two bilateral lung zones was found to have a positive likelihood ratio (LR) of 12.38 and a negative LR of 0.06 (table 2).[4] Our patient only had B lines in one lung zone and does not meet these criteria, thus the negative LR would apply, making it highly likely that our patient does not have cardiogenic pulmonary edema. POCUS has also been studied as a tool to detect pneumonia which also has significantly high LRs associated with the presence of subpleural consolidation or focal B-lines. (table 2).[4,5] Taking each of these studies into consideration, we can feel confident that our patient did not have pulmonary edema and was appropriately treated for CAP. This case emphasizes a few important points. First, it is important to consider anticipated POCUS findings and how they may affect our diagnosis and management. In this case, we still rely on clinical judgment to treat with antibiotics regardless of our POCUS findings. While POCUS supported the diagnosis of pneumonia, its main clinical effect was the management decision to hold diuretics. Second, B-lines are not synonymous with cardiogenic pulmonary edema. Rather, they can represent an array of interstitial processes, requiring careful interpretation and integration of findings into the clinical picture. Finally, it's important to recognize the limitations of POCUS. Not all views will be perfect, and it's critical for the examiner to recognize when an exam is limited and he or she should not draw conclusions from those images. For example, in this case, three of the cardiac views were suboptimal and were not used as part

continued on page 15

Table 2

Clinical Consideration	Pulmonary Edema	Pneumonia
POCUS Definition:	≥ 3 B-lines in bilateral lung zones	Subpleural consolidation and/or focal B-lines
Sensitivity (%)	94.1	92
Specificity (%)	92.4	94
Positive Likelihood Ratio	12.38	15.3
Negative Likelihood Ratio	0.06	0.09

(Summary and comparison of performance characteristics of bedside ultrasound findings for pulmonary edema and pneumonia [adults.] *Adapted from Al Deeb, et al [2014], Orso, et al [2018].)*

manipulating the probe and acquire specific images. Once the views are obtained, both resources direct students to identify anatomical structures and relationships, guide them to recall additional anatomical concepts not visible on US, and discuss clinical questions. For example, directions are given to obtain a view of the anterior midline of the neck and subsequently the thyroid gland and nearby musculature will be identified in the on-screen US image. Next the muscle innervations will be reviewed although not visible in the on-screen image and finally students will discuss how a thyroid nodule would appear on US. The consistency between these resources reinforces US and anatomical concepts while allowing students opportunities to test and identify gaps in their knowledge.

The integration of US sessions into a gross anatomy course is an excellent way to introduce a clinical skill while demonstrating the clinical relevance of anatomy. The flipped classroom format allows for an active approach to learning and incorporates forced recall activities to help students learn both subjects. Students are expected to demonstrate professionalism and can practice other skills such as physical examination while working in small groups. Furthermore, the inclusion of live US scanning sessions is an engaging format for learning anatomy and ultrasonography. Many students are genuinely excited to correlate the gross anatomical structures from cadaveric dissection with the living anatomy of themselves and their classmates.

Integrating the teaching of US to gross anatomy and correlating it to physical exam provide students with a subset of interrelated knowledge and skills that will be imperative for their future clinical practice. The US content taught during these sessions provides students with early literacy in US as well as the stepping-stone for the continued growth and development of these skills, which will likely be fundamental for practice.

References

1. Bahner DP, Adkins EJ, Hughes D, et al. Integrated medical school ultrasound: development of an ultrasound vertical curriculum. *Crit Ultrasound J*. 2013 Jul;5(1):6. doi: 10.1186/2036-7902-5-6.
2. Hoppmann RA, Rao VV, Bell F, et al. The evolution of an integrated ultrasound curriculum (iUSC) for medical students: 9-year experience. *Crit Ultrasound J*. 2015 Dec;7(1). doi: 10.1186/s13089-015-0035-3.
3. Davis JJ, Wessner CE, Potts J, et al. Ultrasonography in undergraduate medical education: A systematic review. *J Ultrasound Med*. 2018 Nov;37(11):2667-2679. doi: 10.1111/medu.13211.
4. Bornemann P. Assessment of a novel point-of-care ultrasound curriculum's effect on competency measures in family medicine graduate medical education. *J Ultrasound Med*. 2017 Jun;36(6):1205-1211. doi: 10.7863/ultra.16.05002.
5. Beal EW, Sigmond BR, Sage-Silski L, et al. Point-of-Care ultrasound in general surgery residency training: A proposal for milestones in graduate medical education ultrasound. *J Ultrasound Med*. 2017 Dec;36(12):2577-2584. doi:10.1002/jum.14298.
6. Smith JP, Kendall JL, Royer DF. Improved medical student perception of ultrasound using a paired anatomy teaching assistant and clinician teaching model. *Anat Sci Educ*. 2018 Mar;11(2):175-184. doi: 10.1002/ase.1722.

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MORNING REPORT *(continued from page 14)*

of the interpretation. In this case, POCUS did not clinch the diagnosis, but rather reinforced our clinical suspicion and helped guide management. POCUS is an emerging clinical tool with the capacity for a wide array of applications—highlighting its integral nature in the future education and practice of our specialty.

References

1. Soni NJ, Schnobrich D, Mathews BK, et al. Point-of-Care ultrasound for hospitalists: A position statement of the Society of Hospital Medicine. *J Hosp Med*. Published January 2, 2019. doi: 10.12788/jhm.3079.
2. Lichtenstein DA, Mezière GA. Relevance of lung ultrasound in the diagnosis of acute respiratory failure: The BLUE protocol. *Chest*. 2008 Jul;134(1):117-25.
3. ACP. ACP statement in support of point-of-care ultrasound in internal medicine. https://www.acponline.org/meetings-courses/focused-topics/point-of-care-ultrasound-pocus-for-internal-medicine/acp-statement-in-support-of-point-of-care-ultrasound-in-internal-medicine. Accessed November 15, 2019.
4. Al Deeb M, Barbic S, Featherstone R, et al. Point-of-care ultrasonography for the diagnosis of acute cardiogenic pulmonary edema in patients presenting with acute dyspnea: a systematic review and meta-analysis. *Acad Emerg Med*. 2014 Aug;21(8):843-52.
5. Orso D, Guglielmo N, Copetti R. Lung ultrasound in diagnosing pneumonia in the emergency department: a systematic review and meta-analysis. *Eur J Emerg Med*. 2018 Oct;25(5):312-321.

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HEALTH POLICY *(continued from page 11)*

health/maternalinfanthealth/pregnancy-mortality-surveillance-system.htm. Published June 4, 2019. Accessed November 15, 2019.
5. Kaiser Family Foundation. Analysis: Most short-term health plans don't cover drug treatment or prescription drugs, and none cover maternity care. https://www.kff.org/health-reform/press-release/analysis-most-short-term-health-plans-dont-cover-drug-treatment-or-prescription-drugs-and-none-cover-maternity-care. Published April 23, 2018. Accessed November 15, 2019.
6. Vesoulis A. Paid family leave has stalled in Congress for years. Here's why that's changing. *Time Magazine*. https://time.com/5562960/paid-family-leave-congress. Published May 4, 2019. Accessed November 15, 2019.

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