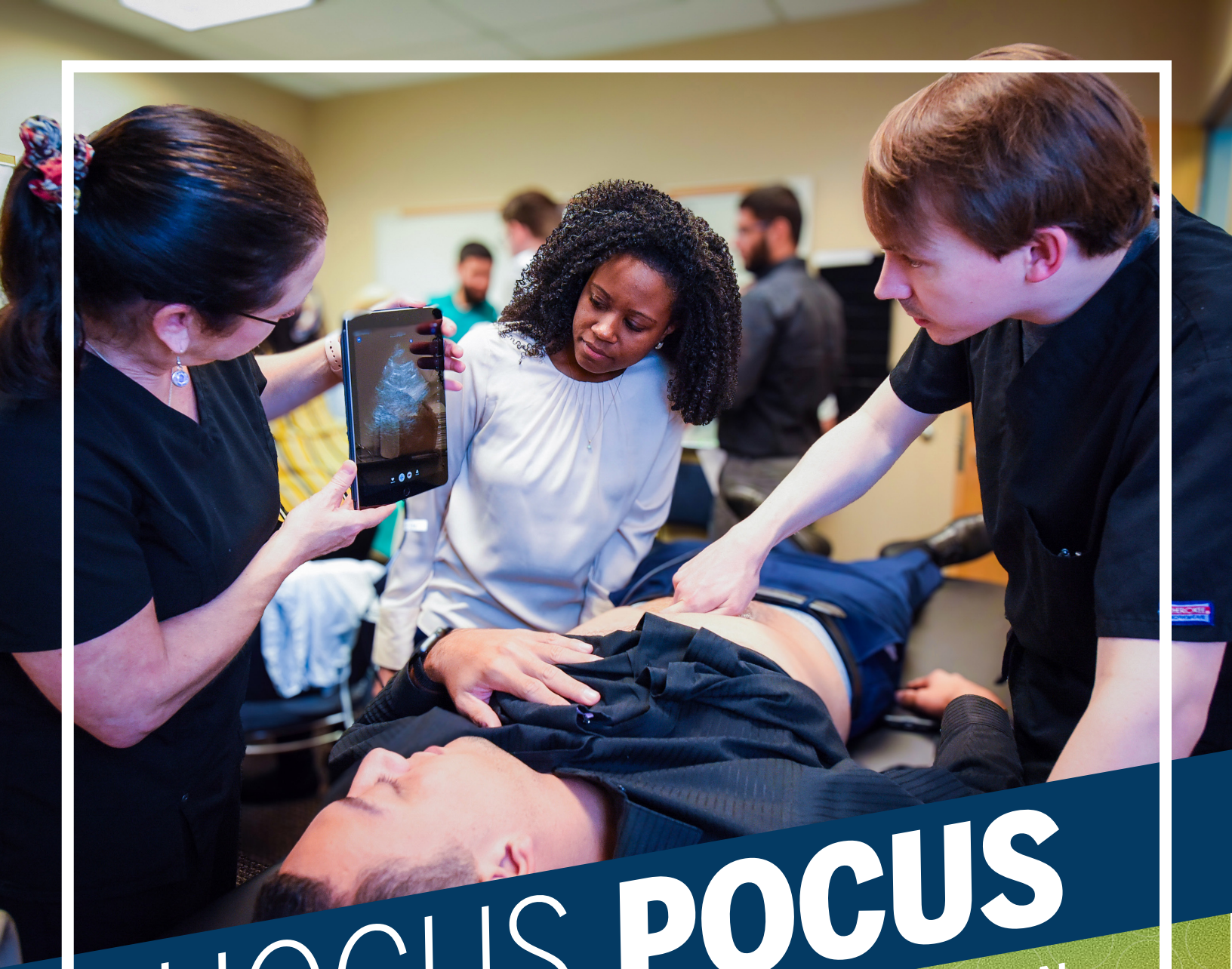


HOCUS POCUS

STATE-OF-THE-ART MEDICAL EDUCATION THROUGH INNOVATIVE POINT-OF-CARE ULTRASOUND TRAINING

INDIANA UNIVERSITY
SCHOOL OF MEDICINE

PREPARING **HEALERS.** TRANSFORMING **HEALTH.**

TABLE OF CONTENTS

"IU School of Medicine is clearly a world-leader in POCUS education and training. We know that we need to think big if we want to be successful. As such, we have taken an inclusive and holistic approach where we have launched POCUS training programs for students, residents, fellows and faculty. We know this is the right thing to do because this technology improves patient care and the patient's experience and involvement in their care. It's rare for new technologies to actually bring physicians back to the bedside to spend more time with patients. POCUS is one of those few gems that can do both."

ROBINSON M. FERRE, MD, FACEP
Chief, Point of Care Ultrasound Division
Director, IUSM Point of Care Ultrasound Initiative
Medical Director, IU Health Point of Care Ultrasound
Indiana University School of Medicine

POCUS PROGRAM BY THE NUMBERS

INDIANA University School of Medicine is the nation's largest medical school with more than 1,400 medical students at nine campuses across the state of Indiana and more than 1,400 residents and fellows. After six years, the school is one of only 10 medical schools in the nation with a fully integrated four-year Point of Care Ultrasound (POCUS) education curriculum that marries education with clinical experience, and one of only three with shared POCUS curriculum in its residency programs. With nearly 1,050 devices available school-wide, learners, residents and faculty physicians are poised to significantly improve the health of the communities we serve using this ground-breaking diagnostic tool at the bedside.

TRAINED MORE THAN

3,000 students

and 450 residents and fellows

2023-24

+294%

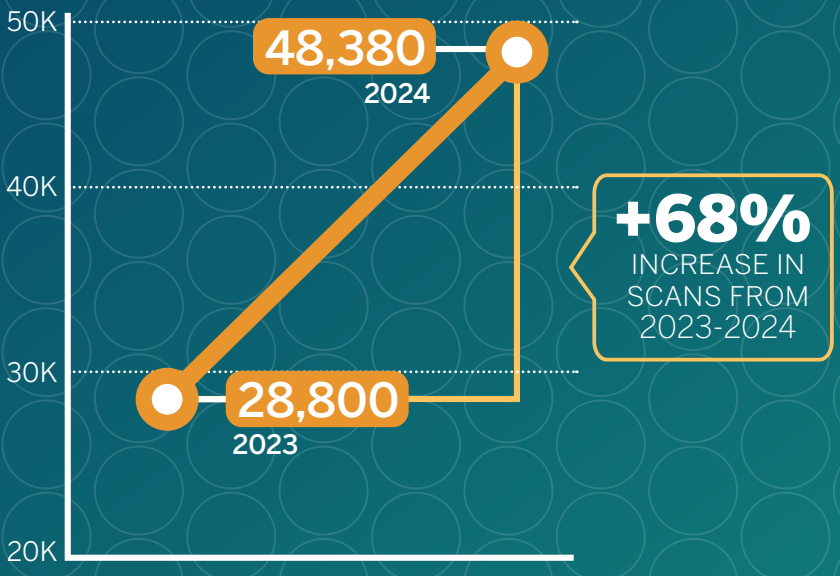
INCREASE IN **PROBES USED**

+620%

INCREASE IN **PROBE USERS**

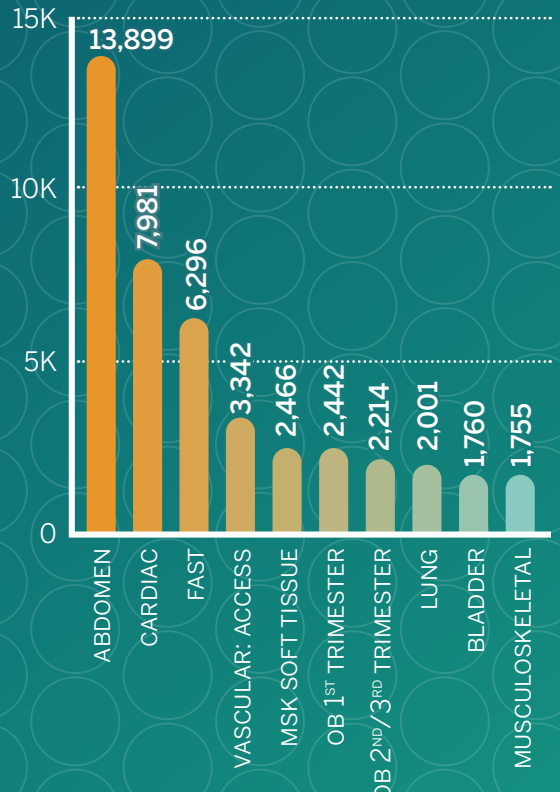
820 in 2024 vs. 115 in 2023

NUMBER OF SCANS



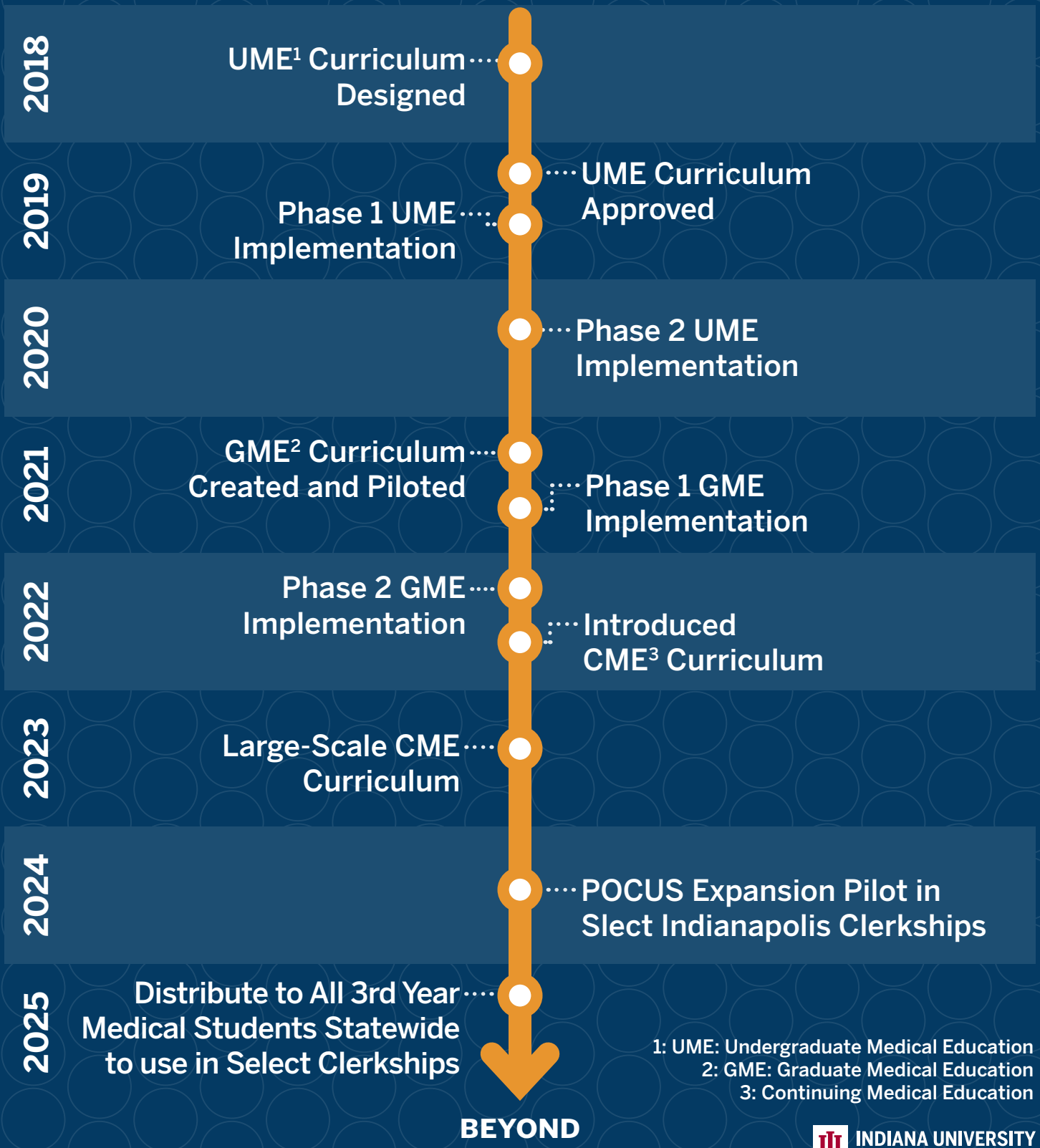
+68% INCREASE IN SCANS FROM 2023-2024

2024 TOP 10 EXAM TYPES



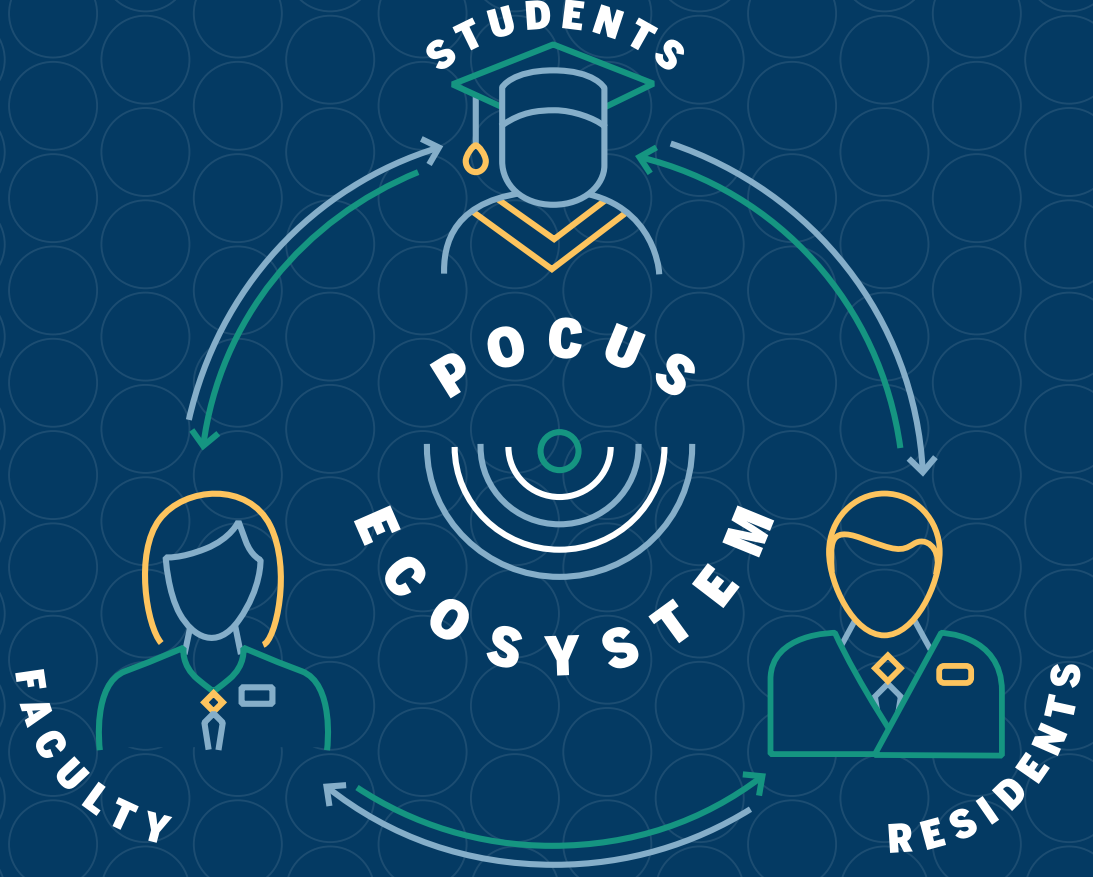
POCUS TIMELINE

The journey to embed POCUS into the school and train future generations of physicians began in 2018 with the development of a POCUS ecosystem where students, residents, fellows, faculty and staff statewide can work together to teach and learn from each other. In addition, the program has been thoughtfully developed to include education and hands-on experiences at all nine of the school's campuses.



1: UME: Undergraduate Medical Education
2: GME: Graduate Medical Education
3: Continuing Medical Education

INDIANA UNIVERSITY SCHOOL OF MEDICINE



KEYS TO SUCCESS

1

LEADERSHIP

2

BUY-IN
from and engagement of pre-clinical and clinical educators

3

AVAILABILITY
of equipment and resources

4

VISION AND STRATEGY

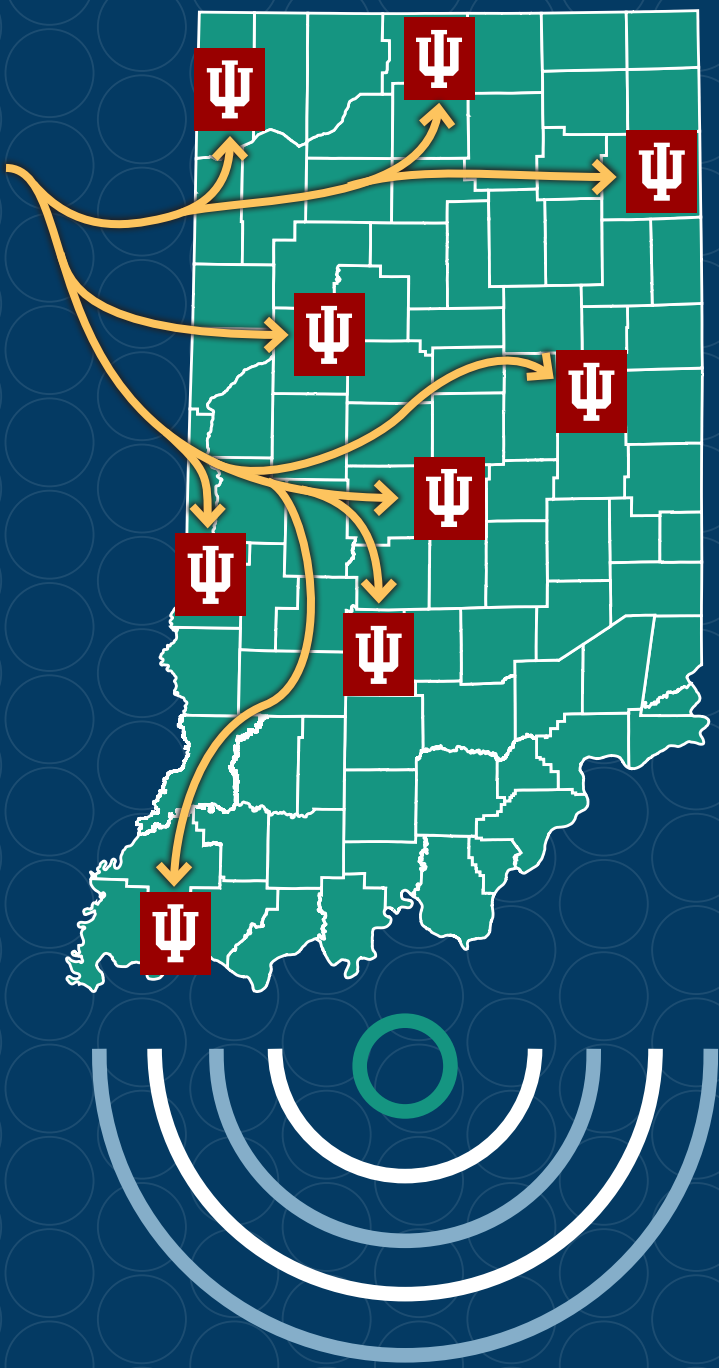
5

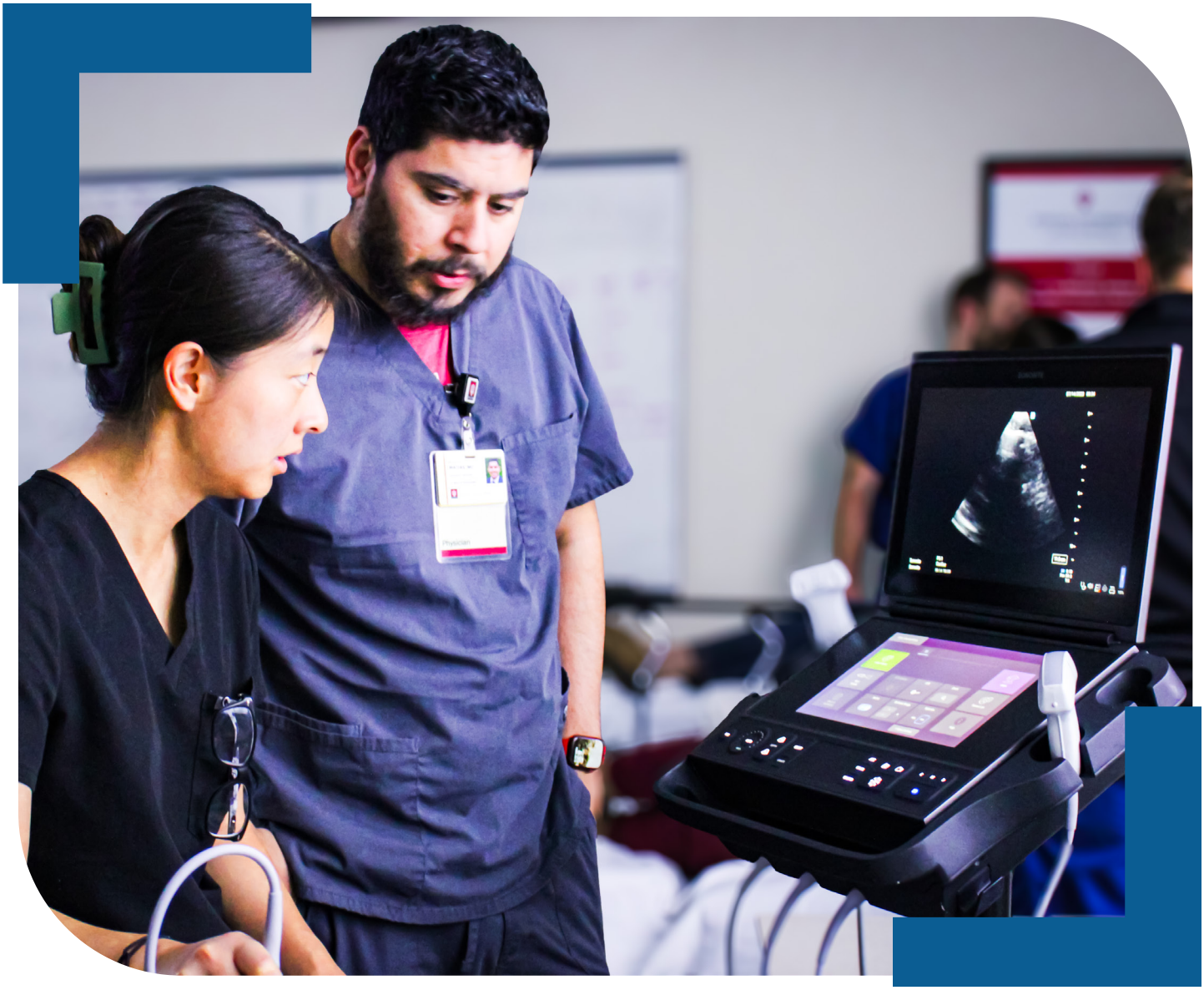
SHARED VALUES
with health system partners, including innovation, excellence, and health equity

DEPLOYMENT

- Curriculum in all four years of medical school and for residents and fellows. Training options for physicians to meet them where they are.
- Hands-on scanning labs and simulation centers **at all 9 IU School of Medicine campuses.**

- **State of the art simulation phantoms** that approximate real patients allow learners to experience a wide variety of pathological conditions.
- Scanning in clinical settings, classrooms, conference rooms to provide education to busy faculty.
- POCUS expert physicians, sonographers, residents and students.





To address the availability of equipment and resources, in 2023, the school purchased 700 Butterfly POCUS iQ+ probes and iPad mini tablets that fit in a white coat pocket as a part of pilot expansion into clinical training in the following Indianapolis clerkships. This pilot significantly contributed to the increased use of POCUS seen in the numbers on page 1 of this report.

- Anesthesia
- Emergency Medicine
- Family Medicine
- Internal Medicine
- Obstetrics and Gynecology
- Surgery
- Critical Care

BUTTERFLY ACADEMY

This purchase also included Butterfly Networks' cloud-based imaging platform and learning management system that allows for quality assurance, utilization tracking, Butterfly Academy didactic courses, and artificial intelligence for self-paced learning. Funding was provided by a grant from the U.S. Health Resources and Services Administration Primary Care Reaffirmation for Indiana Medical Education (PRIME) program.

EDUCATION AND TRAINING

TRAINING FUTURE DOCTORS

IU School of Medicine students gain skills progressively throughout their four years of training. This has evolved over time as described below.

PHASE ONE
Years 1 and 2

Students learn about POCUS and how to use the technology to perform scans, setting the foundation of their POCUS skills, and developing competency for the next phase. Students learn how to identify anatomy on a POCUS image and consider how POCUS exams fit within a clinical context. They have dedicated POCUS labs where they learn to perform POCUS exams, recognize normal anatomy and learn about common pathologic conditions where POCUS is used in day-to-day clinical care. The program provides additional opportunities to practice using simulators and peer-models during open POCUS labs.

ASSESSMENT

Questions in unit tests, pre-work quizzes and skills assessment in lung, FAST and 2 cardiac views in Year 1 and lung, FAST and 4 cardiac views in Year 2

STUDENT

PHASE TWO
Year 3

POCUS curriculum extends throughout required clerkships, which allows students practice in the clinical setting and to increase their POCUS knowledge and skills.

ASSESSMENT

POCUS skill acquisition (OSCE) as well as Medical Knowledge quiz.

TRAINING

PHASE THREE
Year 4

PATHWAY

Students gain additional experience by participating in **SonoKombat**, a gaming tournament of various POCUS skills and knowledge. They can continue to gain clinical experience during 4th year clerkships, and electives.

"I teach students in FCP (Fundamentals of Clinical Practice) 1 and FCP 2 during their POCUS sessions on the West Lafayette campus, and I teach students at the bedside when working in the emergency department. It has been rewarding seeing IUSM students apply their POCUS knowledge and skills in the clinical setting. While some students have used it more than others, it is clear that IUSM students have been trained and are taught how to use POCUS for clinical image acquisition and diagnosis."

MATTHEW TEWS, DO,
Associate Dean and Campus
Director, IU School of Medicine-West Lafayette

"It's gratifying to see students connect the things that they do clinically to the things that they have read. I had a student diagnosis a breech presentation in the 37th week of pregnancy. It (POCUS) has shown them that imaging influences clinical care and that these are skills that they can quickly pick up and implement with the appropriate supervision."

ANTHONY SHANKS, MD, MEd, FACOG,
William H. and Sallie E. Coleman Professor of
Obstetrics and Gynecology, Vice Chair of
Education and MFM Fellowship Director

SONO KOMBAT

A GAMING TOURNAMENT OF POCUS SKILLS AND KNOWLEDGE

SUMMER TRAINING PROGRAM

An exciting two-week program in the summer between their first and second year of medical school, the POCUS Summer Training Program allows students to become comfortable with POCUS and then serve as campus champions and peer educators for fellow students and faculty at training events. Since the program began in 2021, with support from the school's U.S. Health Resources Administration PRIME grant and IU Health Values grants, more than 150 rising second year medical students have successfully completed the program.

- Various clinical specialties teach about POCUS uses
- 16-24 hours of hands-on experience
- Receive a POCUS probe to take home and practice on their own

> *"This program was a quintessential part to developing my competence and confidence in POCUS. The summer program gave me the skills to begin applying POCUS in clinical contexts, and I am now experienced enough to interpret images in real time, independently perform imaging and procedures, and teach other students about POCUS."*
>
> **OLIVER HOBSON**, MD Candidate 2026, IU School of Medicine – Indianapolis

A WINNING PARTNERSHIP

A partnership with the IU School of Medicine's Diagnostic Sonography program is a win-win-win for the school, medical students and sonography students. Sonographers and sonography students have been instrumental in the school's statewide POCUS deployment. With their deep knowledge and skillset, sonography students play an important role teaching students, residents and faculty. Senior sonography students also teach in the school's summer POCUS program.

> *"It's a great opportunity for sonography students to teach what they know and gain confidence in their abilities. It's also a great opportunity for medical students to learn and understand the role of the sonographer. We would not have been able to deliver POCUS training around the state without this collaboration."*
>
> **DINA PETERSON**, MSED, RT(R), RDMS, RDCS, RVT, Diagnostic Sonography program director, IU-Indianapolis.

HONOR SOCIETIES RECOGNIZING EXCELLENCE

The POCUS Probe and POCUS Golden Probe Societies encourage self-directed POCUS education and training beyond the classroom and recognize students who go "above and beyond" what is required in the curriculum. They include opportunities to train and mentor emerging POCUS leaders within IU School of Medicine.

POCUS PROBE SOCIETY: introductory club-like group where membership criteria are easily within reach and enrollment is ongoing.

POCUS GOLDEN PROBE HONOR SOCIETY: a prestigious honor society for IU School of Medicine medical students who want to be future POCUS leaders. It has more rigorous requirements and greater responsibilities for membership. Membership is awarded if criteria are met in four domains: education; practice; training; and scholarship.

RESIDENCIES RAISE THE BAR

Eleven different residency or fellowship programs offer POCUS training for trainees, including Emergency Medicine, Emergency Medicine-Pediatrics, Internal Medicine (programs in Indianapolis and Muncie), Medicine-Pediatrics, Family Medicine (programs in Indianapolis and West Lafayette), Acute Care Surgery, Pediatric Emergency Medicine, Pediatric hospitalist, and Nephrology.

Internally developed didactic education training modules are available to every residency program. Each module includes a pre- and post-module knowledge assessment. Residency programs select pertinent modules to customize their training to meet their specialty's needs. Many programs use this shared curriculum as their core knowledge base and are able to build more specialty specific knowledge and uses of POCUS from that foundation.

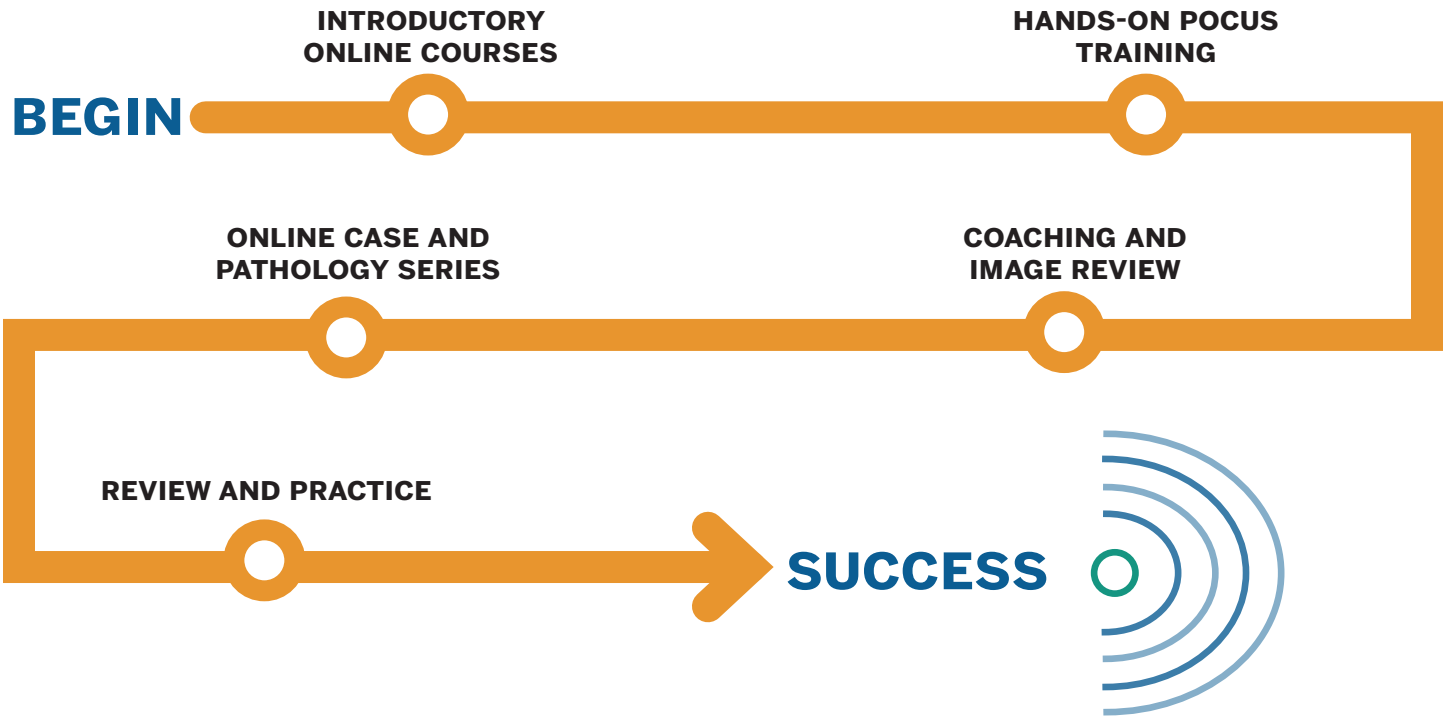
POCUS ECHO

Project ECHO (Extension for Community Healthcare Outcomes) is a free program that connects local primary care teams with inter-disciplinary specialists to spread knowledge and amplify local capacity to provide best practice care for complex chronic health conditions. It is primarily focused on rural and traditionally underserved populations. Held twice weekly for an hour via Zoom, the program has engaged physicians, physician assistants, advanced practice nurses, nurses, social workers, case managers, sonographers and patient navigators.

CONTINUING MEDICAL EDUCATION

Continuing Medical Education provides any practicing physician with a POCUS training pathway. The content is available online and includes opportunities for hands-on learning, practice and coaching. Details can be found at https://medicine.iu.edu/point-of-care-ultrasound/continuing-education

POCUS TRAINING PATHWAY



POCUS IN PRACTICE

PARAMEDIC POCUS USE FOR ACUTE HEART FAILURE

Over the past 4-years paramedics (non-physicians) have been trained to use ultrasound in the prehospital setting to identify patients with acute heart failure. Paramedics use lung ultrasound to identify B-lines, which are pathologic findings seen in patients with pulmonary edema and fluid overload, to determine diagnosis and initiate treatment. It is a huge paradigm shift to move early care for acute heart failure patients from the hospital setting to the pre-hospital setting.

This is important as earlier treatment leads to better outcomes, and with the use of hand-held POCUS devices, paramedics significantly improved recognition of acute heart failure and treatment. Francis Russell, MD, professor of Emergency Medicine, and her team have shown that paramedics can perform lung ultrasound for acute heart failure with moderate to high sensitivity and high specificity both through a systematic review meta-analysis study and a prospective interventional study.

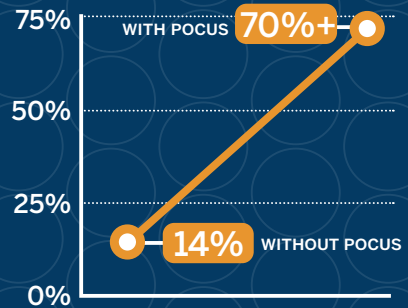
POCUS PATIENTS RECEIVE TREATMENT AROUND

3 hours earlier

THAN NON-POCUS PATIENTS

HIGH SPECIFICITY
WITH VERY FEW FALSE POSITIVES

IMPROVED RECOGNITION
OF ACUTE HEART FAILURE WITH POCUS



STUDENTS RESPOND TO POCUS CALL

A survey of medical students who participated in the school's summer POCUS program over 2 years found a vast majority were highly engaged 9 months after their summer experience.

94.2% **TAUGHT PEERS OF FACULTY**

ONLY ONE STUDENT

DIDN'T USE POCUS AFTER PROGRAM

849 hours

OF POCUS INSTRUCTION

Herbert A, Russell FM, Ferre RM, Wilcox J, Peterson D, Davis J, Zakeri B, Hays M, Wallach PM. Two-week intensive medical student point-of-care ultrasound training impact on long term utilization. BMC Med Educ. 2024 Aug 16;24(1):884. doi: 10.1186/s12909-024-05866-5. PMID: 39152440; PMCID: PMC11330062.

EXPANDING CARE FOR VETERANS

A collaboration between the school and the Richard L. Roudebush VA Medical Center in Indianapolis has made significant progress, thanks to the persistence of VA leaders, and equipment and training provided by IU School of Medicine, though more work remains. Seven hospitalists achieved basic proficiency in cardiac, pulmonary, and FAST POCUS exams through their dedicated participation in regular training and practice sessions. This was possible through resources provided by IU School of Medicine: 10 Butterfly probes and iPads; the time and expertise of two sonographers; and models for biweekly training sessions between March and November 2024.

Challenges that had to be overcome include gaining approval for equipment use, teaching sessions, and use of human models at the VA, and sanitation protocols for probe cleaning, among others.

> *"We are very grateful for this collaboration – it has provided a solid foundation for POCUS integration, with clear steps for further progress as there is still a lot of work to be done. Participants praised the training and the sonographers' patience and expertise, and seasoned models were very easy to work with."*
>
> **RICHA GUPTA,** MD, assistant professor of Clinical Medicine and Key Clinical Educator for Hospital Medicine, and assistant chief hospitalist, VA Medical Center

POCUS POTENTIAL FOR RURAL CARE

A recent project with seven rural physicians at IU School of Medicine-Terre Haute proved challenging, yet important lessons were learned. Mirroring rural care, nearly half left practice during the year-long project. Overall, only those who had previous experience were really interested in learning more. From a clinical standpoint, use for orthopedics or musculoskeletal conditions could be supported by POCUS since there's often little access to orthopedics in rural areas.

> *"There's so much potential with this exciting, new technology and we are at the forefront of something that will benefit patients and researchers. Technology and time have turned out to be barriers for practicing physicians. So, teaching medical students and residents today will lead to doctors and faculty members who embrace POCUS and will have the background, competencies and skill to use it to provide care regardless of location."*
>
> **ELLEN IRELAND,** PhD, MPH, assistant professor of Clinical Family Medicine, IU School of Medicine-Terre Haute

NATIONAL LEADERSHIP ON DISPLAY

Indiana University is at the forefront of advancing POCUS through AI-driven software and hardware development. In collaboration with GE Healthcare and the Biomedical Advanced Research and Development Authority (BARDA), we are developing software to support clinical scenarios such as out-of-hospital management and mass casualty situations. BARDA is a division of the U.S. Department of Health and Human Services responsible for countermeasures against chemical, biological, radiological, nuclear threats, bioterrorism, pandemic influenza, and emerging diseases.

RESEARCH AND SCHOLARSHIP

IU School of Medicine faculty members who are experts in Point of Care Ultrasound have made extensive contributions to the published literature. The following is a selection of scholarly articles as of October 2024. A complete listing can be found at https://medicine.iu.edu/point-of-care-ultrasound/publications.

2024

A Crossover Trial Evaluating Coconut Oil as an Alternative to Commercial Ultrasound Gel in Obstetrical Ultrasounds.
Edelman C, Rouse C, Yang Z, Cook M, Daggy J, Shanks A. Am J Perinatol. 2024 Oct;41(14):1918-1923. doi: 10.1055/s-0044-1782687. Epub 2024 Mar 26. PMID: 38531377

Deep Learning Based Shear Wave Detection and Segmentation Tool for Use in Point-of-Care for Chronic Liver Disease Assessments.
Honarvar M, Lobo J, Schneider C, Wolfe N, Gawrieh S, Loomba R, Ramji A, Hassanein T, Yoshida EM, Pang E, Curry MP, Afdhal NH. Ultrasound Med Biol. 2024 Dec;50(12):1812-1820. doi:
10.1016/j.ultrasmedbio.2024.08.002. Epub 2024 Sep 6. PMID: 39244483

Arterial Thrombosis Diagnosed With Point-of-Care Ultrasound.
Gonzalez AA, Brenner DS. Cureus. 2024 Sep 13;16(9):e69357. doi: 10.7759/cureus.69357. PMID:
39416590

Serial Trauma Abdominal Ultrasound in Children (STAUNCH): A Pilot Study.
Nti BK, Benzoni N, Starr R, Hays M, Vish D, End B, Russell F. Pediatr Emerg Care. 2024 Sep 1;40(9):623-626. doi: 10.1097/
PEC.0000000000003208. Epub 2024 Apr 8. PMID: 38587011.

Two-week intensive medical student point-of-care ultrasound training impact on long term utilization.
Herbert A, Russell FM, Ferre RM, Wilcox J, Peterson D, Davis J, Zakeri B, Hays M, Wallach PM. BMC Med Educ. 2024 Aug 16;24(1):884. doi: 10.1186/
s12909-024-05866-5. PMID: 39152440; PMCID: PMC11330062.

A shared point of care ultrasound curriculum for graduate medical education.
Ferre RM, Kaine JC, Lobo D, Peterson D, Sarmiento E, Adame J, Herbert A, Wallach PM, Russell FM. BMC Med Educ. 2024 Aug 6;24(1):843. doi:
10.1186/s12909-024-05797-1. PMID: 39107748; PMCID: PMC11305004.

Point-of-Care Ultrasound in the Primary Care Office for Early Detection of Squamous Cell Carcinoma of the Supraglottic Larynx: A Case Report.
Wilcox J, Kaefer SL. Cureus. 2024 Jul 29;16(7):e65682. doi: 10.7759/cureus.65682. PMID: 39211698; PMCID: PMC11357834.

2023

Prehospital lung ultrasound in acute heart failure: Impact on diagnosis and treatment.
Russell FM, Supples M, Tamhankar O, Liao M, Finnegan P. Acad Emerg Med. 2024 Jan;31(1):42-48. doi: 10.1111/acem.14811. Epub 2023 Oct 19. PMID:
37772384.

Removing Barriers to Emergency Medicine Point-of-Care Ultrasound: Illustrated by a Roadmap for Emergency Medicine Point-of-Care.
Ultrasound Expansion in India. Smith M, Krishnan SV, Leamon A, Galwankar S, Sinha TP, Kumar VA, Laere JV, Gallien J, Bhoi S. J Emerg Trauma Shock. 2023 Jul-Sep;16(3):116-126.
doi: 10.4103/jets.jets_50_23. Epub 2023 Sep 29. PMID: 38025509

External validation of the ultrasound competency assessment tool.
Russell FM, Herbert A, Kennedy S, Nti B, Powell M, Davis J, Ferre R. AEM Educ Train. 2023 Jun 22;7(3):e10887. doi: 10.1002/aet2.10887. eCollection 2023 Jun. PMID: 37361190

A Program of Assessment Model for Point-of-Care Ultrasound Training for Pediatric Critical Care Providers: A Comprehensive Approach to Enhance Competency-Based Point-of-Care Ultrasound Training.
Maxson IN, Su E, Brown KA, Tcharmtchi MH, Ginsburg S, Bhargava V, Wenger J, Centers GI, Alade KH, Leung SK, Gowda SH, Flores S, Riley A, Thammasitboon S; Pediatric Research Collaborative on Critical Ultrasound (PeRCCUS), a subgroup of the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network. Pediatr Crit Care Med. 2023 Jun 1. doi: 10.1097/PCC.0000000000003288. Online ahead of print. PMID: 37260313

Evaluation of Point-of-Care Ultrasound Training for Family Physicians Using Teleultrasound.
Russell FM, Herbert A, Lobo D, Ferre R, Nti BK. Fam Med. 2023 Apr;55(4):263-266. doi: 10.22454/FamMed.2023.469019. Epub 2023 Feb 13. PMID: 37043188

Gamification of POCUS: Are Students Learning?
Russell FM, Lobo D, Herbert A, Kaine J, Pallansch J, Soriano P, Adame JD, Ferre RM. West J Emerg Med. 2023 Feb 22;24(2):243-248. doi: 10.5811/westjem.2022.11.57730. PMID: 36976585

Bedside lung ultrasound for the diagnosis of pneumonia in children presenting to an emergency department in a resource-limited setting.
Amatya Y, Russell FM, Rijal S, Adhikari S, Nti B, House DR. Int J Emerg Med. 2023 Jan 9;16(1):2. doi: 10.1186/s12245-022-00474-w. PMID: 36624366

2022

Artificial Intelligence-Augmented Pediatric Lung POCUS: A Pilot Study of Novice Learners.
Nti B, Lehmann AS, Haddad A, Kennedy SK, Russell FM. J Ultrasound Med. 2022 Dec;41(12):2965-2972. doi: 10.1002/jum.15992. Epub 2022 Apr 15. PMID: 35429001.

Point-of-care echocardiography of the right heart improves acute heart failure risk stratification for low-risk patients: The REED-AHF prospective study.
Harrison NE, Favot MJ, Gowland L, Lenning J, Henry S, Gupta S, Abidov A, Levy P, Ehrman R.
Acad Emerg Med. 2022 Nov;29(11):1306-1319. doi: 10.1111/acem.14589. Epub 2022 Sep 26.
PMID: 36047646 Free PMC article. Clinical Trial.

Effect of a point-of-care ultrasound (POCUS) curriculum on emergency department soft tissue management.
Nti BK, Phillips W, Sarmiento E, Russell F. Ultrasound J. 2022 Oct 21;14(1):41. doi: 10.1186/s13089-022-00292-4. PMID: 36269462

Assessment of Medical Students' Ability to Integrate Point-of-Care Cardiac Ultrasound Into a Case-Based Simulation After a Short Intervention.
Russell FM, Herbert A, Peterson D, Wallach PM, Ferre RM. Cureus. 2022 Jul 31;14(7):e27513. doi: 10.7759/cureus.27513. eCollection 2022 Jul. PMID: 36060409

Piloting a Graduate Medical Education Point-of-Care Ultrasound Curriculum.
Ferre RM, Russell FM, Peterson D, Zakeri B, Herbert A, Nti B, Goldman M, Wilcox JG, Wallach PM. Cureus. 2022 Jul 23;14(7):e27173. doi: 10.7759/cureus.27173. eCollection 2022 Jul.
PMID: 36017274

Point-of-Care Ultrasound Education During a Pandemic: From Webinar to Progressive Dinner-Style Bedside Learning.
Herbert A, Russell FM, Zahn G, Zakeri B, Motzkus C, Wallach PM, Ferre RM. Cureus. 2022 May 19;14(5):e25141. doi: 10.7759/cureus.25141. eCollection 2022 May. PMID: 35747012

The State of Point-of-Care Ultrasound Training in Undergraduate Medical Education: Findings From a National Survey.
Russell FM, Zakeri B, Herbert A, Ferre RM, Leiser A, Wallach PM. Acad Med. 2022 May 1;97(5):723-727. doi: 10.1097/ACM.0000000000004512. Epub 2022 Apr 27. PMID: 34789665

Success of implementation of a systemwide point-of-care ultrasound privileging program for emergency medicine faculty.
Kennedy SK, Ferre RM, Rood LK, Nti B, Ehrman RR, Brenner D, Rutz MA, Zahn GS, Herbert AG, Russell FM. AEM Educ Train. 2022 Apr 1;6(2):e10744. doi: 10.1002/aet2.10744. eCollection 2022 Apr. PMID: 35493291

Design and implementation of a basic and global point of care ultrasound (POCUS) certification curriculum for emergency medicine faculty.
Russell FM, Kennedy SK, Rood LK, Nti B, Herbert A, Rutz MA, Palmer M, Ferre RM. Ultrasound J. 2022 Feb 19;14(1):10. doi: 10.1186/s13089-022-00260-y. PMID: 35182232

Right ventricular dysfunction in acute heart failure from emergency department to discharge: Predictors and clinical implications.
Harrison NE, Ehrman R, Favot M, Gowland L, Lenning J, Abidov A, Henry S, Gupta S, Welch R, Levy P. Am J Emerg Med. 2022 Feb;52:25-33. doi: 10.1016/j.ajem.2021.11.024. Epub 2021 Nov 17. PMID: 34861517

2021

Teaching Seasoned Doctors New Technology: An Intervention to Reduce Barriers and Improve Comfort With Clinical Ultrasound.
Kennedy SK, Duncan T, Herbert AG, Rood LK, Rutz MA, Zahn GS, Welch JL, Russell FM. Cureus. 2021 Aug 17;13(8):e17248. doi: 10.7759/cureus.17248. eCollection 2021 Aug. PMID: 34540474

Lung ultrasound training and evaluation for proficiency among physicians in a low-resource setting.
House DR, Amatya Y, Nti B, Russell FM. Ultrasound J. 2021 Jun 30;13(1):34. doi: 10.1186/s13089-021-00236-4. PMID: 34191145

B-line quantification: comparing learners novice to lung ultrasound assisted by machine artificial intelligence technology to expert review.
Russell FM, Ehrman RR, Barton A, Sarmiento E, Ottenhoff JE, Nti BK. Ultrasound J. 2021 Jun 30;13(1):33. doi: 10.1186/s13089-021-00234-6. PMID: 34191132

Painless loss of vision: rapid diagnosis of a central retinal artery occlusion utilizing point-of-care ultrasound.
Taylor GM, Evans D, Doggette RP, Wallace RC, Flack AT, Kennedy SK. Oxf Med Case Reports. 2021 Jun 18;2021(6):omab038. doi: 10.1093/omcr/omab038. eCollection 2021 Jun. PMID: 34158954

Building and Maintaining an Ultrasound Program: It Takes a Village.
Dversdal RK, Northcutt NM, Ferre RM. Adv Chronic Kidney Dis. 2021 May;28(3):236-243. doi: 10.1053/j.ackd.2021.06.005. PMID: 34906308

Development and implementation of a point of care ultrasound curriculum at a multi-site institution.
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