Establishing Ultrasound Curricula – Challenges and Practical Considerations

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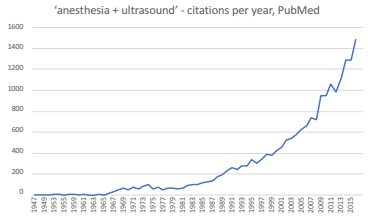
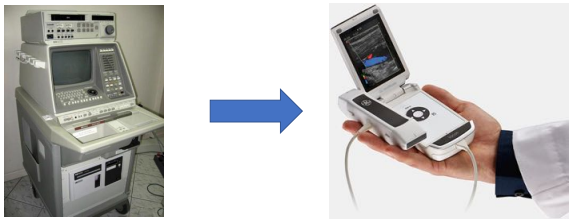
Objectives

- Review the evolution of ultrasound in clinical practice
- Discuss expert consensus surrounding ultrasound education
- Explore challenges and barriers to establishing educational programs
- Propose pragmatic strategies for success across anesthesia subspecialties

Ultrasound really is exploding





Coming *now* to a med school near you…

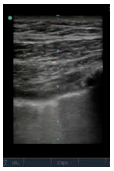
TOPICS IN ULTRASOUND EDUCATION

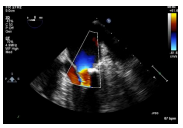
National Ultrasound Curriculum for Medical Students

Oksana H. Baltarowich, MD, Donald N. Di Salvo, MD,† Leslie M. Scoutt, MD,‡ Douglas L. Brown, MD,§ Christian W. Cox, MD,|| Michael A. DiPietro, MD,¶# Daniel I. Glazer, MD,# Ulrike M. Hamper, MD, MBA,** Maria A. Manning, MD,†† Levon N. Nazarian, MD,*‡‡ Janet A. Neutze, MD,§§ Miriam Romero, MD,||| Jason W. Stephenson, MD,¶¶ and Theodore J. Dubinsky, MD##*

US Applications in Anesthesia

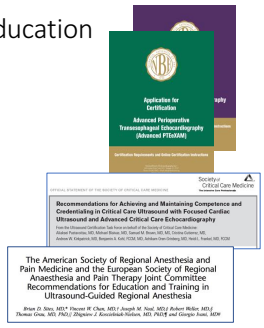
- Vascular access
- Procedural guidance
- Cardiac diagnostic applications – TEE and TTE/ACCE/FoCUS
- Hemodynamic evaluation
  - Cardiac
  - Abdominal
  - Lung
- Airway assessment/management
- Neuraxial and regional anesthesia
- Neurologic/ICP assessment
- Gastric volume assessment





Defining Outcomes of US Education

- Defining proficiency
  - Technical/acquisition skills and interpretive ability that allows for integration into clinical practice
- Certification: NBE – Periop TEE
  - Exam
  - Case logs/supervised interpretation
  - MOC
- Specialty-specific consensus statements: CCUS, Regional
  - Recommended case numbers with supervised interpretation
  - Recommended curriculum/didactic topics
  - Local credentialing
- What about trainees who come with advanced experience?
  - How do we help them grow?

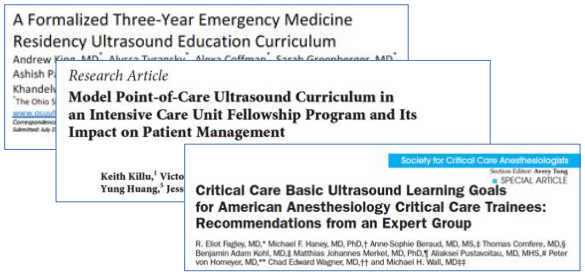


Challenges of Teaching Ultrasound

- Dependent on $ equipment and IT/biomed support
- Wide spectrum of faculty knowledge/skill
- Rapidly evolving field
- Requires new workflows, burdens for QA, credentialing
- Scope of practice, local 'traditions' that dictate/complicate professional boundaries

**Need to teach advanced skills to a small group of learners over a short period of time

Curriculum Recommendations



The task can be daunting…

Table 8. Sample Curriculum for Critical Care Ultrasound

Title	Type	Time or no.
Equipment and artifacts	Didactic	30 min
Equipment and artifacts practical*	Wet lab	15 min
Vascular ultrasound	Didactic	45 min
Vascular ultrasound practical*	Wet lab	30 min
Vascular ultrasound study review	Exam	10
Vascular ultrasound study performance	Exam	10
Abdominal ultrasound	Didactic	90 min
Abdominal ultrasound practical*	Wet lab	60 min
Abdominal ultrasound study review	Exam	30
Abdominal ultrasound study performance	Exam	30
Lung and pleural ultrasound	Didactic	45 min
Lung and pleural ultrasound practical*	Wet lab	30 min
Lung and pleural ultrasound study review	Exam	10
Lung and pleural ultrasound study performance	Exam	10
Transthoracic echocardiographic views and anatomy	Didactic	90 min
Transthoracic echocardiographic views and anatomy*	Wet lab	90 min
Transesophageal echocardiographic views and anatomy*	Didactic	60 min
Transesophageal echocardiographic views and anatomy**	Wet lab	60 min
Transthoracic and transesophageal echocardiographic pathology	Didactic	120 min
Transthoracic echocardiographic study review	Exam	50
Transthoracic echocardiographic study performance	Exam	50
Transesophageal echocardiographic study review*	Exam	50
Transesophageal echocardiographic study performance*	Exam	50
Critical care ultrasound quality assurance and quality improvement	Meeting	At least quarterly

*May include simulation sessions.
†Strongly suggested, but not required.

What are some solutions?

What works? A lot…

Curriculum Development and Evaluation of a Hemodynamic Critical Care Ultrasound: A Systematic Review of the Literature

Hussein D. Kanji, MD, MSc, MPH[a,b]; Jessica L. McCallum, BSc[b]; Kapil M. Bhagirath, MD, FASE[b]; Andrew S. Neitzel, MD, MSc[a,b]

- Review of 15 studies
- High variability among programs
  - Some combination of theory and hands-on instruction in almost all
  - Short/intense workshops vs. longitudinal instruction
  - Techniques: Formal didactics, web-based instruction, bedside scanning, live models/simulation
- Consensus that learners gain skill ~30-50 scans
- 'Hands-on' time ranged from 3-15 hours (more seems better)
  - This is a crucial element

Hands-On Learning is Essential

- Image acquisition is a critical skill (and can be challenging)
  - Probe/patient manipulation
  - Image optimization
  - Facility with equipment
- Numerous opportunities
  - Live scanning on patients
  - Scanning on live models
  - Simulation

Simulation is Effective

The Use of Computerised Simulators for Training of Transthoracic and Transoesophageal Echocardiography. The Future of Echocardiographic Training?

David Gerard Platts, FRACP[a,b,*], Julie Humphries, FRACP[a], Darryl John Burstow, FRACP[a,b], Benita Anderson, M Anest Sc[a,c], Tom Forshaw, M Cardiac Ultrasound[d]

Comparison of the didactic lecture with the simulation/model approach for the teaching of a novel perioperative ultrasound curriculum to anesthesiology residents☆

Davinder Ramsingh MD (Assistant Professor)[a,*], Brenton Alexander BS (Medical Student II)[a], Khanhvan Le BA (Research Assistant)[a], Wendell Williams MD (PGY-4 Resident)[a], Cecilia Canales MPH (Director of Operations, Simulation Center)[a], Maxime Cannesson MD, PhD (Professor of Anesthesiology)[a]

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Utility of a Transesophageal Echocardiographic Simulator as a Teaching Tool

Ruma R. Bose, MD,*† Robina Matyal, MD,*† Haider J. Warraich, MD,*† John Summers, MD,† Balachundher Subramaniam, MD,*† John Mitchell, MD,*† Peter J. Panzica, MD,*† Sajid Shahul, MD,*† and Feroze Mahmood, MD*†

Web-Based Instruction

A Comparison of Web-Based with Traditional Classroom-Based Training of Lung Ultrasound for the Exclusion of Pneumothorax

Thomas Edrich, MD,* Matthias Stopfkuchen-Evans, MD,* Patrick Scheiermann, MD, PhD,† Markus Heim, MD,‡ Wilma Chan, MD,§ Michael B. Stone, MD,‖ Daniel Dankl, MD,‖ Jonathan Aichner,¶ Dominik Hinzmann, MD,‡ Pingping Song, MD,* Ashley L. Szabo, MD,* Gyorgy Frendl, MD, PhD,* Kamen Vlassakov, MD,* and Dirk Varelmann, MD*

Comparison of Web-Versus Classroom-Based Basic Ultrasonographic and EFAST Training in 2 European Hospitals

Elke Platz, MD, RDMS, Katja Goldflam, MD, Maria Mennicke, MD, Emilio Parisini, PhD, Michael Christ, MD, PhD, Christian Hohenstein, MD

From the Department of Emergency Medicine, Brigham and Women's Hospital, Boston, MA (Platz, Goldflam, Mennicke); the Harvard School of Public Health, Boston, MA (Platz, Parisini); the Department of Emergency Medicine, Klinikum Nürnberg, Nürnberg, Germany (Christ); and the Department of Anesthesiology, Klinikum Kempten Oberallgäu, Kempten, Germany (Hohenstein).

Web-Based Instruction – Practical Considerations

- What do you need to make a video?
  - Some software (<$100)
  - A decent microphone ($100-200)
  - A good talk (the hardest part)
  - Some time to learn the software, edit and optimize the video
- Good resources are already available online
- Curriculum development is a great project for fellows/junior faculty
- Once developed, can be deployed in numerous ways
  - Use from year-to-year
  - Inclusion in resident/student educational materials
  - Can aid with faculty development

Use It or Lose It

Internal Medicine Residents' Retention of Knowledge and Skills in Bedside Ultrasound

James A. Town, MD
Paul A. Bergl, MD
Akhil Narang, MD
John F. McConville, MD

SPECIAL ARTICLES

Retention of Ultrasound Skills and Training in "Point-of-Care" Cardiac Ultrasound

Bruce J. Kimura, MD, Sean M. Sliman, DO, MPH, Jill Waalen, MD, MPH, Stan A. Amundson, MD, and David J. Shaw, MD, *San Diego, California*

Evolution of a Program

Education

- Limited, basic lectures
- Occasional scanning sessions
- Limited expectations and assessment targeting basic proficiency

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- Formalized curriculum
- Routine scanning, image review, reporting
- Case logs and assessment for proficiency
- Ability to help learners achieve advanced proficiency
- Prepares fellows for credentialing requirements

Clinical Program

- A few faculty champions/early adopters
- Intermittent, inconsistent use
- Minimal QA, IT integration

Faculty development

Outreach to administrative leadership

Establish US leadership and infrastructure

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- Deep integration into routine clinical practice for majority of faculty
- Faculty credentialing
- QA/QI processes, standardized practice
- Robust IT integration with image archival, reporting
- Research/academic output

Bridging the Divide

- Cultivate the US champions
  - Advocate for faculty development!
- Intensive courses can be really effective
- Establish regular US teaching sessions
  - Journal club, didactics, fellow-led case conference, bedside scanning, image review
- Collaborate locally (leverage other educators)
  - Core residency program
  - Other anesthesia fellowships
  - Non-anesthesia fellowship programs
  - Regional peers
- Don't reinvent the wheel
  - Excellent web-based resources, hands-on workshops
- Establish clear expectations for proficiency
  - Case logs
  - Integration into clinical practice

Proficiency vs. Growth – The Advanced Learner

Help them help you:

- QI/QA process development
- Individual QI projects
- Educational program development
  - For co-fellows
  - For residents
  - For students
- Mentored research project

Our CCUS Program at UCSF

<u>Established Components:</u>

- 2-day intensive workshop with live models twice yearly
  - 50:50 mix of didactics and hands-on scanning
  - Focus on US basics, cardiac, vascular, lung, abdomen, ICP
  - **Advanced topics: RV and valvular assessment
- Inclusion of US into weekly fellow-led case conferences
- Quarterly US journal club/conferences
- Ultrasound 'attending of the week'
- Optional CCUS elective
  - ED scanning time, formal TTE experience with cardiology…

Our CCUS Program at UCSF

<u>Evolution:</u>

- Expectation of 'shock' exam for all new patients admitted with hypotension within 6 hours of admission by fellow
- Established formal ordering and digital archival capabilities
- Formal QA process with image review by US Director/Faculty

<u>Ongoing work:</u>

- Credentialing
- Billing
- Research projects

Vertical Expansion into the Residency

- 2-hour CCUS workshop for all residents on ICU rotations
  - Focused on the basics of cardiac ultrasound, lung ultrasound, and volume assessment
  - Includes scanning on patients with ICU fellows
- Longitudinal curriculum for CA1/2/3
  - During monthly education days (and embedded within rotations)
  - Includes didactics and hands-on scanning
  - Goal: establish proficiency in periop PoCUS for all residents

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