

ICCUME All Domain recommendations – Montreal, October 14, 2017 10

Domain 1 (Scope)

- 1.1 Goal: The ICC will produce consensus recommendations on “An integrated ultrasound curriculum” for undergraduate medical education (medical school) that will form the foundation for ultrasound as a core clinical competency for all graduates regardless of specialty choice or location of practice.
- 1.2 The integrated ultrasound curriculum for undergraduate medical education will provide the foundation of ultrasound for all medical students, regardless of their location or medical degree.
- 1.3 The integrated ultrasound curriculum for undergraduate medical education can serve as a resource for other healthcare professionals such as nurse practitioners, nurses, physician assistants, and emergency medicine technicians.

Domain 2 (Curricular Objectives – Why to Teach)

- 2.1 The integrated ultrasound curriculum will support medical student education globally, based on standards of accreditation and the local healthcare needs.
- 2.2 The integrated ultrasound curriculum will facilitate teaching and integration of basic and clinical sciences.
- 2.3 The integrated ultrasound curriculum will enhance the overall educational experience.
- 2.4 The integrated ultrasound curriculum can improve the medical students’ ability to examine, diagnose, and appropriately care for patients.
- 2.5 The ultrasound curriculum will foster competency-based medical education model with milestones, competencies, and entrustable professional activities
- 2.6 To serve the theme of a continuum of medical education and “backwards vision” in which the knowledge and skill necessary for best medical practice are identified and the curriculum is designed to develop that knowledge and skill in healthcare providers
- 2.7 To assure learners’ competency in relation to the appropriateness, safety, and feasibility of ultrasound as it will be commonly used throughout medicine in the near future.
- 2.8 It has been shown that medical students can learn basic ultrasound relatively quickly and well.

2.9 Ultrasound fits well into a competency-based approach to medical education.

Or

Domain 2 (Curricular Objectives – Why to Teach)

- 2.1 Learning POCUS increases student engagement in studies.
- 2.2 Learning POCUS prepares students for POCUS use in future clinical work.
- 2.3 Learning POCUS improves students' physical examination skills.
- 2.4 Learning POCUS makes students more confident residents.
- 2.5 Learning POCUS improves test scores in anatomy.
- 2.6 Learning POCUS improves test scores in physiology.
- 2.7 Learning POCUS encourages students to choose certain types of residencies.
- 2.8 Learning POCUS improves success in medical school.

Domain 3 (Curriculum Criteria)

- 3.1 The ultrasound curriculum forms the foundation for ultrasound training along a continuum of medical education from undergraduate through graduate to continuing medical education.
- 3.2 The ultrasound curriculum supports undergraduate medical education and prepares learners for any additional clinical training and/or practice opportunities they wish to pursue.
- 3.3 The ultrasound curriculum is developed in accordance with accepted standards for medical education as defined by national and international accrediting bodies.
- 3.4 The ultrasound curriculum is a competency-based model that includes measurable outcomes and markers of progression toward those outcomes (milestones); and incorporates ultrasound knowledge, skills, attitudes, and professional judgment into entrustable professional activities (EPAs) as appropriate for patient care.
- 3.5 The ultrasound curriculum enhances the learning of basic sciences that are relevant to

the understanding of human pathophysiology and the practice of medicine.

3.6 The ultrasound curriculum enhances the learning of clinical sciences through the integration of ultrasound into clinical problem solving and the care of patients at their point of care.

3.7 The ultrasound curriculum includes opportunities for self-directed learning and assessment, and encourages life-long learning.

3.8 The ultrasound curriculum is based on evidence and expert opinion, and is consistent with recommendations and guidelines of well-established specialty organizations and regulatory bodies with significant experience in ultrasound.

Domain 4 (Curricular Content – What to Teach)

4.1 An ultrasound curriculum should assure that learners understand fundamental ultrasound principles and instrumentation, demonstrate safe and appropriate use of ultrasound equipment, explain the basis of common ultrasound artifacts, and describe the technical aspects of optimizing ultrasound images.

4.2 Basic scientists and clinicians should collaborate to assure that relevant content within and across the foundational and clinical sciences is delivered at the optimal time within the broader curriculum. The ultrasound curriculum should encompass all organ systems, a continuum of patient populations and clinical scenarios.

4.3 Ultrasound education should be integrated with physical diagnosis training. Ultrasound provides immediate verification and feedback to learners. Ultrasound teaches students how to flexibly augment the classical physical examination with point-of-care imaging. An ultrasound curriculum should include evidence based measures of utility as it relates to the teaching, learning and performance of an ultrasound enhanced physical examination with inclusion of data that incorporates sensitivity, specificity, and likelihood ratios relevant to evidence based practice.

4.4 An ultrasound curriculum should address issues of: standards of competence, adherence to regulatory standards, licensure, relevance of contextualized clinical findings (incidental findings), medico legal documentation, patient and peer communication and the practices of informed consent)

4.5 Curricular content must necessarily be individualized based on unique needs of trainees and/or populations served, available resources, and to accommodate changes in educational and clinical practice. Whenever possible, such changes should be guided by validated criteria.

Appendix

Appendix 1: Recommended Curriculum Inclusions, P1D4.1

1. Foundational basics of mechanics of sound waves.
2. Probe mechanical properties, strengths and limitations of various probes
3. Parts of the probe and cardinal probe movements
4. Appropriate understanding and use of sonographic terminology
5. Major parameters of spatial, temporal and grayscale resolution and their affect on image quality
6. Compare and contrast continuous and pulsed Ultrasound applications
7. Speed of sound in various bio-tissues and air
8. Phasing, steering and focusing of sound waves, near and far field
9. Compare and contrast major forms of attenuation, absorption, reflection, scatter
10. Discuss the through transmission and refraction of sound
11. Compare and contrast the Spectral, Power and Color Doppler
12. Appropriate use of B-mode and M-modes
13. ALARA principles and risks of ultrasound in terms of heat dissipation, cavitation
14. 10 most commonly seen artifacts (and all artifacts associated with curricular content)
15. Knobology effectiveness with institutionally available machines (gain, depth, TGC, On/off, focal position/number, Save, Freeze,
16. Ability to properly set up and enter patient data and label/save archive images appropriately for medical legal requirements and patient safety
17. Ability to properly care for, maintain and clean probes
18. Ability to recognize common forms of malfunctioning systems and damaged probes
19. Ability to measure 3 axis of an object as well as circumference
20. Recognize the sonotextures of basic tissues, tendon, muscle, nerve, fat, fluid, air, bone cartilage, ligament, organs
21. Ability to evaluate what needs adjusted/can be adjusted when an image is clinically substandard

Appendix 2: System ultrasound scanning examples, P1D4.2

1. **Cardiovascular system:** (Sonographic anatomy; anatomic and functional assessment of normal and abnormal valves, cardiac cycle (including correlates with ECG), normal and abnormal wall motion, PLAX, Subcostal, PSAX, Apical 4 chamber, qualitative and quantitative measures of cardiac output, Cardiac axis, Cardiac malformation, Aortic dissection, Pulmonary embolism, sonographic assessment of intravascular volume, pericardial effusion and cardiac

- tamponade; assessment of chamber enlargement and hypertrophy; peripheral IV and arterial line placement
2. **Respiratory system:** Rib counting and evaluation, normal lung sliding, sliding curtain sign, interstitial/lobar assessments, pathology of pneumothorax, hemothorax, intubation placement, M-mode, Thoracic cage anatomy
 3. **Gastrointestinal system:** Liver, Gallbladder/biliary tract, portal system, IVC, Hepatorenal and splenorenal pouch, Free abdominal fluid, pancreas, spleen, kidney, aortic aneurism, Liver and spleen measurements, pathology of region, appendicitis; abdominal vasculature
 4. **Endocrine system:** Thyroid, adrenal glands, Cervical anatomy
 5. **Nervous system:** Peripheral nerves, ulnar, radial, median, sciatic, femoral, brachial plexus
 6. **Reproductive system:** uterus, prostate, breast, ovaries, developmental defects, testicles, inguinal hernia, transvaginal scanning, fetal lie, BPD, femoral length, placental position, crown-rump length, gestational sac
 7. **Musculoskeletal system/small parts:** Shoulder, Knee, Wrist, nerves, bones, tendon, ligaments, scrotal evaluation
 8. **Genito-urinary system:** Bladder, Kidneys (including obstruction/stones), prostate
 9. **Vascular system:** peripheral venous and arterial vasculature, central venous and arterial vasculature, DVT evaluation, vascular injury and anomaly evaluation
 10. **Procedures:** US-guided thoracentesis, peripheral, central and arterial line placement, paracentesis, pericardiocentesis, joint aspiration, joint injection. Nerve, muscle, tendon injection.
 11. **Other:** eyes,

Appendix 3: Assessment components, P1D4.5

1. Knowledge based questions on machine operation, image idealization and physics of ultrasound.
2. Principles of safety and risk assessment
3. Ultrasound images and their sonographic descriptions
4. Reporting on sonographic anatomy or physiological properties as demonstrated by ultrasound images and clips
5. Interpretations of ultrasound studies as they would relate to the patient management or intervention
6. Interpretations of ultrasound image in conjunction with clinical presentations
7. Well formulated clinical scenarios integrating the foundational sciences knowledge, treatment plans or

8. Objectively Structures Clinical Exams (OSCE's) expecting students to generate clinically relevant and appropriate images based on patient scenarios or presentatons
9. Spatial interpretation and rotations images assuring students understanding of probe handling and regional sonoanatomy of clinically relevant images.