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.

Considering the overlap in medical student educational content and skill with that of other healthcare professionals as set by their accrediting bodies such as nurse practitioners, nurses, physician assistants, mid-wives, dentists, and emergency medicine technicians an integrated ultrasound curriculum for medical students should prove to be a valuable and appropriate resource for the education of these other healthcare professional as well. (supported by standards of medical students (LCME), NP, Nurse, PA, EMT).

Considering the overlap in clinical responsibilities of physicians and these other healthcare professionals and the need to increase patient access to technology that improves patient care and patient safety, various clinical ultrasound applications in an integrated ultrasound curriculum for medical students would be appropriate for adoption into the curriculum of these other healthcare professionals. (supported by standards).
It has been demonstrated that non-physician providers such as nurse practitioners, nurses, physician assistants, and emergency medicine technicians can learn and competently use ultrasound in the clinical setting (Ref X).

With a common clinical skill like ultrasound, having a variety of health professionals involved in the care of the patient trained with a similar basic curriculum and even inter-professional training, will likely enhance the communication among members of the healthcare team, improve the coordination and continuity of care, and ultimately results in better patient care. In addition, the Liaison Committee on Medical Education (LCME), the accrediting body of all allopathic medical schools in the United States and Canada through its Standards for Accreditation encourages development of inter-professional collaborative skills and requires that “medical students have opportunities to learn in academic environments that permit interaction with students enrolled in other health professions” (Ref Y).
<table>
<thead>
<tr>
<th>Reference# PMID (linked to article)</th>
<th>Title</th>
<th>Article Summary</th>
<th>Graded for Level of Evidence (L. Melniker to complete)</th>
<th>Tied to Recommendations (list all)</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Ref X PMID: 26945396 | Accuracy of nurse-performed lung ultrasound in patients with acute dyspnea | • Prospective Observational Study  
• Aims: assess accuracy of nurse-performed LUS in dx of cardiogenic dyspnea with secondary aim to assess accuracy of combining LUS and BNP  
• Population: 5 IM nurses; study population- 226 consecutive ED patients with dyspnea and plans for admission  
• LUS training: 4 wk course = 8 hrs lectures, 20 hrs practice on live models, 4 hrs chest US image review  
• Nurses performed LUS blinded to history, other clinical assessment, and treatment – made determination of cardiogenic dyspnea based on bilateral B-lines in two or more areas and lack of other significant LUS findings such as consolidation  
• Reference comparison was final assessment of two physicians using all available data except LUS finding – Hx, PE, labs, imaging other than LUS, clinical course – if disagreement a 3rd physician adjudicated the case  
• Outcomes: physician identified cases of cardiogenic dyspnea = 107 with nurses-performed LUS diagnosis showing a sensitivity of 95.3%, specificity of 88.2%, positive predictive value of 87.9%, negative predictive value of 95.5%; adding BNP results increased sensitivity to 98.9%, negative predictive value to 98.8%, and gave a negative likelihood ratio of 0.01  
• Conclusions: nurse-performed LUS has a good accuracy for cardiogenic dyspnea and combining LUS with BNP would be a useful rule-out combination  
• Limitations: observational study, small number of learners at a single site, no information on how nurses were selected, patient population was already set for admission so represented more severe cases of dyspnea and heart failure, LUS was the only US application assessed and is relatively easy to learn  
• Relevant points: nurses learned and successfully applied an important clinical ultrasound application that will likely be one of the core applications in medical curricula | ? | P1D1.3 others |
| Ref Y | LCME Functions and Structure of a Medical School – Standards for Accreditation of Medical Education Programs Leading to the MD Degree | • Official Accreditation Standards  
• Provides guidance and standards for conducting medical student education and for preparation of Accreditation Evaluations  
• Pertains to all allopathic medical schools in USA and Canada  
• Encourages development of inter-professional collaborative skills and requires opportunities for medical students to interact with students in other health professions  
• Relevant points: inter-professional training in ultrasound would be consistent with the LCME standards and can present additional opportunities for inter-professional training and development of inter-professional communication skills | ? | P1D1.3 | others |
<table>
<thead>
<tr>
<th>Reference# PMID (linked to article)</th>
<th>Title</th>
<th>Article Summary</th>
<th>Graded for Level of Evidence (L. Melniker to complete)</th>
<th>Tied to Recommendations (list all)</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 25319403 | The integrated curriculum in medical education: AMEE Guide No. 96 | - Extensive review of the literature  
- Assist educators in the design, implementation, and evaluation of an integrated medical school curriculum and propose a clarified definition of “integrated curriculum”  
- Pertains to all medical schools globally with 4-6 year curricula  
- Interest in “integrated curriculum” has grown tremendously in the past two decades. There is presently no uniform definition of integrated curriculum. A number of major accrediting bodies encourage and even require that the curriculum be integrated (Liaison Committee on Medical Education- USA, The General Medical Council – UK, Association of Faculties of Medicine of Canada, Australian Medical Council, Inquiry on Medical Education in Sweden. There is a “scarcity” of published long-term effectiveness of integrated curricular. Outcome trials that do exist “often show at least non-inferiority if not objective benefits for the learner in an integrated setting.” Authors suggest the ideal integration model may be the spiral model in which the basic and clinical sciences are continually integrated throughout medical school. Knowledge, skills, and attitudes are a focus at all levels of the spiral. The spiral model offers solutions to three frequent shortcomings of many integrated programs: ensuring synchronous presentation of material, avoiding the tendency to diminish the importance of basic sciences, and using unified definitions.  
- Proposed definition: an integrated curriculum is a fully synchronous transdisciplinary delivery of information between foundational sciences (basic sciences) and applied sciences (clinical sciences) throughout all years of a medical curriculum.  
- Relevant to ICCUME – all listed conclusions above | | | | |