The Integrated Ultrasound Curriculum
Initiated 2006

First (M1) and Second (M2) Year Medical Students

- Didactic classroom lectures
- Web-based learning modules
- Scheduled hands-on laboratory scanning sessions
- Open ultrasound laboratory practice sessions
- Integration of ultrasound into gross anatomy, physiology, and physical diagnosis.
Longitudinal Scan (Upper)
M1 Student Practical Exam Fall Semester

- All first year students are individually evaluated for their ability to scan a standardized patient. They were also evaluated by an observer regarding their interaction with the standardized patient and attentiveness to patient comfort and modesty.

- Each student had 15 minutes to capture, identify structures and save the images.
<table>
<thead>
<tr>
<th>Images</th>
<th>RUQ</th>
<th>Pelvis</th>
<th>LUQ</th>
<th>Neck</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt Kidney</td>
<td>Bladder</td>
<td>Lt Kidney</td>
<td>Carotid Artery</td>
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<tr>
<td>Liver</td>
<td>Spleen</td>
<td>Lt Ventricle</td>
<td>Internal Jugular Vein</td>
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<tr>
<td>Diaphragm</td>
<td>M. pouch</td>
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**Parasternal Long Axis Heart**

- Lt Atrium
- Lt Ventricle
- Mitral valve
Results of M1 Practical

- All students easily completed the exercise within the allotted time of 15 minutes.

- Maximum possible score for the OSCE = 50 points

- Mean score for the class = 49.1 points

- Range for the class = 39.0 - 50.0 points

- Students with a perfect score of 50.0 = 65 (78%)
Physiology Ultrasound Labs

- Three ultrasound labs have been integrated into the physiology course for M1 students

- **Cardiac lab**: normal heart function (4-chamber apical view). Wall and valve motion; flow through the cardiac chambers

- **Hemodynamics lab**: doppler principles, pulse wave forms (venous / arterial systems)

- **Cardiogenic Shock**: gross LV/RV function, pericardial effusion, RV strain from a PE
M2 Ultrasound Curriculum: Coordinated with Physical Diagnosis and Pathophysiology

• Focused ultrasound examinations, clinical scenarios, and ultrasound guided procedures
  – Cardiac views: parasternal long and short axis, 4-chamber apical, subcostal
  – Abdomen: organ size, abdominal fluid, AAA screen
  – Vascular: DVT screen, IVC and volume status, central line placement
  – Neck: thyroid, carotid, and jugular exam
  – Pelvic ultrasound (female gynecology)
M3 Clerkship OSCEs

- **Internal Medicine:**
  - thyroid scan
  - central line placement with ultrasound guidance

- **Family Medicine:**
  - Abdominal Aortic Aneurysm (AAA) screen

- **OB/GYN:**
  - third trimester pregnancy with bright red vaginal bleeding - transabdominal scan

- **Pediatrics:**
  - Assess volume status of a 9 year old using the aorta / IVC ratio

- **Surgery:**
  - Trauma patient – FAST exam
ICU Ultrasound

• Role for Bedside Ultrasound in the ICU:
  – Quick cardiac exam: global function, pericardial effusion, severe valvular dysfunction
  – Assessment of volume status: IVC, JVD
  – Abdominal bleeding, AAA
  – Pneumothorax
  – Pulmonary embolus (effects on heart, IVC, detect DVT)
  – Pleural effusion
Fourth Year (M4) Students

• Four week Emergency Medicine Ultrasound Elective

• Hands-on ultrasound experience added to Radiology Elective

• Two day Capstone course to prepare for residency: FAST for trauma, RUSH for shock, ultrasound guided procedures

• Ultrasound Independent Study: research, further develop US skills, help with M1/M2 labs
Recent Additions to the Curriculum

- Introduced pocket devices into the curriculum
- Web-based Portal for evaluation and archiving all ultrasound images for students
- Physiology pilot with EKG and Ultrasound
- Heart sounds and ECHO on IM clerkship
Lessons Learned Years 1-4

• Start small – work with course/clerkship directors and identify a limited number of ultrasound objectives for the course/clerkship

• Timing – introduce during M1 orientation

• Open laboratory sessions

• Faculty – must have champions in multiple specialties

• Student feedback – regular and ongoing, it’s their curriculum too
• Student-patient interaction: using patients and standardized patients creates more “clinical time” in the first two years

• Content: do not need to develop all teaching material in-house

• Equipment: try to keep ratios low – students-machines-patients-instructors