Knowledge and Motor Skill Acquisition and Retention after a Multimodal Perioperative Ultrasound Curriculum for Interns

The Problem
- Use of perioperative ultrasound (US) techniques as monitoring and diagnostic tools for patient care is growing
- Lack of structured teaching of perioperative US to residents
- Ideal stage for learning US not determined

Aim/Goal
- Implement a structured, multimodal curriculum in basic perioperative US for anesthesiology interns to allow them to:
  o Develop knowledge and motor skills for US
  o Sustain these gains over 90 days
  o Meet or exceed the performance of seniors

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The Interventions
- Multimodal 13-day basic US course for six interns
- Topics: knobology, US-guided regional anesthesia and vascular access, lung US, transthoracic and transesophageal echocardiography (TEE and TTE), and US in shock
- Teaching modalities: online modules, Apple iBooks (Cupertino, CA), simulators, homemade and live models, and live lectures/discussions

The Results/Progress to Date
- Improved knowledge from start of course to end of course
- End-of-course knowledge similar to follow-up and seniors’ knowledge
- End-of-course TEE and TTE skills similar to follow-up skills and superior to seniors’ skills
- Follow-up knowledge similar to seniors’ knowledge
- Follow-up skills superior to seniors’ skills

Table 1: Knowledge and Skills of Interns and Seniors

<table>
<thead>
<tr>
<th>Element</th>
<th>Metric</th>
<th>Interns at End of Course</th>
<th>Interns at Follow-up</th>
<th>Graduating Seniors</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEE Skills</td>
<td>Path length (cm)</td>
<td>11.70 (4.89-21.03)</td>
<td>8.06 (4.63-12.80)</td>
<td>12.63 (3.99-18.15)</td>
</tr>
<tr>
<td></td>
<td>Probe accelerations (#)</td>
<td>48.5 (26-80.25)</td>
<td>45 (27.52-77.5)</td>
<td>89 (40.5-138.5)</td>
</tr>
<tr>
<td></td>
<td>Total Time (s)</td>
<td>17.24 (13.94-24.71)</td>
<td>14.84 (10.85-23.10)</td>
<td>26.43 (15.59-46.77)</td>
</tr>
<tr>
<td>TTE Skills</td>
<td>Path length (cm)</td>
<td>39.82 (27.64-54.61)</td>
<td>30.30 (18.65-41.21)</td>
<td>117.76 (54.80-160.53)</td>
</tr>
<tr>
<td></td>
<td>Probe accelerations (#)</td>
<td>80.5 (54.5-126)</td>
<td>77 (48-131.5)</td>
<td>553 (266-814)</td>
</tr>
<tr>
<td></td>
<td>Total Time (s)</td>
<td>12.10 (8.70-18.48)</td>
<td>11.40 (8.42-18.16)</td>
<td>64.47 (28.14-90.47)</td>
</tr>
<tr>
<td>Ultrasound Knowledge</td>
<td>Score on Test (%)</td>
<td>72.73 (64.55-75.45)</td>
<td>66.36 (64.09-67.27)</td>
<td>60.91 (51.36-70.45)</td>
</tr>
</tbody>
</table>

Lessons Learned
- Course taught basic perioperative US knowledge and skills to interns
- Gains sustained 90 days after the course
- Intern performance comparable to seniors on knowledge testing and superior to seniors on TEE and TTE skills testing

Next Steps/What Should Happen Next
- Refine teaching materials
- Implement curriculum with new interns
- Explore generalizability of course

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