Enhancing Physical Exam in Medical Students through a Longitudinal Hypothesis-Driven Physical Exam Curriculum

John Cunningham MD, Jennifer E Adams MD

Denver Health Medical Center, University of Colorado SOM, Department of Internal Medicine

Introduction

- Physical exam (PE) teaching has declined and deficiencies in PE performance directly contribute to diagnostic error.
- Barriers to PE education have included a lack of a systematic, longitudinal curriculum.
- Hypothesis-driven physical exam (HDPE) is an alternative method of teaching the PE with focusing on selecting PE maneuvers that alter the post-test probability of disease.

Goals and Objectives

Goals

Utilize HDPE sessions to integrate students’ physical exam into clinical reasoning so students learn to perform the PE in a hypothesis-driven manner.

Objectives

a. Apply a hypothesis-driven approach to the physical exam allowing students to improve their ability to tailor their exam to a chief complaint.
b. Interpret physical exam findings and revise the post-test probabilities of competing diagnoses

Program Description

Third year medical students in the Denver Health Longitudinal Integrated Clerkship attended six HDPE sessions.

HDPE Sessions

**Anticipation**- Facilitator presents a chief complaint and brief history. Students form a differential diagnosis and discuss physical exam maneuvers to perform.

**Assess the learner’s pre-existing knowledge**

**Elicit findings**- Perform exam maneuvers and provide feedback on student technique.

**Assess the learner’s PE skills**

**Interpretation**- Teach evidence-based physical diagnostic to help students utilize exam findings to justify a working diagnosis.

**Debriefing**- Discuss case and impact of PE on diagnosis and treatment.

Program Assessment

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Pretest</th>
<th>Midpoint</th>
<th>p-value</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF (5)</td>
<td>2.7</td>
<td>3.5</td>
<td>0.013</td>
<td>1.31</td>
</tr>
<tr>
<td>CAP (5)</td>
<td>2.5</td>
<td>3.4</td>
<td>1.44</td>
<td>1.56</td>
</tr>
<tr>
<td>COPD (4)</td>
<td>0.7</td>
<td>2.1</td>
<td>0.017</td>
<td>2.33</td>
</tr>
<tr>
<td>Valve disease</td>
<td>1.3</td>
<td>2.8</td>
<td>0.02</td>
<td>0.85</td>
</tr>
<tr>
<td>Neuronal disease</td>
<td>1.3</td>
<td>2.8</td>
<td>0.02</td>
<td>0.85</td>
</tr>
</tbody>
</table>

**Table 2: Anticipation Midpoint comparisons**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>LIC</th>
<th>NAC</th>
<th>p-value</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF (5)</td>
<td>3.7</td>
<td>2.2</td>
<td>0.012</td>
<td>0.53</td>
</tr>
<tr>
<td>CAP (5)</td>
<td>1.4</td>
<td>1.8</td>
<td>0.009</td>
<td>0.53</td>
</tr>
<tr>
<td>COPD (4)</td>
<td>2.1</td>
<td>1.2</td>
<td>0.11</td>
<td>0.53</td>
</tr>
<tr>
<td>Valve disease</td>
<td>2.3</td>
<td>2.4</td>
<td>0.08</td>
<td>0.53</td>
</tr>
<tr>
<td>Neuronal disease</td>
<td>2.8</td>
<td>1.4</td>
<td>0.027</td>
<td>0.53</td>
</tr>
</tbody>
</table>

**Discussion**

- Clerkships provide opportunities for students to practice PE skills, but often without direct observation or dedicated teaching.
- HDPE sessions improved students’ ability to anticipate PE findings associated with common inpatient diagnoses
- Students’ ability to interpret abnormal findings exceeds their ability to independently anticipate expected findings.
- Facilitators observed improved skill in PE maneuvers and selection of a tailored PE approach as sessions progressed
- HDPE sessions improved student knowledge of the diagnostic utility of the PE, and aim to coach students in improving PE technical skill and incorporation of the PE into their clinical reasoning.

**Next Steps:**

- Collect and analyze end of year data
- Expand HDPE sessions and assessment to CUSOM sites beyond the DHLIC