Improving Clinical Reasoning
with Multiple Choice Questions

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Key Points

- What is Clinical Reasoning?
- Medical Knowledge
- Cognitive Ability
- Meta-Cognitive Skill
- Development of Clinical Reasoning
- Clinical Reasoning Strategies
- Confidence Ranking on Exams
- Student Generated MCQs
What is Clinical Reasoning?

- Process used to solve a clinical problem
  - searching & finding necessary clues
  - hypothesis generation
  - testing hypotheses to diagnose
  - selection of an appropriate treatment method
What is Clinical Reasoning?

- Core elements of clinical reasoning
  - Medical knowledge
  - Cognitive ability
  - Meta-cognitive skill
Medical Knowledge

- Quantity of medical knowledge does not determine clinical reasoning competency
- Novices can be aware of textbook knowledge necessary to solve clinical problems, but lack utilization of knowledge due to rudimentary knowledge structure
- Textbook knowledge increases in residency training, stabilizes in early postgraduate years, peaks during house appointments and falls to the same level as first-year clinical students during consultant years.

  — Grant & Marsden, 1988
Cognitive Ability

- Core element of the clinical reasoning process
- Determined by organization of knowledge
- Formed by encounters with clinical problems
- Develops continuously over the career of physician
- Experts’ knowledge is organized into rich & tight knowledge network by encountering lots of clinical problems in the domain

– Norman, 2005
Meta-Cognitive Skills

- The monitoring of the thinking process
- Necessary for the management of cognitive skills
- During clinical reasoning, individual medical knowledge and cognitive abilities are integrated by observing the connects and inconsistencies between them.
Development of Clinical Reasoning

- **Novices:** gather unnecessary detail, overemphasize rare pathologic situation and lack the awareness necessary to discern which information is pertinent to solving clinical problems

- **Intermediates:** seek explanation the current clinical situation, using a causal model of reasoning; lack of self-confidence results in seeking additional evidence and support, slowing their reasoning process

- **Experts:** reasoning process is unconscious and automatic resulting in a faster solution to the clinical problem
Current Research Incorporating MCQs

- Clinical Reasoning Strategies (IM residents)
- Confidence Ranking (dental students)
- Student Generated MCQs (pharmacy students)
Exploring Clinical Reasoning Strategies

- 6 clinical vignette style multiple choice questions
- 12 Internal Medicine interns
- Comparison based on Step 2 CK Score

<table>
<thead>
<tr>
<th>Strategies</th>
<th>High CK Score</th>
<th>Moderate CK Score</th>
<th>Low CK Score</th>
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<tbody>
<tr>
<td>Reaching closure prematurely</td>
<td>0</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Admitting knowledge deficits</td>
<td>58</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Applying faulty knowledge</td>
<td>8</td>
<td>28</td>
<td>46</td>
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<tr>
<td>Ruling out alternatives</td>
<td>92</td>
<td>69</td>
<td>17</td>
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</tbody>
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– Heist, Gonzalo, Durning, Torre & Elnicki, 2014
Exploring Clinical Reasoning Strategies

- Findings (high score VS low score)
  - Ruled out alternatives: **92%** vs **17%** of questions
  - Admitted knowledge deficits **58%** vs **13%** of questions
  - Demonstrated premature closure **0%** vs **25%** of questions
  - Applied faulty knowledge **8%** vs **46%** of questions

- Conclusion
  - Authors hypothesized that premature closure & failure to admit knowledge deficits could relate to over confidence
Including Confidence Ranking on Exams

- 104 3rd year dental students (implant dentistry)
- 20 MCQ exam based on clinical scenarios
- Faculty designated distractors as benign, inappropriate, or harmful
- Students selected best possible answer & indicated ‘confident’ or ‘not confident’

<table>
<thead>
<tr>
<th>Incorrect Responses</th>
<th>Benign</th>
<th>Inappropriate</th>
<th>Harmful</th>
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<tbody>
<tr>
<td>Incorrect &amp; Confident (misinformed) 22%</td>
<td>1%</td>
<td>17%</td>
<td>4%</td>
</tr>
<tr>
<td>Incorrect &amp; Not Confident (uninformed) 8%</td>
<td>1%</td>
<td>5%</td>
<td>2%</td>
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– Curtis, Lind, Boscardin & Dellinges, 2013
Including Confidence Ranking on Exams

- Findings:
  Student confidence did not decrease as the potential harm of answers increased

- Conclusion:
  Important for learning potential & remediation strategies
  - Uninformed students requires additional knowledge
  - Misinformed students often strongly believe in incorrect information and may be resistant to change
Employing Student Generated MCQs

- 165 2nd year Pharmacy students
- Develop patient case scenario; create 2 therapeutic based MCQ with 4 answer options with explanations
- Faculty assess structure & content
- Provide all questions to students as study aid

<table>
<thead>
<tr>
<th>Student perceptions of educational value</th>
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<tbody>
<tr>
<td>79% agree/strongly agree = Improved depth of understanding of curriculum content</td>
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<tr>
<td>86% agree/strongly agree = Assisted in analyzing concepts learned</td>
</tr>
<tr>
<td>74% agree/strongly agree = Assisted in understanding application to patient care</td>
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References


