Comparability of the Comprehensive Clinical Science Exam and Five NBME® Clinical Science Subject Exams

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Issues in Highstakes Measurement
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Longitudinal Integrated Clerkships

- Internationally, medical schools have been implementing novel longitudinal integrated clerkships (LICs)
  http://www.clicmeded.com/

- Many continue traditional discipline-based rotations for majority of students

- Accreditation requires students achieve same academic standards, “assessment must be comparable”
Assessment Drives Learning

• Identical assessment methods ensure students achieve same academic standards (i.e., comparability)

• Discipline-based examinations in LICs can disrupt learning experience
  ◦ Students focus on specific clinical areas for upcoming exams
  ◦ Faculty align clinical experiences to match the assessment plan

• Assessment must align with and support educational experience
Knowledge Assessment

• NBME® subject exams are used in traditional discipline-based clerkships

• Need an exam that assesses clinical science knowledge in an integrated way

• Comprehensive Clinical Sciences Exam (CCSE) designed to prepare students for USMLE Step 2 exam, has been used in LICs
  ◦ Questions drawn from a different bank
  ◦ 5 clinical disciplines - IM, OG, PD, PS, SR
  ◦ Content representation is not equal
  ◦ IM=PD=SR > OG=PS
Context - natural experiment

UBC Year 3 Clerkship 52 weeks
Rotation Sequence Varies
Purpose

To determine the comparability of the CCSE and 5 NBME clinical sciences subject exams.
Methods

• Y3 students in discipline-based rotations (n = 246)
  ◦ 5 NBME, end of each rotation, summative purposes
  ◦ CCSE required, formative purposes (no advanced prep)

• CCSE taken ~ 4 weeks before end of clerkship year

• Consent to use exam performance data

• UBC Behavioural Research Ethics Board approval
Methods (cont.)

- Incentive to increase *recruitment*
  1st random draw for iPAD®

  211 students provided consent
  197 included in study (12 outliers)
Methods (cont.)

• Incentive to *perform well on the CCSE* 2\(^{nd}\) random draw for iPAD\(^{®}\) *if* CCSE performance ≥ NBME AVG

  CCSE z-score - AVG NBME z scores ≥ -0.05 = Matched
  CCSE z-score - AVG NBME z scores < -0.05 = Lower

  107 CCSE performance *Matched* NBME
  90  CCSE performance *Lower* than NBME

197 Total Students in the Study
Analysis

Descriptive statistics, correlations, multiple regression, ANOVA and ANCOVA analyses conducted:

1. 5 NBME subject exams (best)
2. CCSE total score
3. 5 discipline subscale scores CCSE
## Student Exam Performance

<table>
<thead>
<tr>
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<th>Total n=197</th>
<th>Matched n=107</th>
<th>Lower n=90</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXAM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IM</td>
<td>72.0 ± 8.76</td>
<td>72.2 ± 8.56</td>
<td>71.7 ± 9.04</td>
</tr>
<tr>
<td>OG</td>
<td>73.3 ± 7.5</td>
<td>73.0 ± 7.19</td>
<td>73.8 ± 7.87</td>
</tr>
<tr>
<td>PD</td>
<td>76.1 ± 8.26</td>
<td>76.1 ± 8.31</td>
<td>76.0 ± 8.24</td>
</tr>
<tr>
<td>PS</td>
<td>76.9 ± 8.23</td>
<td>77.2 ± 8.92</td>
<td>76.5 ± 7.37</td>
</tr>
<tr>
<td>SR</td>
<td>75.6 ± 8.34</td>
<td>75.5 ± 8.59</td>
<td>75.7 ± 8.07</td>
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<tr>
<td>NBME AVG</td>
<td>74.8 ± 6.70</td>
<td>74.8 ± 6.61</td>
<td>74.7 ± 6.85</td>
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<tr>
<td>CCSE</td>
<td>73.6 ± 8.69</td>
<td>77.4 ± 7.93*</td>
<td>69.2 ± 7.38</td>
</tr>
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* p<0.01
CCSE vs NBME AVG

<table>
<thead>
<tr>
<th>Group</th>
<th>r</th>
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<tbody>
<tr>
<td>Total</td>
<td>0.81</td>
</tr>
<tr>
<td>Matched</td>
<td>0.92</td>
</tr>
<tr>
<td>Lower</td>
<td>0.90</td>
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To what extent do the 5 NBME exams predict performance on the CCSE?

<table>
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<tr>
<th>Regression Analysis 5 Subject Exams and the CCSE R²</th>
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<tbody>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Matched</td>
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<tr>
<td>Lower</td>
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Does rotation order affect performance in the CCSE discipline subscale?

• ANOVA conducted for the 5 disciplines to determine if proximity of rotation to taking CCSE was associated with higher performance in CCSE subscale

• No significant effect of rotation order on performance in CCSE subscale in that discipline, in any group
Does NBME subject exam performance and/or rotation order predict performance in the CCSE discipline subscale?

• ANCOVA

• Each NBME subject exam explained variance in CCSE subscale score in that discipline (p<0.001 with a large effect size) in both groups

• Rotation sequence had virtually no effect in predicting performance in a CCSE subscale score
Summary of Results

1. Performance on the 5 NBME subject exams explained nearly all of the variance in CCSE performance.
2. Correlation between the NBME AVG and CCSE was 0.9 when analyzed to control for potential differences in student effort.
3. NBME subject exam performance significantly predicted performance in that discipline on the CCSE.
Conclusion

• CCSE and 5 NBME® clinical science subject exams measure similar constructs providing evidence that they are comparable
• CCSE can be used to ensure that LIC students achieve the same academic standards in the 5 clinical disciplines represented in NBME exams
• Further research is needed to determine the generalizability of the findings
So What?

• LIC’s using the CCSE can feel confident that students are achieving the same standard

• CCSE can be used in rotation-based clerkships

• Provides a broader definition of competence

• Cost may be a consideration
Thank you

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