Do the National Board of Medical Examiners (NBME) subject examinations predict success on the MCCQE Part I?

Author: Dr. Carolina Escudero
Date: September 24, 2011
Introduction

• Evaluation of medical students is an important but challenging process

• Essential to identify students who are not meeting the requisite minimum level of knowledge and clinical competence

• Many different tools have been used in the evaluation process

  • several tools shown to be poor at identifying students who are below average (Colleti, 2000; Speer et al., 2000)
Introduction

• National Board of Medical Examiners (NBME) subject examinations
  • Discipline-based, standardized multiple choice tests
  • Provide normally distributed scores and have correlated with overall clerkship performance (Nahum, 2004)
  • Security of the examination
  • Widely used in clerkship evaluation
    - In 2001, 67% of medical schools in Canada and US used the NBME subject examination in pediatrics (Kumar et al., 2004)
Introduction

• NBME subject examinations are available in the following 6 subjects:
  • Pediatrics
  • Internal medicine
  • Surgery
  • Obstetrics/gynecology
  • Psychiatry
  • Family Medicine

• Memorial University uses 5 NBME examinations to evaluate students during their clerkship rotations
NBME subject examination use by English-speaking Canadian medical schools

* From personal correspondence in April, 2011
NBME and Licensing Examinations

• NBME exams correlate well with scores on the USMLE Step 2
  • Correlations ranging from $r = 0.53 - 0.74$ (Ripkey et al., 1999; Myles et al., 2002)
  • Suggested that low scores on the NBME could predict students at risk for low scores on the USMLE Step 2

• Canadian licensing examination (MCCQE Part I)
  • No previously published research on using the NBME to predict MCCQE Part I performance despite wide uptake in Canada
Purpose

• To compare Memorial University medical students’ scores on the NBME subject examinations to their scores on the MCCQE Part I

• To help determine if NBME scores can identify students at risk of MCCQE Part I failure
Methods

• Obtained NBME scores from 4 academic years
• Total MCCQE Part I, MCQ, CDM, and discipline-specific MCQ scores collected
• To be involved in the analysis, NBME and the MCCQE scores were required
• Only the results of the first attempt for each examination were included
• Pearson’s correlation, chi square, and ROC analysis were performed
Confidentiality

- Student names and randomly generated numerical identifiers sent to the Medical Council of Canada (MCC)
- MCC matched MCCQE Part I scores to name and numerical code
- Student names removed and the remainder sent to the Canadian Post-MD Education Registry (CAPER)
- List of identifying numbers and NBME scores sent to CAPER
- CAPER matched the MCCQE Part I scores and the NBME scores
- After matching, the numerical codes were removed and the de-identified list was sent to the authors
- Student confidentiality was ensured as reverse de-identification could not be performed
Results

• 224 student scores were analyzed

• Mean NBME scores:
  • Pediatrics: 73.8 (SD 7.0)
  • Internal Medicine: 75.9 (SD 6.7)
  • Surgery: 70.9 (SD 7.5)
  • Obstetrics/Gynecology: 73.6 (SD 6.6)
  • Psychiatry: 78.0 (SD 7.0)

• Mean MCCQE Part 1 score: 522.8 (SD 63)
Results

• Correlations between the examinations
  • NBME exams and total MCCQE Part I score (r=0.519-0.613, p=0.000)
  • NBME exams and the MCCQE part I MCQ score (r=0.506-0.605, p=0.000)
    - Similar to those reported between the NBME exams and the USMLE Part II (0.53-0.74)
  • NBME exams and their respective subject-specific MCQ scores (r=0.333-0.489, p=0.000)
Results

- 6 students failed the MCCQE Part 1
  - 3 passed all of the NBME exams
  - 3 failed 2 or more examinations
- 12 students failed at least one NBME examination (score <60)
  - 25% of these students failed the MCCQE Part 1
    - 1 NBME exam failed: 0%
    - 2 or more NBME exams failed: 75%
- Failing at least 1 NBME exam gives an odds ratio of failing the MCCQE Part I of 23.2 (95% CI = 4.1-131.5)
Results

• ROC Analysis

  • To determine the sensitivity and specificity of NBME threshold scores in predicting MCCQE Part 1 failure
ROC Curve Comparing Average NBME Score to MCCQE Part 1 Performance
ROC Curve Comparing Average NBME Score to MCCQE Part 1 Performance

Average NBME score of $\leq 70$ gives 100% sensitivity and 76% specificity
gives 83% sensitivity and 83%

Average NBME score of $\leq 68$ gives 67% sensitivity and 90% specificity
<table>
<thead>
<tr>
<th>NBME Exam</th>
<th>Area under the Curve</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Average</td>
<td>0.922</td>
<td>0.000</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>0.932</td>
<td>0.000</td>
</tr>
<tr>
<td>Internal Med.</td>
<td>0.898</td>
<td>0.001</td>
</tr>
<tr>
<td>Surgery</td>
<td>0.886</td>
<td>0.001</td>
</tr>
<tr>
<td>Obs/Gyne</td>
<td>0.830</td>
<td>0.006</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>0.819</td>
<td>0.008</td>
</tr>
</tbody>
</table>
Results

- ROC Analysis for average NBME score
  - Average NBME score of <70 is a good predictor of students at risk of MCCQE Part 1 failure

- Students with an average NBME score <70 are significantly more likely to fail the MCCQE Part 1 ($\chi^2 = 19.9$, $p = 0.000$)
Overall Findings

• NBME subject examinations show moderate correlations with MCCQE Part I scores

• Failure of at least one of the NBME subject examinations is associated with an increased risk of MCCQE Part I failure

• When looking at the average score on the NBME examinations, a cut-off score of <70 gives a good sensitivity and specificity for identifying students at increased risk of MCCQE Part I failure
Study Limitations

- Results from only one medical school
- Were not able to correct for the time at which students wrote the examination during their clerkship year
  - Studies show improvement in scores when NBME written later in the clerkship year (Reteguiz \textit{et al}, 2002; Manley \textit{et al}, 2006)
- Failure of either the NBME subject examinations or the MCCQE Part I is an uncommon event
  - Small number of students who failed the MCCQE Part I, it is difficult to draw firm conclusions from these results
Acknowledgements

• Dr. Anne Drover (Memorial University)
• Medical Council of Canada (Dr. Tim Wood)
• CAPER
References


Questions?
<table>
<thead>
<tr>
<th>NBME Exam</th>
<th>Cut-off for 83% Sensitivity</th>
<th>Associated Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Average</td>
<td>≤69</td>
<td>83%</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>&lt;65</td>
<td>93%</td>
</tr>
<tr>
<td>Internal Med.</td>
<td>&lt;71</td>
<td>78%</td>
</tr>
<tr>
<td>Surgery</td>
<td>&lt;66</td>
<td>78%</td>
</tr>
<tr>
<td>Obs/Gyne</td>
<td>&lt;70</td>
<td>73%</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>&lt;78</td>
<td>55%</td>
</tr>
</tbody>
</table>