Teaching Evidence-Based Medicine to Large Classes of Undergraduate Medical Students: Team-Based Learning versus Small Group Discussions

A Randomized Controlled Trial

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• AUB-FM → New medical curriculum (Impact)

• EBM instruction: from 1\textsuperscript{st} to 4\textsuperscript{th} year

• Challenge:
  • Preclinical classes: 100-120 students/class
  • Only 7 instructors
Background

- Variable instructor availability
- Instruction format:
  - Small group discussions (SGD): 11-15 students/group; ≥3 instructors
  - Team-based learning (TBL): 1-2 instructors
- Evidence of teaching effectiveness ??
Educational QI-PIC

- P: Preclinical medical students (1st yr)
- I: Teaching CA in TBL format
- C: Teaching CA in SGD format
- O: Score on Berlin Questionnaire-Set B
- S: RCT (Current Controlled Trials ISRCT N1543 0424)
Methods

• April 2018-May 2019
• All 1st-year medical students (N=108)
• 7 EBM instructors (Anesthesiology, IM, Pediatrics, Pharmacology, Surgery)
• Random allocation (computer-generated permuted block randomization)
  • 2 Groups: TBL or SGD
• Allocation concealed until 1st day of the course
Methods

• Groups assigned same reading material
• TBL: Standard TBL instruction format
  • IRAT, GRAT, Application exercise
• SGD:
  • Active discussion with the instructor
  • Random allocation of instructors to groups
Methods

• 1ry outcome: Student’s score on the Berlin Questionnaire (end of 2nd yr)

• Sample size:
  • All 1st-yr students (N=108)
  • 80% power, 5% alpha level
  • Diff. in mean Berlin questionnaire scores = 0.55 SD
Data

- Age, gender
- Medical College Admission Test (MCAT) score
- Rank at admission to medical school (in tertiles)
- Grade on the Epi/Biostat course
- Pooled grade average of 1st yr (excluding Epi/Biostat)
- Self-reported preferred teaching method (TBL vs. GD)
Results
Enrolled

Year 1 pre-clinical medical students in 2018 (n=108)

Randomized (n=108)

Team-based learning (n=52)
Group discussions (n=56)

1 Week before each CA session

Session learning objectives
Student instructions
Reading of CA chapter
Reading of assigned paper

Session learning objectives
Student instructions
Reading of CA chapter
Reading of assigned paper
TBL

During CA session

SGD

1 group, 1 tutor

IRAT
GRAT
Application exercise
Discussion of controversies with instructor

Analyzed=52

4 groups, 4 tutors

10-minute quiz
Group discussion of paper
Discussion of controversies with instructor

Analyzed=55
Missing data: 1

CONSORT flow diagram
<table>
<thead>
<tr>
<th>Student Characteristics</th>
<th>TBL ( n=52 )</th>
<th>GD ( n=55 )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Categorical variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female gender ( n \ (% )</td>
<td>24 (42.1)</td>
<td>33 (57.9)</td>
</tr>
<tr>
<td>Rank on admission ( n \ (% )</td>
<td>17 (32.7)</td>
<td>22 (40.0)</td>
</tr>
<tr>
<td>1st tertile</td>
<td>19 (36.5)</td>
<td>19 (34.5)</td>
</tr>
<tr>
<td>2nd tertile</td>
<td>16 (30.8)</td>
<td>14 (25.5)</td>
</tr>
<tr>
<td>Preferred instruction method ( n \ (% )</td>
<td>30 (57.7)</td>
<td>34 (61.8)</td>
</tr>
<tr>
<td>GD</td>
<td>17 (32.7)</td>
<td>17 (30.9)</td>
</tr>
<tr>
<td>TBL</td>
<td>5 (9.6)</td>
<td>4 (7.3)</td>
</tr>
<tr>
<td>Lecturing</td>
<td></td>
<td></td>
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<tr>
<td><strong>Continuous variables</strong></td>
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<tr>
<td>Score on MCAT ( M \ (SD) )</td>
<td>509.4 (4.8)</td>
<td>509.5 (5.3)</td>
</tr>
<tr>
<td>Score on FMR ( M \ (SD) )</td>
<td>87.4 (6.9)</td>
<td>88.0 (5.7)</td>
</tr>
<tr>
<td>Score on courses excluding FMR ( M \ (SD) )</td>
<td>84.3 (5.1)</td>
<td>83.8 (5.1)</td>
</tr>
<tr>
<td>Score on Berlin Questionnaire ( M \ (SD) )</td>
<td>80.4 (11.6)</td>
<td>80.1 (12.1)</td>
</tr>
<tr>
<td>Predictor</td>
<td>$\beta$</td>
<td>95% CI</td>
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<td>-----------------------------------</td>
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<tr>
<td>Group allocation</td>
<td>0.27</td>
<td>-3.79 to 4.33</td>
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<tr>
<td>Score on all courses excluding FMR</td>
<td>1.08</td>
<td>0.68 to 1.48</td>
</tr>
</tbody>
</table>
Strengths

• 1st TBL vs. SGD comparison (RCT)

• No attrition (curricular requirement)

• Random allocation of instructors → generalizability

• Testing of long-term knowledge retention
Limitations

- Open-label
- Need to know basic Epi/Biostat a priori
- Generalizability to other settings
Conclusions

• Teaching CA to large preclinical classes:
  • TBL and SGD are equally effective instructional formats
  • Prior competence in Epi/Biostat enhances students’ performance