Comparative Effectiveness of Methods used to Learn Peripheral Intravenous Catheter Insertion in Chinese Nursing Students

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Conflict of Interest

• The authors declare no conflict of interest.
Wuhan University
Educational Challenges

• Teaching peripheral intravenous catheter insertion (PICI)

• Student mastery of clinical practice skills
Learning Trends

• PICI evidence-based teaching & learning

• Intravenous arm manikin method
  • Known effectiveness in improving clinical outcome learner objectives
  • Established feasibility for faculty and students in time & effort

• Virtual technology method
  • Unknown effectiveness in improving clinical outcome learner objectives
  • Unclear feasibility for faculty and students in time & effort
Purpose

• To determine the effectiveness of using a new virtual technology method of learning peripheral intravenous catheter insertion compared to the existing intravenous arm manikin method on performance and comprehension of students enrolled in a fundamentals of nursing skills laboratory course in China
Framework

Classroom Instruction → Simulated Learning → Skill Mastery

Intravenous Arm Manikin Method
Faculty Supervised versus Virtual Technology Method
Student Self-Directed

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Specific Aims

- To evaluate the effectiveness of the new virtual technology method of practicing PICI compared to the existing intravenous arm manikin method under direct faculty supervision
Hypothesis

Compared to students randomized to the existing intravenous arm manikin method, students randomized to the new virtual technology method of learning PICI will demonstrate

a) Equivalent scores on PICI performance
b) Equivalent scores on comprehension of PICI concepts & patient safety principles
Method

• Two-group, randomized control trial
• Convenience sample
  • 68 Freshman BSN students
  • Aged 19–21 years
  • Enrolled in Nursing Fundamentals
  • Wuhan University in China
• No previous training in PICI
$N = 68$ Students Enrolled in Nursing Fundamental

Best Practices Classroom Instruction

Group 1: Intravenous Arm Manikin Method $n = 33$

Group 2: Virtual Technology Method $n = 35$

PICI Standardized Skills Checklist
Measures: PICI Checklist

• Observational Performance Skills
  • 22-items
  • Weighted scores based on major & minor errors
  • Potential scores range from 0–100

• PICI-related Patient-Safety Principles & Concepts
  • 7-items
  • Dichotomous Yes/No response options where Yes = 1 & No = 0
  • Supplemental prompts elicit clarifying rationale
  • Potential scores indicate Pass (7) or Fail (0–6)
Data Analysis

• Independent sample $t$-test
  • Differences between two group on performance

• Chi-square
  • Differences between two groups on the distribution of performance score
  • Differences between two groups on the distribution of comprehension scores
# Skill Test Score

<table>
<thead>
<tr>
<th>Group</th>
<th>Learning Method</th>
<th>$N$</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$-value</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intravenous Arm Manikin</td>
<td>33</td>
<td>80.45</td>
<td>11.94</td>
<td>0.859</td>
<td>0.394</td>
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<tr>
<td>2</td>
<td>Virtual Technology Method</td>
<td>35</td>
<td>78.00</td>
<td>11.63</td>
<td></td>
<td></td>
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</tbody>
</table>
## Distribution of Performance Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>Learning Method</th>
<th>Score &gt; 60</th>
<th></th>
<th>Score &gt; 90</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intravenous Arm Manikin</td>
<td>87.9</td>
<td>0.34</td>
<td>30.3</td>
<td>1.64</td>
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<tr>
<td></td>
<td>Virtual Technology Method</td>
<td>17.1</td>
<td>0.735</td>
<td>17.1</td>
<td>0.258</td>
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</table>
## Error Rate of PICI-related Patient-Safety Principles & Concepts

<table>
<thead>
<tr>
<th></th>
<th>Intravenous Arm Manikin Method</th>
<th>Virtual Technology Method</th>
<th>$X^2$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citing the sequence of steps</td>
<td>21</td>
<td>30</td>
<td>8.66</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Yes</td>
<td>14</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrating professional behavior</td>
<td>2</td>
<td>13</td>
<td>11.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>33</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Conclusions

• The new virtual technology method of learning PICI was deemed equivalent to using the existing intravenous arm manikin method.

• Students using the new virtual technology method demonstrated increased comprehension.

• Additional research is needed to estimate the cost savings.
谢谢