Evaluating the effectiveness of structured self-evaluation of video recorded performance on peripheral intravenous catheter insertion. A randomised control trial
1. Disclosure of Relevant Financial Relationships
   I have no financial relationships to disclose.

2. Disclosure of Off-Label and/or investigative Uses
   I will not discuss off label use and/or investigational use in my presentation.
Learning objectives

• By the end of this session you will be able to;

• Discuss the findings of the study and the use of the teaching and assessment approach for peripheral intravenous catheter insertion.

• Describe the study data collection tools used to assess students' knowledge, confidence and performance of the skill

• Discuss future research considerations of this teaching and assessment strategy.
What we will cover

• Background
• Evaluation study
• Randomised control trial
• Study design
• Data collection tools
• Theoretical framework
• Study outcomes (primary / secondary)
• Recruitment
• Results
• Limitations
• Future research
Background

• Irish Context

• Standard Curriculum – blended approach

• Evaluating venepuncture and peripheral intravenous cannulation knowledge, attitude and performance of nursing students: A two-phase evaluation study.
The two-phase mixed method evaluation study.

- Survey – Knowledge, attitudes and practices survey
- Observation – Evaluated the videoed performance of students performing peripheral intravenous cannulation in the simulated environment
The two-phase mixed method evaluation study.

- Knowledge score – mean 7.2/15 (SD = 2.40)
- Attitude score - mean 10.2/18 (SD = 4.79)
- Performance score – mean 16.2/28 (SD = 2.98)
- Room for improvement
How can we improve training?

• Students' wishes
  - Improved simulation
  - Clinical opportunities
  - More practice opportunities in simulation lab
  - Specific training areas
  - Re-training

• The use of technology
The randomised control trial

- Evaluate the effectiveness of structured self-evaluation of video-recorded simulation practice on nursing students’ PIVC knowledge, confidence and performance.
## Experimental vs control

<table>
<thead>
<tr>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directly after their practice sessions they self-evaluated their video-recorded simulated PIVC insertion performance using a task-analysis checklist</td>
<td>Were video-recorded performing their simulated PIVC insertion but they did not watch their performance back nor self-evaluate their performance using a task-analysis checklist</td>
</tr>
</tbody>
</table>
Study Design
Data collection tools

• Knowledge, attitude and practices survey
  • Knowledge – 12 Q’s
  • Attitude – 13 Q’s
  • Practices
  • Reactions
Data collection tools

- Task-specific checklist
  - 28 marks

<table>
<thead>
<tr>
<th>Step</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>7*</td>
<td>Apply tourniquet</td>
</tr>
<tr>
<td>8*</td>
<td>Remove needle guard and assess the device for faults</td>
</tr>
<tr>
<td>9*</td>
<td>Use non-dominant hand to achieve skin traction</td>
</tr>
<tr>
<td>10*</td>
<td>Hold the cannula between your thumb and index finger and use the thumb to anchor the cannula hub</td>
</tr>
<tr>
<td>11*</td>
<td>Position the cannula - bevel facing upwards</td>
</tr>
</tbody>
</table>
Data collection tools

• Clinical outcomes survey
  • Evaluate students’ practices in relation to the skill but in the clinical environment
  • Successful/unsuccessful attempt
  • Who supervised student
  • Where did they insert PIVC
Data collection tools

• Qualitative data collection
  • Student feedback
    • how they felt their performance went
    • what they would do differently
    • how they felt about getting these self-directed practice opportunities
      (Structured interview style which was recorded)

• The experimental group only - feedback on the process of self-evaluating
  (Open-ended questions)
Theoretical framework

Ericsson’s deliberate practice theory

• Structured activity (work vs play vs deliberate practice)

• Opportunities for;
  • Repeat practice
  • Reflection
  • Feedback
## Theoretical framework

<table>
<thead>
<tr>
<th>Opportunities for</th>
<th>Control group</th>
<th>Experimental group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeated practice</td>
<td>Simulated practice sessions</td>
<td>Simulated practice sessions</td>
</tr>
<tr>
<td>Reflection</td>
<td>Guided reflection on performance and what they would do differently via interview style questions</td>
<td>Guided reflection on performance and what they would do differently via interview style questions</td>
</tr>
<tr>
<td></td>
<td>Reflected on use of self-evaluation tool</td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>OSCE combined with second practice session. Students received immediate feedback from examiner</td>
<td>By watching video recording provided immediate self-evaluation/feedback</td>
</tr>
<tr>
<td></td>
<td>OSCE combined with second practice session. Students received immediate feedback from examiner</td>
<td></td>
</tr>
</tbody>
</table>
Study outcomes - primary

• Students’ knowledge level of the skill of PIVC insertion
Study outcomes - secondary

• students’ procedural competence

• students’ confidence

• students’ practices in the clinical environment

• students’ feedback of their performance of the skill and of the intervention
Participant flow

Enrollment
- Assessed for eligibility (n = 69)
  - Excluded (n = 11)
    - Declined to participate
  - Randomised (n = 58)

Allocation
- Allocated to experimental group (n = 29)
- Allocated to control group (n = 29)

Follow-up
- Lost to follow up (n = 8)
  - Did not participate in study interventions
- Lost to follow up (n = 5)
  - Did not participate in study interventions

Analysis
- Analysed (n = 21)
- Analysed (n = 24)
## Results – primary outcome - knowledge

<table>
<thead>
<tr>
<th>Knowledge Score</th>
<th>N</th>
<th>Experimental (N=21)</th>
<th>Control (N=24)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre knowledge Score</td>
<td>43</td>
<td></td>
<td></td>
<td>0.7</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>5.35 (1.73)</td>
<td>5.61 (1.78)</td>
<td></td>
</tr>
<tr>
<td>Unknown (missing data)</td>
<td></td>
<td>N=1</td>
<td>N=1</td>
<td></td>
</tr>
<tr>
<td>Post knowledge score</td>
<td>40</td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>6.53 (2.20)</td>
<td>7.19 (1.86)</td>
<td></td>
</tr>
<tr>
<td>Unknown (missing data)</td>
<td></td>
<td>N=2</td>
<td>N=3</td>
<td></td>
</tr>
</tbody>
</table>
## Results – primary outcome - knowledge

Between group difference using the ANCOVA model

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Estimates</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>4.54</td>
<td>2.34 – 6.75</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control Group</td>
<td>0.25</td>
<td>-1.01 – 1.50</td>
<td>0.695</td>
</tr>
<tr>
<td>Pre Knowledge</td>
<td>0.42</td>
<td>0.03 – 0.81</td>
<td>0.034</td>
</tr>
</tbody>
</table>
Results – primary outcome - knowledge

Student improvement in each group – paired t-test

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean of the difference</th>
<th>95% CI</th>
<th>p -value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>1.56</td>
<td>0.27 - 2.85</td>
<td>0.021</td>
</tr>
<tr>
<td>Control Group</td>
<td>1.55</td>
<td>0.85 - 2.25</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
## Results – secondary outcome – procedural performance

<table>
<thead>
<tr>
<th>Score</th>
<th>N</th>
<th>Experimental (N=21)</th>
<th>Control (N=24)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>First performance Score</td>
<td>45</td>
<td></td>
<td></td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>13.33 (2.89)</td>
<td>13.04 (2.01)</td>
<td></td>
</tr>
<tr>
<td>Final performance score</td>
<td>45</td>
<td></td>
<td></td>
<td>0.056</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>18.7 (3.4)</td>
<td>16.8 (3.2)</td>
<td></td>
</tr>
</tbody>
</table>
Results – secondary outcome – procedural performance

Between group difference using the ANCOVA model

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Estimates</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>16.89</td>
<td>11.17 – 22.61</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control Group</td>
<td>-1.88</td>
<td>-3.88 – 0.12</td>
<td>0.065</td>
</tr>
<tr>
<td>First</td>
<td>0.13</td>
<td>-0.28 – 0.55</td>
<td>0.520</td>
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</tbody>
</table>
Results – secondary outcome – procedural performance

Student improvement in each group – paired t-test

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean of the difference</th>
<th>95% CI</th>
<th>p -value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>5.33</td>
<td>3.42 - 7.24</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Control Group</td>
<td>3.71</td>
<td>2.18 - 5.24</td>
<td>&lt; 0.001</td>
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</table>
## Results – secondary outcome - attitude (including confidence)

<table>
<thead>
<tr>
<th>Attitude Score</th>
<th>N</th>
<th>Experimental (N=21)</th>
<th>Control (N=24)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre attitude score</td>
<td>43</td>
<td></td>
<td></td>
<td>0.4</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>7.35 (2.76)</td>
<td>8.00 (2.73)</td>
<td></td>
</tr>
<tr>
<td>Unknown (missing data)</td>
<td>N=1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post attitude score</td>
<td>40</td>
<td></td>
<td></td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>10.74 (1.94)</td>
<td>10.76 (2.10)</td>
<td></td>
</tr>
<tr>
<td>Unknown (missing data)</td>
<td>N=2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results – secondary outcome - attitude (including confidence)

Between group difference using the ANCOVA model

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Estimates</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>8.31</td>
<td>6.40 – 10.22</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control Group</td>
<td>-0.22</td>
<td>-1.46 – 1.03</td>
<td>0.728</td>
</tr>
<tr>
<td>Pre</td>
<td>0.33</td>
<td>0.11 – 0.56</td>
<td>0.005</td>
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</table>
### Results – secondary outcome – attitude (including confidence)

Student improvement in each group – paired t-test

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean of the difference</th>
<th>95% CI</th>
<th>p -value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>3.39</td>
<td>1.78 - 5.00</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Control Group</td>
<td>2.7</td>
<td>1.81 - 3.59</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
Results - combining outcomes – knowledge, performance, attitude

<table>
<thead>
<tr>
<th>Score</th>
<th>N</th>
<th>Experimental (N=21)</th>
<th>Control (N=24)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre combined score</td>
<td>38</td>
<td></td>
<td></td>
<td>0.8</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>26.1 (5.3)</td>
<td>26.6 (4.2)</td>
<td></td>
</tr>
<tr>
<td>Unknown (missing data)</td>
<td>N=3</td>
<td>N=4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post combined score</td>
<td>38</td>
<td></td>
<td></td>
<td>0.12</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>36.7 (5.6)</td>
<td>34.4 (5.5)</td>
<td></td>
</tr>
<tr>
<td>Unknown (missing data)</td>
<td>N=3</td>
<td>N=4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results - combining outcomes – knowledge, performance, attitude

Between group difference using the ANCOVA model

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Estimates</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>20.47</td>
<td>11.35 – 29.59</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control Group</td>
<td>-2.66</td>
<td>-5.80 – 0.49</td>
<td>0.096</td>
</tr>
<tr>
<td>Pre</td>
<td>0.62</td>
<td>0.28 – 0.96</td>
<td>0.001</td>
</tr>
</tbody>
</table>
## Results - combining outcomes – knowledge, performance, attitude

Student improvement in each group – paired t-test

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean of the difference</th>
<th>95% CI</th>
<th>p -value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group</td>
<td>10.61</td>
<td>7.69 - 13.54</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Control Group</td>
<td>7.75</td>
<td>5.81 - 9.68</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
Results – secondary outcome
- practices in the clinical environment

- Opportunities
  - Total - 209
  - Mean - 4.64
  - Range – 0-13

- Surveys
  - Total – 86

- Who supervised attempts?
- Reporting successful attempts?
Results – secondary outcome - practices in the clinical environment

Confidence levels before, during and after procedural attempt

<table>
<thead>
<tr>
<th>Confidence</th>
<th>Prior to attempt</th>
<th>During attempt</th>
<th>After attempt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>5.16 (2.11)</td>
<td>5.52 (2.09)</td>
<td>6.65 (2.62)</td>
</tr>
</tbody>
</table>
Results – secondary outcome
- practices in the clinical environment

<table>
<thead>
<tr>
<th>Question</th>
<th>February KAP Response (n=43)</th>
<th>May KAP Response (n=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advised on the most appropriate site for IV cannulation?</td>
<td>Antecubital Fossa n=25, Back of the hand n=4, Forearm n=9, Unsure / Did not answer n=5</td>
<td>Antecubital Fossa n=25, Back of the hand n=6, Forearm n=9</td>
</tr>
<tr>
<td>Observed most IV cannulas to be placed?</td>
<td>Antecubital Fossa n=26, Back of the hand n=7, Forearm n=9, Did not answer n=1</td>
<td>Antecubital Fossa n=22, Back of the hand n=12, Forearm n=4, Other n= 2</td>
</tr>
</tbody>
</table>

https://stocksnap.io/
Results – secondary outcome - student feedback

How the performance went

- Happy (enough)
- Not good
- Forgot steps
- Feelings
- Manikin vs patient
- Different process in the clinical environment
- Familiarity with equipment
- Long time since training/revision needed
- Focusing on the flashback
How the performance went

Happy (enough)
- “happy enough with how it went”

Not good
- “oh terrible”

Forgot steps
- “I think I did the steps in the wrong order sometimes but I’m not sure”
How the performance went

Feelings

• "panicked", “nervous”, “sorry to the arm”

Manikin vs patient

• “there’s a lot of sort of communication when you’re doing it as well, it’s difficult to simulate”

• “em I find it’s much easier to do it on a real person, cause your just, it's not real here”

• “eh, like looking back on it now I know I made a load of mistakes but I’d rather make the mistakes here rather than on a patient so I’m glad I got the opportunity because I’m going to * next, I will be cannulating people so at least I know I’ll remember what I did wrong there and then remember not to do it on a patient as such”
How the performance went

Different process in the clinical environment

• “do ya know in practice now I know from an examination point of view the aspiration is quite important but in practice I haven’t seen that done much and I don’t think I’ve ever done it myself in actual practice”

• “the only thing that confused me, sometimes the nurses on the ward they will, like all of them have a different way of putting the dressing on so I never know what is the best way to dress the cannula em so thats always somethings that I’m always like thinking of”

Familiarity with equipment

• “and with the ones I did on the ward they didn't have this (extension set).. it was just a bung, I hadn't done it with the extension so I was a bit confused on where to put it but I figured it out in the end”

• “I hadn’t used that tourniquet before, I’ve only used the purple papery ones”
How the performance went

**Long time since training/revision needed**

- “I find it hard to remember from November, it's definitely a long time”

- “em, ok, considering I haven’t practiced it since we did it that day and I only did it once that day as well, so not as bad as I thought.”

- “I’d definitely go back and look like through the procedure before coming in”

**Focusing on the flashback**

- “obviously getting flashback would be good”

- “yeah it flushed for me so I was happy with that as soon as I saw flashback”
Results – secondary outcome - student feedback

*Do anything differently*

- Asepsis
- Preparation
- Tourniquet
- Flushing
- Dressing
Results – secondary outcome - student feedback

Opinion on practice sessions

- Helpful
- Good
- Makes up for the lack of ward opportunities
- Helps with procedural flow
- Helps with nerves
- More simulated practice opportunities
- Good to practice on a manikin instead of a patient (but there are differences)
- Familiarity with equipment
- Different to how things are done on the ward
- Want self-directed opportunities
Opinion on this self-evaluation feedback approach/checklist (experimental group only – after first practice session):

“I think this is useful; I had some faults that I didn’t notice otherwise.”

“Very beneficial as it allows you to identify your weaker areas properly. The video allows you to remember parts of the procedure that you might not have thought of as incorrect.”

“Difficult to watch video and answer questions at same time”

“I think this is useful and had some faults that I didn’t notice otherwise.”

“Very useful, allowed me to identify faults in technique that I wouldn’t have noticed otherwise.”

“This checklist approach is very helpful in noticing where I went wrong and where I can improve.”

“Very useful. Clearly can see steps missed or not carried out in the correct order.”

“Struggled to keep up with the video when answering questions here”
Results – secondary outcome - student feedback

Opinion on this self-evaluation feedback approach/ checklist (experimental group only – after second practice session)

"Good practice, I included a few more steps than last time e.g. aspirate the vein"

"A good way to promote best practice"

"Much easier to keep up with and analyse this time around and much easier to see faults in my practice"

"I think that rewatching over my IVC attempt has helped me see the areas where I need to improve and to learn from any mistakes that I made. It is a safe way of practicing the skill without any patient harm"

"Very helpful, greatly improving my confidence"

"Very helpful, can see where I can make improvements and steps that I performed in the wrong order. Good way to learn"
Inter-rater reliability

Primary researcher vs second marker

<table>
<thead>
<tr>
<th>Inter-rater reliability</th>
<th>February</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation</td>
<td>0.59</td>
<td>0.64</td>
</tr>
<tr>
<td>Mean difference</td>
<td>3.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Inter-rater reliability

Student (experimental) vs researcher checklist scoring

<table>
<thead>
<tr>
<th>Student vs researcher checklist scoring</th>
<th>February</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation</td>
<td>0.37</td>
<td>0.43</td>
</tr>
<tr>
<td>Mean difference</td>
<td>4.4</td>
<td>4.9</td>
</tr>
</tbody>
</table>
Summary of results

• Each group improved significantly in their average knowledge, performance and attitudes scores from baseline to follow-up

• However, there was no significant difference in average improvement between the control and intervention groups across any of the knowledge, performance and attitude scores

• Students in both groups appeared satisfied with practice sessions and for the experimental group, using a checklist to self-evaluate recorded performance

• More simulated practice sessions and self-evaluating video-recorded performance are both effective teaching strategies to improve educational outcomes and to increase students' satisfaction with their learning.
Limitations

- Retention
- Missing data
- Sample size
- Reporting real time data
- Resource intensive
- Experimental vs control vs standard
Future research

• Interprofessional

• Multi-site
  (national and international)

• Using technology for self-directed learning
References


Any questions?

Go raibh maith agaibh/ Thank you
**IMPORTANT**

Record the **Session ID** and **CE Code** below to earn Continuing Education Credit