

## Project Title

IV NIMBLE game in Nursing Intravenous Cannulation Training

## Project Lead and Members

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## Organisation(s) Involved

Singapore General Hospital

## Healthcare Family Group(s) Involved in this Project

Nursing,

## Applicable Specialty or Discipline

Nursing Quality, Research and Transformation

## Aim(s)

To reduce the time taken for IV cannulation training and assessment for all newly hired SGH nurses from 30 minutes to 18 minutes in 3 months while maintaining the confidence level and success rate of cannulation of the new trainees.

## Background

See poster appended/ below

## **Methods**

See poster appended/ below

## **Results**

See poster appended/ below

## **Conclusion**

See poster appended/ below

## **Project Category**

Training & Education

Simulated Training, Virtual Reality, Augmented Reality, Learning Approach,  
Gamification, Education Platform, Virtual Learning Platform, Assessment, Workplace  
Based Assessment

Technology

Digital Health, Virtual Reality (Mixed Reality)

## **Keywords**

Nursing intravenous cannulation training, nursing innovation, mobility-based learning,  
3D printed arm cannulation game, confidence level, intravenous cannulation success  
rate, pressure sensor glove, virtual standard patient

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# IV NIMBLE game in Nursing Intravenous Cannulation Training

## Background of the problem

Performing peripheral intravenous (IV) cannulation is an essential core skills competency that all new registered nurses and enrolled nurses must learn when they joined the organization. Skills-based simulation training and assessment requires the nurses to demonstrate both knowledge and skills and require an assessor face-to-face to provide immediate feedback. In view of COVID-19 outbreak, the training curriculum has shifted from classroom based teaching to online e-learning wizlearn platforms in Singapore General Hospital (SGH). The skill based training and assessment have to be suspended as we could not minimize the social interaction between the trainer and nurse. Therefore, the team from Alice Lee Institute of Advanced Nursing (IAN) aims to streamline the IV cannulation training and assessment to minimize training hours and social contact without compromising on the quality of the training.

## Mission Statement

To reduce the time taken for IV cannulation training and assessment for all newly hired SGH nurses from 30 minutes to 18 minutes in 3 months while maintaining the confidence level and success rate of canulation of the new trainees.

## Analysis of problem

The 5 Why was used to identify possible causes for the key problem in the project and the team brainstormed the major categories of the causes of problem.

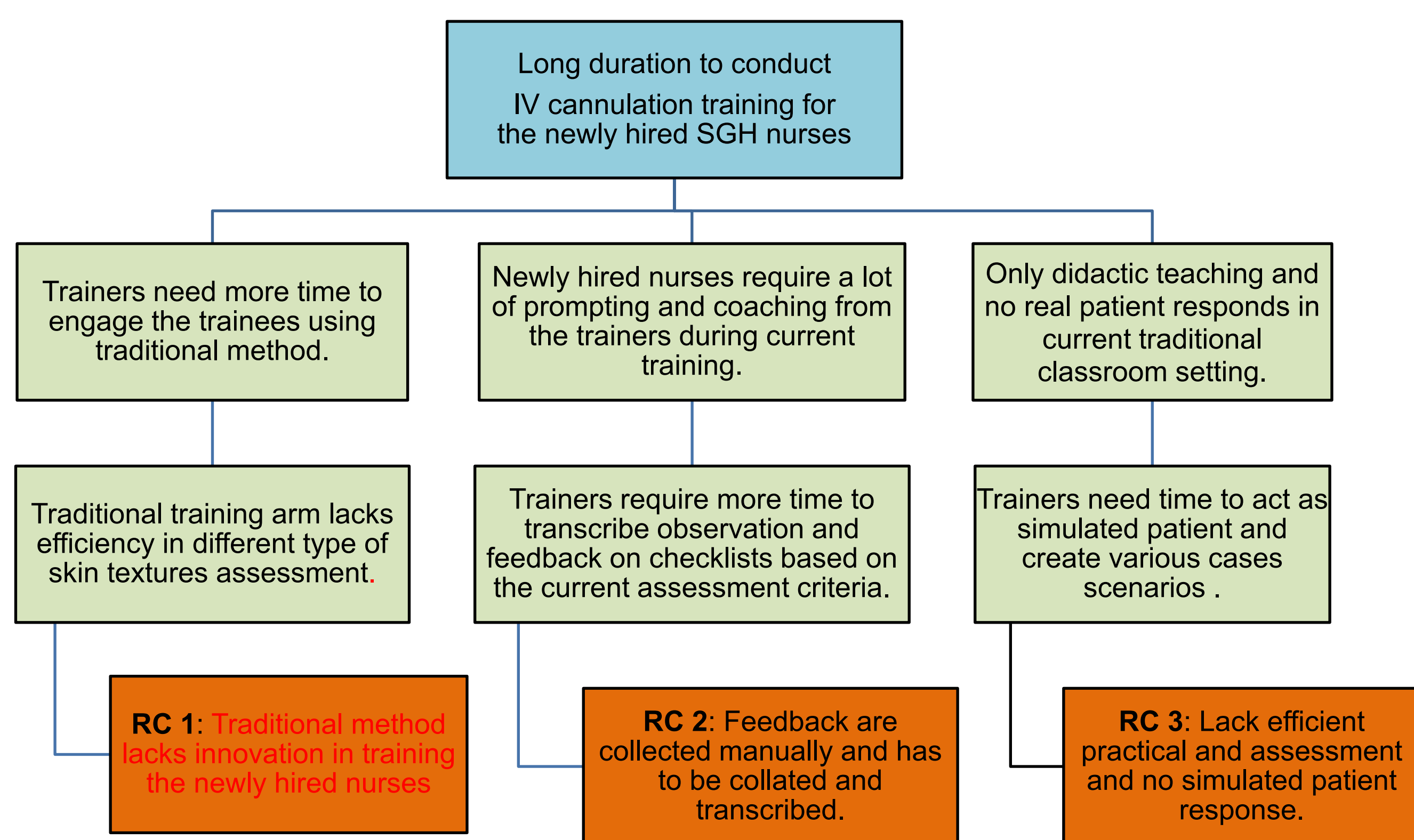


Figure 1: 5 Why diagram for factors leading to long duration in IV cannulation training

## Interventions / Initiatives

Based on the root cause identified, IAN team had worked closely with Nursing Quality, Research and Transformation Unit at Nursing Division to improve on the existing method of training newly hired nurses. Together, the team had collaborated with 2 external vendors who specialised in pressure sensors and game-based technology and embark on an innovation project to improve the current training and assessment of IV cannulation (RC 1). The team also managed to secure funding from Singapore University of Social Sciences to build a game-based technology for training.

The team did many rounds of pilot testing on various designs from January 2021 to June 2021. In July 2021 the team finalised on a prototype called IV Nursing Innovation in Mobility-based Learning (NIMBLE) cannulation integrating a pressure sensor glove with a virtual standard patient, enabling efficient assessment of nurses' dexterity while simulating patient response as they cannulate on a 3D printed arm cannulation game (RC 3). The game play from this prototype was captured and summarised in a performance dashboard that the learner can access immediately (RC 2).



Photo 1: IV Nimble Cannulation game



Photo 2-5: IV NIMBLE cannulation game was tested with newly hired nurses

The IV NIMBLE cannulation game was tested on 120 new nurses in July 2021. Each participant was timed on the total duration they spend on practicing and assessment of IV Cannulation. On top of that, all participants were given a pre and post training survey on their confidence level score and success rate of cannulation on a real patient to assess the efficiency and quality of the new IV cannulation training.

## Results

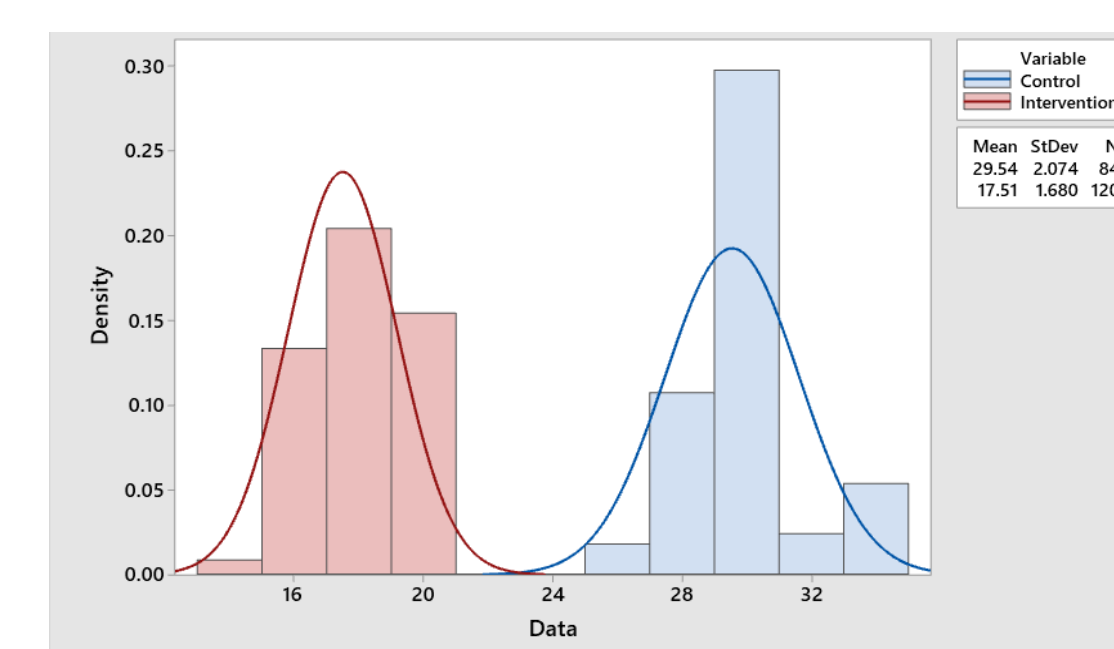


Figure 2: Left shift in time taken shown in Distribution Chart for training and assessment of newly hired nurses (pre-implementation in Blue; post-implementation in Red)

Through a 2 sample t-test, we conclude that the IV NIMBLE cannulation game had resulted in a significantly faster IV cannulation training and assessment, where the total duration for training and assessment had improved from an average of 30 minutes to 18 minutes ( $p < 0.05$ ).

The team also compared the confidence level and success rate of the different cohorts using a Paired T-Test. Both group's level of confidence increased significantly post training and had similar mean confidence score post training (IV NIMBLE: 7.2, Control: 7.5) ( $p < 0.05$ ). Both groups also showed similar success rate on their first cannulation on a real patient (IV NIMBLE: 76.9%, Control: 74.4%). This showed that the IV NIMBLE cannulation game is as effective as the traditional teaching method.

|   | Pre-Implementation | Post-Implementation | Savings |
|---|--------------------|---------------------|---------|
| Time taken per assessor and trainee (mins)                        | 30                 | 18                  | 12      |
| Total time taken per session for 3 assessors & 15 trainees (mins) | 540                | 324                 | 216     |
| Numbers of training runs / year (based on 2021 runs)              | 30                 | 30                  | 30      |
| Total Time Taken (mins)   | 16200              | 9720                | 6480    |

Based on the QI Saving calculator, 6480 minutes per annum time savings from this implementation is estimated to be around \$4276.80 per annum.

## Sustainability Plans

The IV NIMBLE cannulation game would be incorporated into the formal orientation program, which is known as "Graduated Nursing Integrated Programme" (GNIP). The team will also be expanding and building different patient profiles to have a variation of the scenarios into the game.

In line with the safe management measurements, number of trainers and training timing can be adjusted to allow for small group practice. Multiple Scenarios with assessment dashboards can be used as well, adapting well to different cases and different medical fields can also be explored further with different scenarios. A bigger sample size and data can further enhance this training and assessment kit to make it a gold standard assessment tool kit in Singapore General Hospital.