10.5005/jp-journals-10028-1206

ORIGINAL RESEARCH

# Can Physiotherapists be trained to work in Critical Care utilizing Clinical Simulation?

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## ABSTRACT

**Aims:** The intensive care unit (ICU) is an acute area requiring significant expertise and training. This study aimed to see if a novel package of simulation training of physiotherapists in ICU physiotherapy competencies would promote confidence and be less stressful compared to traditional training. The secondary aim was to see if simulation training was less costly in terms of training time and whether additional support staff hours required.

**Materials and methods:** Fifteen physiotherapists participated in the study, with two trainee cohorts (traditional, n = 5; simulation, n = 5) and supervising staff (n = 5). A simulation training program was implemented over 6 half days during 2013/2014. All participants then completed follow-up questionnaires. Data were also collected relating to training costs and cost of support provided to the trainee on commencement of independent work in the ICU.

**Results:** Respondents reported that simulation was extremely useful (> 4.75) and likely to reduce stress and improve confidence (> 3.8). All training components were useful (> 3.4) with simulation trainees perceiving the highest usefulness (4–4.8). Simulation training took less time per trainee (mean 3 *vs* 4.4 days), and less trainer time (total 9 *vs* 22 days). Costs incurred during 1st week of independent work were similar.

**Discussion:** This study has demonstrated that the delivery of a novel package of simulation scenarios was successful in improving the confidence of inexperienced physiotherapists moving into the ICU setting. The mode of up-skilling was also less expensive compared to the existing training model. Simulation may be useful for other health professionals in the critical care environment.


**Keywords:** Intensive care unit, Physiotherapy, Simulation, Training.

**How to cite this article:** Dennis D, Marsh L. Can Physiotherapists be trained to Work in Critical Care utilizing Clinical Simulation? J Postgrad Med Edu Res 2016;50(3):136-140.

**Source of support:** Nil

**Conflict of interest:** None

## INTRODUCTION

The intensive care unit (ICU) is a highly acute area requiring significant hands-on expertise. As such, inexperienced physiotherapists at our facility who have not previously worked in the setting undergo considerable training from senior physiotherapists prior to commencing independent treatment of patients. This training may be an intense and stressful experience, as the learning environment traditionally involves real patients who are often gravely ill. Historically, it is also an inherently time-consuming and costly exercise at our institution where training occurs on a one-to-one basis. High-fidelity medical simulations are educationally effective and can facilitate learning under the right conditions.[1] Simulation of ICU scenarios and competencies has been shown to be valuable to physiotherapy students,[2] nurses,[3] medical students,[4] and doctors.[5-7] It provides a less confronting environment that allows focused, deliberate practice in a controlled setting which complements medical education in the patient care setting.[1]

The aim of this study was to see if simulation training of inexperienced physiotherapy staff in basic ICU physiotherapy competencies would be less stressful and result in higher confidence on commencement of work in an Australian tertiary ICU compared to traditional training. The secondary aim was to see if this method of training was less costly both in terms of the time spent in training, and the support required when the trainee began working in the ICU compared to the existing model of one-to-one training, as there is little literature relating to the cost effectiveness of simulation training in medical education.[8] If successful and more efficient, the long-term objective was to develop a regular and ongoing orientation package that could be adopted by other institutions.

## MATERIALS AND METHODS

### Design

The study was an observational pre-test, post-test study of physiotherapy training of ICU competencies and cost of staffing the existing traditional training model *vs* a simulation model.

### Participants

This study took place at an Australian 600 bed tertiary university hospital with a mixed medical-surgical, 23 bedded ICU. There were three groups of participants:

1. *Traditional trainee (pre-simulation study) cohort:* All inexperienced physiotherapists who had worked

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in the ICU in the past 9 months leading up to this study (June 2012–February 2013) were invited to participate. These staff had undergone routine existing ICU training and on-the-job orientation prior to commencement of regular ICU rostering. Traditionally, an additional senior physiotherapist was allocated to the ICU in order to deliver one-to-one training of inexperienced staff in the ICU setting. This up-skilling involved the treatment of a limited caseload of actual patients with progressive exposure to ICU techniques over a period of days. Trainees undertook specific competencies during on-the-job training before being deemed competent to commence independent treatment of ICU patients on a regular roster.

2. *Simulation trainee cohort:* Those inexperienced physiotherapists due to rotate onto the ICU roster during the 12 months between March 2013 and 2014 were identified and invited to participate in the study. These staff attended simulation ICU training prior to commencement of regular ICU rostering. A simulation training program was developed by the investigators in consultation with both senior ICU physiotherapists and those with experience with simulation training. The specific components of the program included the specialties of respiratory (suctioning, manual hyperinflation, mechanical ventilation modes and setups, positioning), cardiovascular (arrhythmias), and orthopedics (transfers, application of common orthopedic appliances). This model involved up-skilling for 6 half days over 3 days and had the capacity to deliver training up to a 1:3 ratio. The 1st half of each day was spent in simulation setups in a quiet room away from ICU utilizing a high fidelity mannequin (SimMan, Laerdal Medical, Stavanger, Norway) who was intubated and attached to an Evita XL (Dragermedical, Lubeck, Germany) mechanical ventilator. The 2nd half of the day was spent in the ICU as supernumerary staff consolidating competencies with real clinical practice, treating patients under close supervision without the pressure of a caseload. The trainer was dedicated to the training alone, with no other clinical or administrative commitments during up-skilling time. This cohort underwent specific simulated competencies before being deemed to have passed the simulation training. They then undertook the same specific competencies as the traditional cohort during on-the-job training before being deemed competent to commence independent treatment of ICU patients on a regular roster.
3. *Senior supervisory cohort:* Those senior physiotherapists involved in the orientation and up-skilling of inexperienced ICU staff between June 2012 and March 2014.

## Outcome Measures

### *Questionnaires*

*Traditional trainee cohort questionnaire:* Having undergone the existing training program before working in the ICU, trainees completed a questionnaire relating to the development of simulation training. Questions centered on the potential role of simulation training, and the perception of its usefulness in the ICU setting.

*Simulation trainee cohort questionnaire:* After 1 month of regular rostering, trainees completed a questionnaire relating to the usefulness of the simulation training. Questions centered on the core components of the training, and the usefulness of these when applied to real clinical practice.

*Senior supervisory cohort questionnaire:* The senior physiotherapy staff normally involved in the up-skilling, orientation, and mentoring of inexperienced staff completed questionnaires during March 2014 as to the worthiness or otherwise of the simulation program in terms of the comparative level of on-the-job training and further orientation required by both groups.

### *Cost*

The cost of training and orientation of both cohorts was estimated retrospectively from ICU full-time equivalent staff numbers during both training and the 1st week of structured support for the ICU rostering that was provided to all trainees.

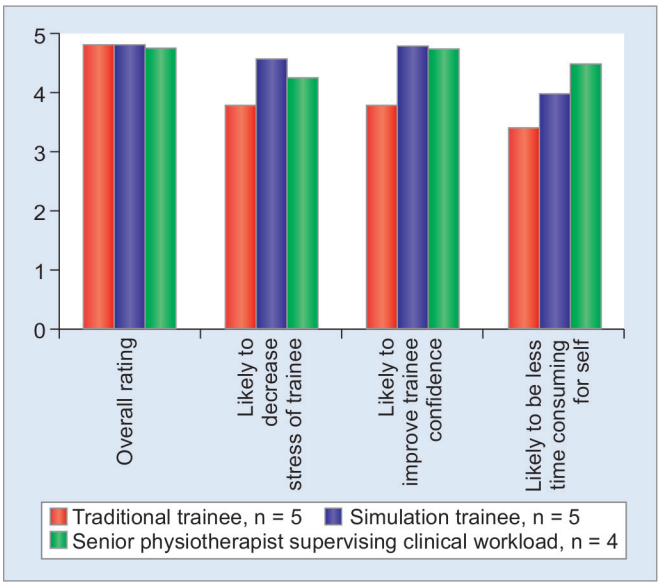
## Data Analysis

Survey responses (1–5) were scored, whereby a response of "extremely useful" or "highly agreed upon" was given 5. The average of these scores was presented as summary statistics for each cohort. Small study numbers precluded more detailed statistical analysis of differences between groups.

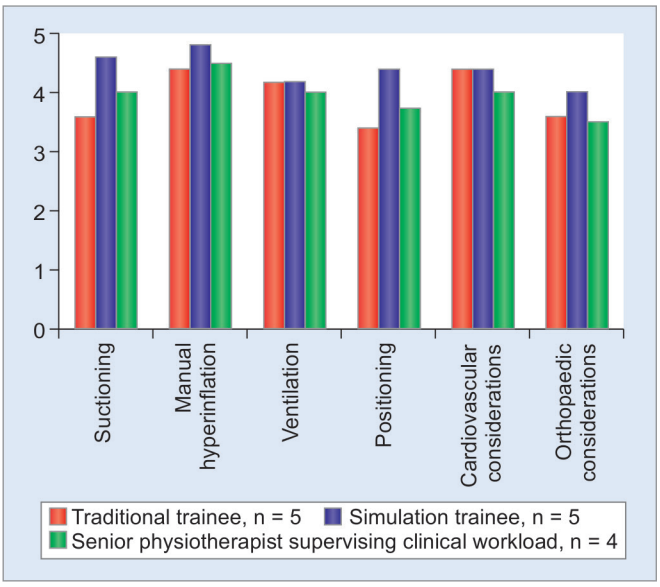
## RESULTS

Fifteen physiotherapists participated in the study, with five in the traditional trainee cohort, five in the simulation trainee cohort, four senior supervisory physiotherapists, and one senior physiotherapist simulation trainer.

Mean summary scores for each group are shown in Graphs 1 and 2 and in Table 1. Overall respondents reported that simulation would be (traditional trainees, 4.8) or was (simulation trainees, 4.8 and supervising physiotherapists, 4.75) extremely useful (Graph 1, column 1). Both the simulation trainees (4.6; 4.8) and their supervisors (4.25; 4.75) found the program more likely to reduce stress and improve trainee confidence than the traditional trainees (3.8; 3.8) expected that it would be (Graph 1, columns 2




**Graph 1:** Rating the simulation program overall, mean score, whereby 5 is "extremely useful" or "highly agree"




**Graph 2:** Perceived usefulness of simulation training, mean score, whereby 5 is "extremely useful"

and 3). Senior supervising staff thought that the simulation resulted in the most overall time savings for themselves (4.5) compared to the other groups (traditional trainee 3.4; simulation trainee 4; Graph 1, column 4).

All components of the training were found to be useful to all groups (Graph 2), with manual hyperinflation rating the most useful across all groups (4.4–4.8). Across all components, the simulation trainee perceived the highest usefulness from the simulation training (4–4.8). The lowest scores for usefulness from both the traditional trainees and the supervising physiotherapists were the orthopedic (3.6–3.5) and positioning (3.4–3.75) components.

### Cost

Excluding data of one simulation trainee (who underwent only half the training due to illness), simulation training took less time per trainee (mean 3 days) compared to the traditional model (mean 4.4 days) (Table 1). In addition, simulation training took less trainer time (total 9 days) compared to the traditional model (total 22 days) due to the higher trainer to trainee ratio in two of the simulation trainee groups.

The costs incurred in supporting the trainees during their 1st week of work (Table 1) were very similar with only 1 hour difference between the groups when the data from the simulation trainee who had been sick and therefore required more support was excluded.

## DISCUSSION

This study has demonstrated that the overall outcome of the simulation of physiotherapy competencies was positive from the perspective of both the trainees and those supervising them in the ICU clinical setting. The simulation trainee felt that simulation training decreased their stress more than the other groups, and rated the

**Table 1:** Cost of training models, days spent

| *Trainee* | *One-to-one training (hours)* | *Number of days trainer required to train trainees* | *Support provided during 1st week of roster (hours)* |
|---|---|---|---|
| Traditional trainee 1 | 4 | 4 | 12 |
| Traditional trainee 2 | 5 | 5 | 8 |
| Traditional trainee 3 | 5 | 5 | 12 |
| Traditional trainee 4 | 3 | 3 | 15 |
| Traditional trainee 5 | 5 | 5 | 15 |
| *Traditional trainees* | *Mean = 4.4 days* | *Total = 22 days* | *Mean = 12.4 hours* |
| Simulation trainee 1 | 3 | 3 | 15 |
| Simulation trainee 2 | 3 | | 12 |
| Simulation trainee 3 | 3 | 3 | 12 |
| Simulation trainee 4 | 3 | | 15 |
| Simulation trainee 5 | 1.5* | 3 | 30* |
| *Simulation trainees* | *Mean = 3 days^* | *Total = 9 days* | *Mean = 13.5 hours^* |

*Sick during training; ^S5 data excluded

usefulness of program higher (across all techniques) than the other groups.

Simulation-based education is not a replacement for authentic experiential learning, but a powerful adjunct.[9] As such, the literature suggests that for maximal effectiveness, medical simulation needs to be integrated with clinical practice and not used in isolation.[10] Our simulation model of up-skilling may have been both less stressful and more time efficient than the traditional model because although the simulation training involved clinical exposure during the afternoons, there was no expectation of having to undertake a clinical caseload. In addition, there was the capacity for repetitive skill practice which has been shown to facilitate learning.[1]

In terms of the components of the training, all respondents rated the usefulness of each component 3 or above, indicating that the breakdown and relevance of the learning tasks were appropriate to the needs of the learners. It is interesting to note that manual hyperinflation was rated the most useful component across all groups, with the high fidelity of the mannequin allowing for realistic practice of the technique in a safe environment. No data was collected as to the previous clinical workloads undertaken by individuals in the study – other than them never having worked in ICU. The fact that both groups of trainees attached least value to orthopedic and positioning components may reflect some prior experience in these areas which may have negated the worthiness of these components of up-skilling for some trainees.

Educational feedback is one of the most important features of simulation-based medical education[1] and the expertise of the simulation trainer, both as a senior ICU physiotherapist and a teacher, was paramount to the success of the development and implementation of the simulation training package. The fact that one person undertook all of the training presents both advantages and disadvantages. There was the consistency and continuity of having one person explaining everything the same way to all, but also only one person sharing their approach, experiences, and opinions about various clinical situations. It is important to remember that the individual trainee has the opportunity to engage with other experienced staff during their ICU rotation and develop a broad range of influences subsequent to their initial training.

Although cost and cost–benefits of simulation are rarely reported in the simulation for medical training literature,[8] our analysis suggested that there was an explicit saving with simulation training based on the higher trainer to trainee ratios delivered. While traditional up-skilling could have also been undertaken with higher ratios, in the 9 months prior to the simulation study, retrospective survey showed that this had not occurred. One reason may be that there is a limited caseload of suitable patients available for inexperienced staff. There may also be a higher capacity for group training using simulation with a lack of space at the real bedside for multiple trainees at any one time.

There was no cost differences in the support provided to each group of trainees during the 1st week of ICU rostering, as extra support staff were allocated to the ICU for approximately the same period of time in both groups. It may be that whatever the training, inexperienced staff are unable to undertake a full caseload initially in the ICU environment.

In addition to these explicit costs, it is important to acknowledge the perception of time saving by the senior supervising cohort. Although there was no question relating to whether or not the simulation cohort were actually more competent in terms of their entry-level skill at the commencement of rotation compared to those trained in the traditional way, they had to undergo additional specific simulated competencies before the usual on-the-job competencies. The early attainment of these competencies may have resulted in the perception of time saving from the supervising therapists with this group compared to the traditional group. It follows that less time spent by this group supervising inexperienced staff during the early days of orientation may have also led to unmeasured cost efficiencies in their own workload.

The limitation of this single-centered study is that only a small number of inexperienced staff are provided the opportunity to work in our ICU every year, so the extent to which results may be generalized are limited. The pilot data that this study has provided will enable development of the training package for a larger multi-centered study in the future.

## CONCLUSION

This study reports a novel approach to the up-skilling of a group of health professionals in the acute critical care environment. Inexperienced staff found that completion of a competency-driven simulation package of skills specific to physiotherapy care in this setting decreased their stress levels and improved their confidence moving into the clinical area. In addition, there was a cost saving as simulation training took less time utilizing higher trainer to trainee ratios. Simulation based training may be useful for other health professionals in the critical care environment.

## ACKNOWLEDGMENTS

Authors would like to thank the physiotherapy staff of hospital who participated in the study.

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