Title: A short structured skills training course for critical care physiotherapists in a lower-middle income country

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Contribution of the Paper

- This short, structured, critical care focused physiotherapy training was effective in improving the critical care knowledge and skills of the physiotherapists.
- This model may be adaptable to other settings and may fill the current gap in formal, high quality training for critical care physiotherapists in resource-limited settings.

Key words: Critical care physiotherapy; skills training; continuous professional development; lower-middle income country

INTRODUCTION

Critical care is a field where a wide range of professionals act synergistically to provide care for the seriously ill(Adam and Forrest, 1999; Bennett andBion, 1999; Adhikari, Fowler, Bhagwanjee and Rubenfeld 2010). Physiotherapists are an integral part of the provision of care to such patients with evidence supporting the beneficial effects of physiotherapy in reducing the length of critical care unit (CCU) stay and complications such as ventilator associated pneumonia (Castro et al, 2013;Denehy andBerney, 2006; Gosselink et al, 2011; Malkoç, Karadibak, and Yildirim, 2009; Ntoumenopoulos, Presneill, McElholum, and Cade, 2002; Stiller, 2000). However, wide variations in role and profile of ICU physiotherapists remain, even in High Income Countries (HICs) (Hodgin, Nordon-craft, Mcfann, and Mealer, 2010; Norrenberg and Vincent, 2000). These variations also extend to the education and training of physiotherapists. For example in Italy, it was observed that only 29% of the CCU physiotherapists had postgraduate specialization in critical care. Similar data on the situation in low and middle income countries are scarce (Lopes and Brito, 2009).

Noteworthy positive effects of structured training programs on improving confidence, skills, attitudes and patient care provided by healthcare professionals including nurses and physiotherapists have been previously demonstrated in areas such as communication(Murray et al, 2015), inter-professional collaboration and critical care (Beane et al, 2015; Beane et al, 2016; De Silva et al, 2014; Ohtake, Lazarus, and Schillo, 2013; Stephens et al, 2015) in resource limited settings (Beane et al, 2015; Beane et al, 2016; De Silva et al, 2014; Denehy and Berney, 2006; Sodhi, Singla, and Shrivastava, 2011; Stephens et al, 2015; Von der lancken and Levenhagen, 2014). However there is a paucity of research regarding the effectiveness of critical care training for physiotherapists and its effectiveness, specifically in low- and middle- income countries (LMIC).

Sri Lanka is a LMIC with good basic health indicators and a well-developed critical care system, where state provided healthcare is available free at the point of delivery (Vibhuti and Gannon, 2010).The country has over 100 state CCUs with over 500 beds and over 3000 admissions every month(National Intensive Care Surveillance, 2013). Physiotherapy services are available in at least in 91 of these CCUs (Haniffa et al, 2014).

Currently there are two state universities offering undergraduate training in physiotherapy in Sri Lanka with 176 hours of exposure to critical care physiotherapy per student. However, beyond this, there is a lack of regulated and systematic postgraduate training or continuous professional development (CPD) for the country's physiotherapists. This was identified as the greatest barrier to the growth of critical care physiotherapy in an island wide survey involving all state physiotherapists working in critical care (Sigera et al, 2016). Thirty-seven percent of the participants in the study identified the lack of postgraduate training and CPD in critical care as the most pressing concern while "lack of staff" was only mentioned by 15% of the participants (Sigera et al, 2016). These findings demonstrated the urgent need to provide structured critical care training to the physiotherapists in the country. Network for Improving Critical care Systems and Training (NICST formerly known as Network for Intensive Care Skills and Training) (Beane et al, 2016), an international collaboration, utilizes a local multi-disciplinary faculty to provide a portfolio of courses in acute and critical care for frontline nurses and doctors in Sri Lanka (Beane et al, 2015; De Silva et al, 2014; Stephens et al, 2015).

This paper describes the delivery and acceptability of a short, critical care focused structured training course and its effects on the knowledge and skills of the participants in Sri Lanka, a

low-middle-income country and test the hypothesis that the training course will significantly improve the knowledge and skills of the physiotherapists.

MATERIALS AND METHODS

The training course was conducted at the School of Physiotherapy and Occupational Therapy (School of PT and OT), Ministry of Health, Colombo, Sri Lanka, with the collaboration of NICST, the National Hospital of Sri Lanka (NHSL), Office of Deputy Director General (Education, Training and Research),The Mahidol Oxford Tropical Medicine Research Unit (Bangkok, Thailand), and an overseas specialist physiotherapy trainer from the United Kingdom (V.N.).

The course was offered to all 213 state sector critical care physiotherapists in the island. The recruitment was carried out on a first come-first served basis, after an advertisement regarding the program was published in the official website of the Government Physiotherapists Association (GPA) of Sri Lanka. A nominal fee was levied by the GPA with official leave for participants arranged by the Ministry of Health. All participants who registered were invited to complete a short registration questionnaire detailing length of experience, critical care environment exposure and previous critical care skills training.

The structure and content to be included in the training was decided based upon a needs assessment (Appendix 1)from the previous survey involving all state sector critical care physiotherapists in the island (Sigera et al, 2016).The development of course content and structure was led by an overseas specialist physiotherapy trainer from UK (V.N.). Six experienced local physiotherapists from the School of PT and OT, National Hospitals Sri Lanka, and NICST joined the faculty to develop the programme and participate as

facilitators. Coordinated by the overseas specialist physiotherapy trainer the new faculty was invited to participate in a one day train the trainer (TTT)familiarizing them with the methods and content of the course, and giving them opportunity to improve their confidence and knowledge of the course content. The first part of the TTT focused on establishing baseline knowledge of the course content. The facilitators were asked to complete the course multiple choice questionnaire (MCQ) (Supplement 1), (this was later used to assess candidates knowledge pre and post course) enabling them to identify areas where learning was required. This was followed by a series of workshops led by the overseas specialist physiotherapy trainer informed by the learning needs identified through the MCQ.

Facilitators were given an opportunity to practice each component of the course and structured discussions after each session, enabled facilitators to seek clarification and share knowledge. Feedback given by the overseas specialist physiotherapy trainer was given to identify further learning goals. In addition to technical content the TTT provided an opportunity for the up-skilling faculty to develop skills in practical session delivery, session coordination, objective setting and giving and receiving constructive feedback.

The two days courses, conducted (two identical courses conducted on four successive days with the same facilitators) entirely in English, combined short lecture sessions (to refresh candidate's underpinning knowledge), small group workshops and practical skills stations. Course outline and session breakdown is shown in Table 1.

Most skill sessions and some demonstrations were delivered by six up-skilled facilitators, with support and oversight from the overseas specialist physiotherapy trainer.

Course evaluation

A pre and post course 14 question MCQ (Supplement 1) was used to assess candidates' knowledge gain regarding critical care physiotherapy. The pass mark was set at 50%. Confidence and skills gain was evaluated using a 10 point Likert scale self assessment tool, also completed pre and post course. The responses being categorized as Low (1 to 3), Moderate (4 to 7) and High (8 to 10). In addition candidates were invited to give feedback describing their overall experience following completion of the 2 day programme.

The assessment tools were developed and iterated in collaboration with the six local facilitators. The information collected from course participants was used to evaluate the programme. These were collected after informed verbal consent for course evaluation and research publications. No additional information was collected specifically for the study. No patients or volunteers were involved. Ethical clearance was thus not sought as this was a routine evaluation of a trained programme.

Data analysis

Data analysis was done using Stata Corp. 2013. *Stata Statistical Software: Release 13.* College Station, TX: Stata Corp LP.Standard descriptive and univariate analysis was performed. As participant numbers were small, the feedback and skills assessment are reported as one group, while for the MCQ we report marks as a whole and for each course. Continuous variables were analysed using the Wilcoxon signed-rank test for non-parametric variables, while comparison of pre and post MCQ scores were compared using paired t-test. Differences between groups for discrete variables were examined with chi square test while McNemar test was used to compare matched group outcomes. The mean scores were compared using paired t test. Significance was set at $p \leq 0.05$.

RESULTS

The two-day workshop was conducted on consecutive days training a total of 56 physiotherapists (26% of the total physiotherapists in Sri Lanka). The course was delivered by 6 newly up-skilled faculty and overseen by the overseas specialist physiotherapy trainer. The course was delivered in English medium in keeping with existing physiotherapy training. Forty five participants (90%) had been working as a physiotherapist for more than 5 years, with 23 participants (45.1%) having more than 5 years experience in the ICU setting. Seven participants (12.5%) had received formal critical care physiotherapy training prior to the programme. Most participants (87.5%, n=49) had had no exposure to overseas practice. Table 2 describes the profile of the candidates who participated.

Candidate's self evaluation of confidence and skill pre and post course are described in Figure 1. There were 33participants (70.2%) reported that they were highly confident in the skills necessary to assess a critically ill patient post course, compared with 7(14.3%) pre course ($p<0.05$). Thirty three participants (71.7%) reported that they felt highly confident to provide physiotherapy respiratory treatments relevant for ICU patients after completing the programme, compared with 5 (10.4%) pre course ($p<0.05$).

The participants were objectively assessed using pre- and post-MCQ papers. Table 3 shows the number of trainees passing each assessment. The pass mark was set at 50%. There was anincrease in the observed mean($p<0.05$)and median scores as well as the minimum and maximum scores and pass percentage($p<0.05$), from pre-course MCQ to post-course MCQ assessments.

Feedback provided by the participants is shown in Tables 4 and 5. The Overall feedback for the course was very positivewith areas needing further attention highlighted during the feedback. A majority of the participants were highly satisfied with the quality of teaching (75%, n-42) and the course's contribution to improved critical care knowledge (75%, n=42) and skills (61%, n=34). Overall the course was identified as being highly relevant to practiceby 39 (70%) of the participants, with 42 (75%)stating that they wouldrecommend it to their colleagues. Nine (16%) participants reported that time was a limiting factor affecting their opportunity to practice the skills within the programme. Practical sessions focusing on skills unique to critical care,ventilator manipulation and respiratory physiotherapy treatments for ventilated patients, received the most positive session by session feedback, with 75% (n-42) of participants reporting that this was the most 'relevant ' session for improving clinical practice.

DISCUSSION

The paper reports the feasibility of a critical care skills physiotherapy short course delivered by up-skilled local faculty and its positive impact on candidates self perceived skills confidence and short term knowledge acquisition in a LMIC. The participation of more than a quarter of the country's CCU physiotherapists was an opportunityto positively influence theirhealthcare practices to improve patientcare, contribute to minimal research in this area and could potentially provide a model applicable to wider settings.

Physiotherapists are now considered an integral part of critical care team(Adam and Forrest, 1999; Valentin and Ferdinande, 2011). A national survey from Sri Lanka, as part of an ongoing initiative centeredaround critical care(Haniffa et al, 2014),revealed the requirement for critical carespecific training and continuous professional development(Beane et al, 2016;

Sigera et al, 2016). This collaborative program was an attempt to provide a, practically focused, clinically relevant short course to help bridge the knowledge and confidence gap in critical care skills perceived by physiotherapists in Sri Lanka.

Fifty six (26.3%) of the physiotherapists working in the state critical care units participated in the training programme and all of them took part in the study. Only 7 (12.5%) of the participants had previously received critical care specific training. In self-assessment prior to the training, an average of 11.6% perceived their skill levels to be high across 6 predetermined skill categories, compared to 59.2% post course.The median score for the MCQ paper was 36 out 100 with only 13% achieving the pass mark of 50 or above,pre compared to 92.5% post course. Participants overall confidence and skills have been improved in the aspects of assessing critically ill patients and managing them, understand the life saving and respiratory PT interventions for critically ill patients, deciding when to rehabilitate patients in critical care setting and provide an individualized rehabilitation program. This mirrors results from similar nursing courses delivered using TTT methodology in Sri Lanka (Beane et al, 2015; Beane et al, 2016; De Silva et al, 2014; Stephens et al, 2015).Further evaluation and follow up is needed to evaluate the longer term retention of knowledge and assimilation of newly gained knowledge and skills into clinical practice.

Time constraints were a limiting factor for some learners opportunity to practice all sessions. One possible solution is providing pre course reading for some of theoretical components of the programme enable more time to be spent on the practical elements during the 2 contact days. This is now in place using an online electronic learning system.

Six local facilitators were selected for the programand a train-the-trainer approach was utilized to train them as facilitators.

Limitations

An assessment for the facilitators regarding their knowledge, skills and the ability to deliver the training was not carried out due to time constrains at any point during the TTT and the workshop. Future programmes should contain an assessment component for facilitators. Similarly, no assessmentregarding longer term knowledge and skills retention of participants was planned. As the length of follow up was very short, this makes it difficult to determine if there was carryover of knowledge or impact on behaviour change.

An assessment of the practical skills of the participants' pre and post course was not carried out due to the constraints created by the short duration of the program. This program was part of an ongoing initiative aimed at improving the quality of critical care and the skills of the critical care health professionals in Sri Lanka (Beane et al, 2015; Beane et al, 2016; De Silva et al, 2014; Stephens et al, 2015). The experiences from the program, in the context of similar NICST courses, have the potential for use, both within Sri Lanka as well as elsewhere. The lessons can be utilized in planning and executing further programs aimed at different sections of the healthcare work force.Future iterations of the program will include a cost analysis and one month follow-up of participants' knowledge and confidence.

The pre and post MCQ questions are ambiguous and could be developed.Further 14 MCQs is a very short test for a course.

The conduct of the programme and its short-term effects, though limited to a small group, is indicative of the potential for similar programs in other resource poor settings. Although the content and assessment of a such a course may well depend on the setting, the approach used for course development and delivery may well be feasible in other LMIC with functioning

health care systems that wish to up-skill their critical care workforce, and can thus be used as an example (A Beane et al, 2015; Abi Beane et al, 2016; Stephens et al, 2015).

CONCLUSIONS

In this setting, with the lack of a formal CPD, there was limited opportunity for physiotherapists involved in critical care to improve their knowledge and skills. The positive feedback and the significant increase in self perceived confidence to perform skills associated with critical care physiotherapy treatments, suggests this method of locally up-skilled faculty delivering practical training may be of value in this setting and may be of benefit for filling the theory to practice gap for clinicians where opportunity for more formal specialist training is limited

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TABLE 1 Outline of the training programme

Day 1	**Day2**
Ventilation and Perfusion/D/45	Critical care unit assessment
Respiratory Failure	Mechanical Ventilation- advanced
Case Studies: 1. Chronic Obstructive Pulmonary Disease 2. Surgery 3. Chest X-ray 4. Cerebrovascular events – strokes	Ventilator practical-Recruitment, compliance, treatment of hypoxia and hypercarbia
Positive Pressure Ventilation (theory)	Progressive neuropathy
Positive Pressure Ventilation (practical) 1. Intermittent Positive Pressure Breathing 2. Continuous Positive Airway Pressure 3. Mechanical Insufflation-Exsufflation 4. Non –Invasive Ventilation	Workshops: 1. Oxygen devices including “Optiflow” 2. Manual hyperinflation 3. Suction 4. Tracheostomies Quiz

TABLE2 The demographic characteristics of the study participants

Demographic characteristics(n=56)	**Total (%)**
Age (years)	
Less than 30	18 (32.1%)
30 – 39	23 (41.1%)
40 – 49	7 (12.5%)
50 – 59	3 (5.4%)
Missing	*5(8.9%)*
Experience as a physiotherapist	
1 – 4 years	5 (8.9%)
5 – 9 years	22(39.3%)
10 – 14 years	12 (21.4%)
More than 15 years	11 (19.6%)
Missing	*6(10.7%)*
Experience as an critical care physiotherapist	
Less than 1 year	2 (3.6%)
1 – 4 years	26 (46.4%)
5 – 9 years	12 (21.4%)
10 – 14 years	8 (14.3%)
More than 15 years	3 (5.4%)
Missing	*5(8.9%)*
Received any form of critical care training before	
Yes	7 (12.5%)

No	44 (78.6%)
Missing	*5(8.9%)*
Worked/Visited a critical care unit in a foreign country	
Yes	2 (3.6%)
No	49 (87.5%)
Missing	*5(8.9%)*

Figure 1: Percentage of participants with overall confidence and skills rated as high (8-10)

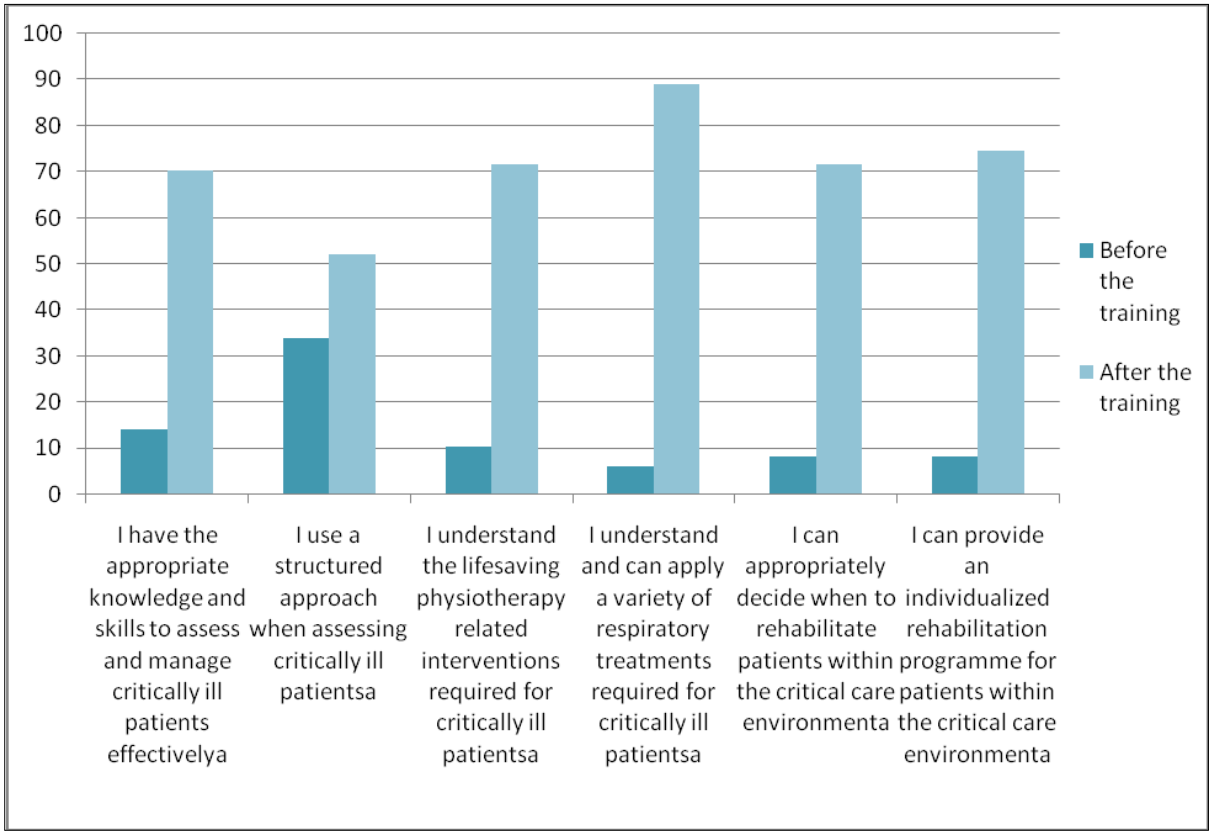

TABLE3 Pre and Post MCQ assessment scores

Descriptive	**Pre MCQ (n=54)**	**Post MCQ (n=53)**
Pass number	7	49
Pass percentage[a]	13%	92.5%
Mean[a] score (standard deviation)	36.6 (±10.9)	63.2 (±10.5)
-	-	-
Minimum - Maximum	12 - 60	37– 83
Missing	*2*[b]	*3*[c]

[a] $p<0.05$

[b]Those who are not able to write pretest MCQ exam as late attendance.

[c]Those who are not able to write pretest MCQ exam as absent at the time of the assessment.

TABLE4 The feedback ratings of participants regarding the training

Responses (n=56)	**Rating**			
	8-10 (High)	**4-7 (Moderate)**	**1-3 (Low)**	**Missing**
Overall, the course was enjoyable	41(73.2%)	8(14.3%)	–	7(12.5%)
Overall the course was worthwhile	39(69.6%)	7(12.5%)	–	10(17.9%)
This course has increased my critical care knowledge	42(75%)	6(10.7%)	–	8(14.3%)
This course has increased my critical care skills	34(60.7%)	13(23.2%)	1(1.8%)	8(14.3%)
The quality of the teaching was of a high standard	42(75%)	7(12.5%)	–	7(12.5%)
The quality of the educational materials provided was of a high standard	22(39.3%)	26(46.4%)	1(1.8%)	7(12.5%)
There was sufficient time allocated in the course to cover all the material appropriately	14(25%)	30(53.6%)	4(7.1%)	8(14.3%)
I would recommend this course to a colleague working in critical care units	42(75%)	7(12.5%)	–	7(12.5%)

TABLE5The free text responses of participants regarding the training

Feedback (n=56)	**Number**	**Percentage**
What I like most about the course was		
Practical training of physiotherapy techniques	18	32%
Mechanical ventilation and Ventilation Hyperinflation	13	23%
Arterial Blood Gas Analysis	3	5%
Assessment of patient in critical care unit	2	4%
What I did not like about the course was		
Not enough time	9	16%
Lack of facilities and space	3	5%
Most important 3 things learnt on this course		
Ventilator care and ventilator hyperinflation	42	75%
Chest physiotherapy	20	36%
Research	13	23%
Blood gas analysis	11	20%
Early rehabilitation of critical care unit patients	8	14%
Evidence based practice	6	11%
Physiotherapy Indications and contraindications	7	13%
Assessment of critical care unit patients	3	5%