An Approach to Train the Non-Respiratory Therapy Health Care Professionals on the Essentials of Respiratory Care during the COVID-19 Crisis

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Abstract

Background: The impacts of the coronavirus disease-2019 (COVID-19) were limited not only to clinical mortality and morbidity but also to the shortage of qualified intensive care professionals, such as respiratory therapists (RTs). To overcome the acute shortage of RTs, the corporate academic affairs of the Abu Dhabi Health Services, Co. (SEHA) instituted a series of training workshops to teach the essentials of respiratory care.

Methodology: Over a 1-month period, a series of 1- and 2-day workshops were conducted for healthcare professionals, including anesthesia technologists, nurses, physicians, and physiotherapists, according to their skill levels. The workshops included core practices of respiratory care, so that the professionals could support the RTs in intensive care units. The course content was delivered as theoretical and practical modules. The training outcomes were assessed subjectively by a competency checklist completed by the trainee during the practical sessions; in addition, pre- and posttest assessments were conducted to statistically evaluate the training outcomes.

Results: The educational intervention was effective in improving the knowledge of the 118 healthcare professionals who received a mean pretest score of 12.25 ± 4.147 and a mean posttest score of 17.71 ± 2.415 ($p < 0.05$). Analyses of pre- and posttest scores of each individual professional group were also statistically significant ($p < 0.05$ for each).

Conclusion: This project's clinical and statistical outcomes were effective. Our project showed that a skilled professional shortage crisis during a pandemic can be compensated to some extent by training related healthcare professionals as a supporting task force.

Keywords: COVID-19, respiratory therapists, healthcare professionals, training

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Background

The World Health Organization declared the coronavirus disease-2019 (COVID-19) to be a public health emergency of international concern on January 30, 2020[1] and a pandemic on March 11, 2020.[2] This underscored the rapid global spread of the disease and the anticipated risk of healthcare services being overwhelmed, with many patients requiring intensive care unit (ICU) admission.[3]

In the ICU, the model of care is always multidisciplinary and inter-professional, with teams consisting of physicians, nurses, respiratory therapists (RTs), other healthcare professionals and, occasionally, family members.[4] Respiratory therapists are specialists in respiratory care with knowledge and skills to provide a wide range of diagnostic and therapeutic procedures to patients who require basic, advanced, and prolonged cardiopulmonary care and ventilatory support.[5]

Many patients in the ICUs may require intensive respiratory support, which includes mechanical ventilation or other form of noninvasive respiratory therapies. In consultation with the physicians and based on endpoints, it is one of the core responsibilities of RTs to initiate, adjust, monitor, and eventually wean ventilator support.[4,6] RTs play essential roles in the efforts to improve patient outcomes and reducing mortality and morbidity.[7-9]

When the COVID-19 pandemic began, with ICUs full of critically ill COVID-19 patients, the role of RTs gained wider attention. Their core therapeutic approaches included invasive ventilation, noninvasive respiratory support, and other strategies, such as inhaled nitric oxide therapy and prone positioning.

Many of the patients admitted eventually required ventilatory support, and efforts were made by the health authorities to provide a sufficient supply of ventilators and other respiratory support equipment. Although implementation of mechanical ventilation and other respiratory support therapies is collaborative, RTs possess unique expertise and experience in operating these life-supporting devices, and studies show that their involvement is associated with lower ICU mortality.[9]

The large inflow of critically ill patients with COVID-19 to ICUs resulted in a drastic shortage of qualified RTs and a serious imbalance in the RT-to-patient ratio in acute care units worldwide. There are not many studies that describe the irreplaceable role assumed by RTs during the COVID-19 pandemic or the potential crisis caused by shortage of RTs in the healthcare workforce. RTs have been mentioned only in few media and internet stories, where these frontline warriors were praised as unsung heroes.[10-13]

The United Arab Emirates (UAE) is a federation of seven Emirates, and Abu Dhabi is its capital, with a population of 1.51 million.[14] In Abu Dhabi, all government hospitals and employees are housed within one system, the Abu Dhabi Health Services, Co. (SEHA). There are 13 full-fledged hospitals under the SEHA, well supported by qualified medical, nursing, and allied healthcare professionals for the multidisciplinary continuum of care.

As on 23 November 2021, 741,570 COVID-19 positive cases and 2,144 deaths were reported in the UAE.[15] Like most of the rest of the world, SEHA hospitals faced a staffing crisis during the COVID-19 pandemic, and the most

affected was the respiratory therapy workforce. Foreseeing this crisis, the hospitals' leadership teams tried to redistribute the RTs among the SEHA hospitals for an optimal RT-to-patient ratio in each. However, as the spread of the virus increased, the number of critically ill patients admitted to ICUs also increased. Plans to recruit new RTs were affected by the pandemic and the shutdown of international travel. This crisis led the SEHA's Corporate Academic Department to consider training and transforming non-respiratory care professionals as a supporting task force for RTs. The aim of the current study is to assess the effect of a training course in respiratory care for non-respiratory therapists.

Methods

To combat the pandemic, the training of RT support was planned as a series of 1- and 2-day workshops, on a "war footing" basis. Only 2 days elapsed between the initial idea to initiate this training and the development of a full curriculum. An official communication with a higher education institute in the UAE facilitated the release of qualified respiratory educators for this mission, all of whom held doctorate degrees in respiratory care. The primary objective in initiating this training was to rapidly deploy newly trained professionals to ICUs as a supportive task force for RTs.

We recruited 152 volunteer healthcare professionals to participate in the training sessions, and we categorized the trainees into two groups. The first group comprised of 34 trainees who did not undergo pretests, and the second group had 118 trainees who completed both pre- and post-tests. The 34 healthcare professionals in the first group were excluded from the statistical analyses because of the lack of a pretest.

The 118 healthcare professionals from the second group (eight anesthesia technologists, 34 nurses, 56 physicians, and 20 physiotherapists) who completed both pre- and post-tests were included in the analyses to statistically evaluate the effectiveness of the study.

The training was conducted at various hospitals of SEHA, where the simulation centers were well equipped with manikins, respiratory devices, and other supportive equipment. The cycle of 1- and 2-days training modules lasted for more than a month from May to June 2020 amidst the pandemic surge. The training content was customized according to the prior knowledge of each discipline's practice, so anesthesia technologists, nurses, and physicians received 2-day training sessions consisting of 16 hours, and physiotherapists received one 8-hour session.

The sessions were conducted in classrooms while social distancing was maintained, and all participants wore face masks. The sessions included both theoretical and practical training on the essential topics needed to support the RTs. The course content developed was validated by the SEHA RT leadership team.

The training topics for anesthesia technologists, nurses, and physicians included an overview of COVID-19 pathophysiology, airway management in COVID-19, the initiation of mechanical ventilation, aerosol and O_2 therapy, prone ventilation, the team approach, arterial blood gas (sampling, analysis, and interpretation), basic life support guidelines in COVID-19, setting up, initiation, titration, and weaning of a high-flow nasal cannula, setting up, initiation, titra-

tion, and weaning of noninvasive ventilation, and bronchial hygiene and airway clearance.

The topics for physiotherapists included bronchial hygiene therapies, theoretical and practical aspects of prone positioning, and rehabilitative measures. Simulation-based practical training was adopted to enhance the skills required by using high-fidelity simulators, mechanical ventilators, and other devices as required.

A three-tier evaluation was planned for the course outcome: the first level of assessment was the subjective-skill test for each focus area, which was conducted during the practical training sessions. At the end of the skill sessions recommended, all trainees who satisfactorily met the requirements were approved. Those who did not achieve competency in a skill area were remediated.

Pre- and post-tests evaluated the overall outcomes of the training, while multiple competency evaluations were performed to assess the practical skills gained by the trainees. The pre- and post-tests included 10 multiple choice questions of 2 marks each, with a total score of 20. Finally, all trainees were expected to undergo five competency checks, given by a senior RT or intensivist in the assigned areas, after which the trainees would receive privilege certification to perform the assigned tasks independently.

For the first group of 34 professionals who were not included in the study analyses, the final evaluation was based on skill and competency checks during the training, the post-test questionnaire, and a worksite competency assessment by their supervisors.

The skill evaluation during the training included preparing for conventional endotracheal intubation and video-laryngoscopy, calibration, setting up, and initiation of invasive and transport ventilators, calibration, setting up, and initiation of noninvasive ventilation, calibration, setting up, initiation, and titration of high-flow oxygen therapy, prone ventilation and the team approach, drawing of arterial blood, gas analysis, and related errors, and bronchial hygiene and airway clearance.

The 152 trainees who completed the training successfully were awarded a certification of successful completion of "Essentials of Respiratory Care in COVID-19" and Continuous Medical Education accredited hours. At the time of preparation of this manuscript, the trainees were still completing the final competency checks, which will enable them to receive their privilege certificates. To evaluate the effectiveness of the training, paired t-tests were used for the pre- and post-test analyses.

The research committee of the Department of Health–Abu Dhabi approved the project, and the training project was retrospectively included in the registry of COVID-19-related projects. All participants provided their informed consent.

The statistical analysis was performed on IBM SPSS Version 22. The pre and post test was conducted using electronic forms. Demographic data was analyzed using descriptive statistics and frequency analysis was done for overall responses. Paired t-test was used to compare pre- and posttest values.

Results

The demographic details of participants are provided in Table 1 and their professional experience is presented in Table 2.

Table 1. Distribution of demographic details of the participants

Demographic profile	n (%)
Gender	
Male	63 (53)
Female	55 (47)
Work Experience	
0–5 years	35 (30)
5–10 years	26 (22)
10–15 years	24 (20)
Above 15 years	33 (28)
Occupation	
Anesthesia Technologists	8 (7)
Nurses	34 (29)
Physicians	56 (47)
Physiotherapists	20 (17)
Age by occupation, (yrs)	
Anesthesia Technologists	40 ± 7.55
Nurses	34 ± 6.38
Physicians	36 ± 9.79
Physiotherapists	42 ± 9.81
Gender by profession	
Anesthesia Technologists	
Male	4 (50)
Female	4 (50)
Nurses	
Male	15 (44)
Female	19 (56)
Physicians	
Male	26 (46)
Female	30 (54)
Physiotherapists	
Male	10 (50)
Female	10 (50)

Table 2. Distribution of work experience of each professional group

Work experience by profession	(%) n
Anesthesia Technologists	
0–5 years	1 (13)
5–10 years	2 (25)
10–15 years	2 (25)
Above 15 years	3 (37)
Nurses	
0–5 years	8 (24)
5–10 years	12 (35)
10–15 years	10 (29)
Above 15 years	4 (12)
Physicians	
0–5 years	24 (43)
5–10 years	11 (20)
10–15 years	6 (11)
Above 15 years	15 (27)
Physiotherapists	
0–5 years	2 (10)
5–10 years	1 (5)
10–15 years	6 (30)
Above 15 years	11 (55)

Figure 1 shows the mean pre- and post-test results of the participants.

The pretest score of the 118 healthcare professionals was 12.25 ± 4.147, and the mean posttest was 17.71 ± 2.415. The change between the pre- and posttest values was statistically significant ($p < 0.05$).

The comparisons between the pre- and post-test scores of each professional group were statistically significant ($p < 0.05$) (Table 3).

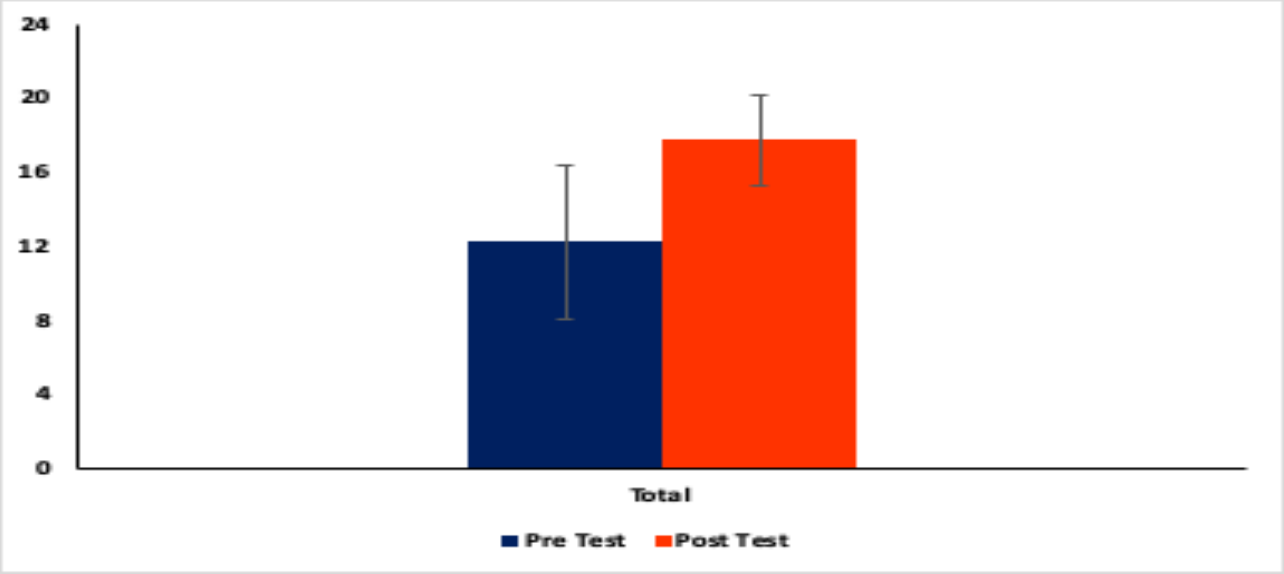

Figure 1. Results of paired t-test representing the mean pre- and posttest results of the 118 participants

Table 3. Comparison between pre and post test scores of each professional group

Profession		Score	t-test	p-value
Anesthesia Technologists	Pre-test	14.01 ± 2.138	7.64	0.0001
	Post-test	19.00 ± 1.069		
Nurses	Pre-test	12.59 ± 3.430	14.37	0.0001
	Post-test	17.47 ± 2.926		
Physicians	Pre-test	12.96 ± 2.867	11.26	0.0001
	Post-test	18.00 ± 1.742		
Physiotherapists	Pre-test	9.00 ± 4.834	6.83	0.0001
	Post-test	18.40 ± 2.092		

Discussion

The availability of trained healthcare professionals is essential during a pandemic crisis, such as COVID-19, and is necessary for optimal functionality in healthcare settings. Our center's scenario was similar to that of other hospitals globally, where highly specialized staff are necessary for the functioning of ICUs and cannot be replaced readily.[16] We agree with other authors who have rightly stated that the critical shortage of health professionals, such as nurses and RTs, is a limiting factor of any disaster relief effort and especially in a healthcare crisis such as COVID-19.[17]

RTs are frontline professionals who provide critical care to fight the COVID-19 pandemic; our educational intervention mobilized expertise to meet the needs of providing this essential care. We rapidly reacted to the COVID-19 crisis by developing a clear plan to support the RTs and train backup personnel. The newly trained personnel continued to improve their respiratory care skills while on the job and were granted more independence by the supervisory RT and intensivists as their skill levels increased. The government of the Emirates supervised a strategic response of rigorous disinfection and sterilization. The COVID-19 surge in the Emirates was reduced after testing centers were created, and a public communication strategy was developed. ICU admissions of patients with COVID-19 decreased, and the trainees were deployed back to their primary areas of practice. The epidemiology of COVID-19 shows that a subsequent wave of the pandemic could be even worse than the first, so our readiness plan is to keep these respiratory trainees prepared by continuing periodic training sessions.

We suggest that other countries could benefit from similar programs undertaken by their health departments.[17-20] Medical students could also be trained to mitigate acute staffing crises and support essential care providers such as RTs.

The significance and sacrifice of RTs never attracted public attention, and hence were known as the unsung heroes. And unfortunately, the pandemic became an eye-opener for the healthcare industry to realize the inevitable role of RTs in diverse care settings.[21]

This project is continuing with a strategic plan to have more ICU nurses as a back-up support for the RTs, in case if there occurs another pandemic surge. The plan is in the implementation phase with 10 senior ICU nurses have already been trained in the advanced aspects of respiratory care.

Limitation

This project trained non-respiratory professionals and equipped them with the skills required to support the RT workforce on an emergency basis. This training project started within 2 days of its planning, and our initial focus was to deploy skilled professionals to ICUs; we did not plan to publish an account of this project. Hence, the first 34 trainees of the first group were not included in the statistical analyses because of the lack of a pretest. We did not statistically analyze the training competency checklist, as it was more subjective for training and quality improvement purposes.

This training initiative could provide a valuable model for other centers around the world, where training could help to overcome the staffing crisis and support skilled professionals during pandemics.

Conclusion

Pandemics such as COVID-19 negatively impact human health, education, and businesses, and create a crisis in healthcare staffing. We understood the need to support our RT workforce, as they are the essential frontline workers during this pandemic. Developing this training program was part of an emergency response to the pandemic. Our training program was planned and implemented within only 2 days.

We showed that we could train 152 healthcare professionals to support respiratory therapy services, and we could rely on them during this unexpected crisis. Therefore, we conclude that our training project met its objectives.

Financial disclosures: This project was funded by SEHA.

Conflicts of interest: None.

Acknowledgments: The authors would like to acknowledge and thank all the healthcare professionals who were and are tirelessly involved in fighting the COVID-19 pandemic. We express our deep gratitude to the Leadership Team of the Allied Health Department in the SEHA, especially the Respiratory Therapy Department, for being the frontline warriors in combating this pandemic and saving the humankind.

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