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Original Contributions

Simulated End-of-Life Care for Respiratory Therapy Students: A Qualitative ReviewJessica D. Fino, EdD, RRTRandy D. Case, PhD, RRT, RRT-NPS
Leadership Qualities in Respiratory Therapy: A Review of Student Perceptions <i>Tammy</i> R. <i>Kurszewski, DHSc, RRT, RRT-ACCS</i> <i>Jessica D. Fino, EdD, RRT</i> <i>Donna D. Gardner, DrPH, RRT, RRT-NPS, FAARC</i>
A Qualitative Needs Assessment Study on Workforce Development of Respiratory Therapists in Singapore Ivan Gerald Lee, EdD, RRT-NPS, RRT-ACCS, RPFT
Ventilator Graphics Interpretation Confidence and Knowledge Among Respiratory Therapy StudentsChasity Brescia, MSRC, RRT, RRT-ACCS, RRT-NPS, RPFTAmanda M. Dexter, MS, RRT, CHSEKimberly M. Clark, EdD, RRT, RRT-NPS, RRT-SDS, RPFT, RRT-ACCS, FAARC 28
Prevalence and Factors of Imposter Syndrome Among Health Science Students:A Scoping ReviewErica L. Judie, DHSc, RRT, RRT-ACCSTammy R. Kurszewski, DHSc, RRT, RRT-ACCSRandy D. Case, PhD, RRT, RRT-NPS

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Simulated End-of-Life Care for Respiratory Therapy Students: A Qualitative Review

Jessica Fino, EdD, RRT Randy D. Case, PhD, RRT, RRT-NPS

Abstract

Background: Providing a comprehensive curriculum for respiratory therapy (RT) students, including coping mechanisms and strategies for dealing with end-of-life care, is essential. End-oflife care is a topic often not included in traditional RT curriculums. One strategy to teach end-of-life issues is with high-fidelity simulation. Simulation provides an opportunity to offer realistic end-oflife experiences in the educational setting. Purpose: This qualitative study focused on discovering themes associated with respiratory therapy students' perceptions of their coping strategies based on end-of-life simulation experiences. Methods: A focus group discussion was carried out with 14 current respiratory therapy students after exposure to simulation requiring end-of-life skills specific to a respiratory therapist. Data obtained were reviewed for qualitative thematic analysis utilizing a phenomenological approach. Results: Analysis of qualitative data resulted in the identification of three primary themes associated with coping strategies for end-of-life care: Communication and interactions with others, situational reflection, and avoidance or separation from the situation. **Conclusions:** The coping strategies expressed by the participants correlated with potential learning opportunities experienced in end-of-life simulation activities. Future learning opportunities should include communication exercises, time for personal reflection, a review of coping skills and emotional stressors, and strategies focusing on acceptance and management of end-of-life situations. End-of-life simulation experiences allow students to prepare for providing end-of-life care while also developing coping strategies such as those identified in this study.

Keywords: Thematic analysis, end-of-life care, coping strategies, simulation, respiratory therapy, students, focus groups, qualitative

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Introduction

Experiencing the death of a patient is an unavoidable aspect of working in health care; however, dealing with end-oflife issues is an area that has been identified as lacking in the curriculum of many health care education programs.^{1,2} In the hospital setting, respiratory therapists (RTs) are often members of the critical care or rapid response team, requiring them to be involved with end-of-life care.3 There are several tasks associated with end-of-life care that may require the assistance of an RT as well as other members of the health care team, regardless of whether they feel prepared to do so or not. For example, the termination and removal of life support are considered primary responsibilities of the RT.^{3,4} Providing this level of care can be challenging for RTs who have just started their careers or even for the more experienced therapist. Therefore, it is imperative that respiratory educational programs incorporate end-of-life care and coping strategies related to the lived experiences of working as an RT.^{4,5} These efforts will better prepare students for working with patients who are actively dying. They will also aid in the development of healthy coping mechanisms to balance the stresses associated with this type of care.

End-of-life Education

Strategies for teaching and preparing students for end-oflife care have often included traditional lectures, simulationbased experiential learning activities, and providing some level of a support group or reflective exercises related to clinical experiences.^{1,2,6} Traditional lectures provide an opportunity to ensure that students are provided end-of-life education in a formal setting. However, this delivery format may not evoke the sense of realism needed to prepare students for the emotions, stress, and grief that are often associated with death and dying. Simulation provides an effective means for teaching end-of-life care that is better suited for enhanced realism and the emotional complexity that may be encountered in the clinical setting.7 Throughout health care education, the use of high-fidelity simulation has been shown to improve confidence and understanding with various skill sets, including palliative and end-of-life care.⁶⁻⁸ However, sudden simulated death is an area of simulation that has been debated among educators and simulation designers. Some educators believe this type of simulation scenario results in undue stress among students without being directly linked to a learning objective.9 In the hospital setting, the RT may care for a patient that is declining in health, allowing for the health care team and family to prepare for the patient's death. Yet, there are many times the RT is called to care for a patient experiencing an unplanned health crisis resulting in sudden death. Studies have shown that the biochemical stress markers among students during a simulation experience in which sudden death occurred resulted in no change between simulator death and simulator survival.^{10,11} Therefore, one can argue that sudden death simulations should be considered when teaching end-of-life care skills within respiratory education.

Coping Mechanisms

Health care providers approach end-of-life care with varying levels of experience, professional education, and personal beliefs. As expected, this can lead to the development of different coping mechanisms and strategies for dealing with the death of a patient. In many situations, students in health care look to their clinical preceptor for guidance on how to handle certain clinical situations. When it comes to managing the death of a patient, students admit that it is difficult to manage their own emotions and find balance with how they should react based on those around them.¹² RT students are regularly involved in providing end-of-life care alongside their clinical preceptor, which can be a stressful and emotional experience. Likewise, health care providers and their students are also called upon to balance their own emotions while also supporting the family or friends of the patient.¹³ In a study identifying coping mechanisms among RTs who have experienced a patient's death, acceptance, experience, support, and separation were the common themes.¹³ Similarly, there is a need for additional end-of-life education and experiences with families and members of the care team to help minimize the distress and moral discomfort among RTs when withdrawing care.¹⁴ RT students must begin to develop their own range of coping mechanisms in order to continue to provide this type of care. However, these coping strategies are not something that can be found in a book or simply taught in the classroom.

Purpose Statement

The purpose of this study was to examine the use of highfidelity simulation when incorporated into a cardiopulmonary dynamics course as a training tool for end-of-life care education among respiratory therapy students. Additionally, this study was meant to gain a better understanding of how respiratory therapy students cope with death and provide end-of-life care on a regular basis, having experienced an increased number of deaths during clinical rotations due to COVID-19. This study was designed to answer the following: What coping skills were most frequently utilized when providing end-of-life care among respiratory therapy students? This study will contribute to the expansion of simulation research as well as death and dying coping strategies within respiratory therapy education.

Methods

Procedure

Prior to the initiation of this study, IRB approval was obtained. Participants for this study included a convenience sample of senior respiratory therapy students enrolled in a cardiopulmonary dynamics course. Participants aged 18 and above were recruited using an introductory course announcement outlining the purpose of the study and participation requirements. Communication with participants addressed the voluntary nature of participation, and that it would not have any bearing on the participants' grades or performance within the course. The inclusion criteria for participation were all students currently enrolled in the course who had participated in the end-of-life simulation scenarios.

The students were treated as one group where exposure to simulation occurred equally for all students, ensuring that the students had the same exposure to all learning experiences within the course. Following the simulation, students were asked to participate in a focus group to share information from their experiences. Consent was implied by their voluntary attendance in the focus group, resulting in 14 participants.

A qualitative thematic analysis was used that followed a phenomenological approach. An interpretive phenomenological approach was deemed appropriate for this study, as the primary aim was to obtain a greater understanding of caring for dying patients through the lived experiences of the students and high-fidelity simulation.¹⁵

End-of-life Simulation

High-fidelity human patient simulators were used for this exercise. The simulation was embedded in a course that was taught over a period of 16 weeks, with a primary focus on obtaining Advanced Cardiac Life Support (ACLS) certification. All course materials and simulation experiences were taught by the respiratory faculty. Two end-of-life simulation scenarios were incorporated into the final module of the course content. The first simulation was a sudden cardiac event of a patient in the emergency department, in which prior patient history was unknown. Students were informed that a 40-year-old male patient collapsed while playing golf and had lost consciousness for at least 20 minutes. Students assumed appropriate roles based on ACLS guidelines to continue the emergency code event. An actor was included in this scenario to assume the role of the patient's wife. After several minutes of failed resuscitation attempts, the code was terminated. The second simulation involved the terminal extubation of a 79-year-old male who had experienced a stroke three days prior. Students were informed that recent testing showed an increased cerebral bleed and decreased brain activity. All sedation had been removed with no signs of patient improvement. Additionally, the family requested that they would like to transition the patient to comfort measures only. The patient's room was staged with plants, getwell cards, child-like drawings, and family photos. Two actors were included in this scenario to play the role of the patient's son and daughter-in-law. Students were tasked with completing the extubation, providing oxygen via nasal cannula, and interacting with the patient's family. A debriefing session followed the simulation experiences, in which students were encouraged to discuss their general feelings regarding the scenarios. Debriefing questions included: (1) Was the information provided before the scenario enough for you to know what was expected of you? (2) What elements of this scenario went well? Or didn't go as well as hoped? (3) What were the key considerations learned from this experience? (4) How did the death of the simulated patient make you feel? (5) What coping skills did you draw from when providing end-of-life care?

Instrument and Data Collection

The method of data collection for this study was a focus group of respiratory therapy students. The focus group was hosted by two respiratory faculty as the primary researchers, one facilitating the questions and the other taking notes. Participating students were assured that their willingness to share information was voluntary prior to the initiation of the discussion. The discussion was guided by open-ended questions designed to address the student's coping skills when providing end-of-life care and the impact of family members' presence when utilizing these coping skills (See Appendix A). Recordings and notes were taken during the focus group sessions to ensure precise documentation of the students' statements. After the completion of the focus groups, the recordings were transcribed verbatim and carefully reviewed by both researchers to ensure the accuracy of the data. No additional or follow-up data collection procedures were conducted in an effort to maintain the participants' immediate responses and perceptions of the end-of-life simulation exercise.

Data Analysis

Thematic analysis was carried out using the qualitative analysis software QUIRKOSTM. Using a conventional content analysis approach, codes were developed based on content, responses, and beliefs. The codes were then grouped into thematic categories to establish major and minor themes based on the focus group observations.¹⁵ To provide increased precision, two outside analysts were utilized to review the developed codes and themes. The analysts convened to assess discrepancies, resolving differences through in-depth discussion and negotiated consensus. A comprehensive review was conducted by both researchers to develop a thematic map and potential connections between categories.

Results

A total of 14 students participated in the focus group for the purpose of this study. The focus group consisted of 11 female students and three male students. All students had completed didactic and clinical coursework to be classified at the senior level. All students self-reported as having participated in at least one or more emergency code procedures during a clinical rotation. Additionally, all students self-reported as having been involved in providing end-of-life care; however, one student reported that they had not taken part in a terminal extubation.

Data analysis resulted in the identification of three common themes relating to the coping strategies most often used by the students: (1) communication and interaction, (2) situational reflection, and (3) avoidance or separation from the situation. The model below (Figure 1) demonstrates the various themes identified within the study group.

Figure 1: Thematic Map of Coping Strategies



Theme 1: Communication and interaction with others

The theme of communication was found to be the most widely used coping strategy among the study's participants. Students discussed the importance of open lines of communication and the ability to discuss traumatic events, such as the death of a patient, with others. Students expressed their need to talk about these types of situations with a variety of people including family members, friends, God, and other respiratory therapists.

Participant 2: "...call my grandparents because they are RTs or my dad, who is a police officer. They tell me to go to the bathroom, collect myself, and do five minutes of deep breathing." Participant 3: "I believe in God and talk to him in situations like that."

Participant 9: "...talk to my mom because she is also a health care professional, and we talk about it (death) a lot."

Participant 12: "Talking with the families in the room and using them as emotional support to bring comfort to the situation."

Participant 14: "... talking to the families is important, but (it) is hard for me to do. So I watch how the doctors do it."

Theme 2: Situational Reflection

Several of the participants within the focus group discussed the importance of reflecting on the situation as a form of coping as the second most common coping strategy. Students conveyed the significance of taking an opportunity to think about the emergency situation and how it was conducted. This would potentially allow for potential growth and development in similar situations.

Participant 6: "I take a 20-30 minute reflection of what happened and what I did. The good and the bad."

Participant 11: "I take a moment to say a prayer for them and say to myself that we did what we could."

Participant 13: "... reflecting with the family or other caregivers can make the situation easier."

Theme 3: Avoidance or separation from the situation

As another form of coping, participants stated that avoidance and separation from the situation are often used as a form of coping when dealing with the death of a patient. Within the focus group discussion, students expressed that separating their responsibilities as a clinician and their emotional well-being was an important strategy to use.

Participant 4: "...separate myself so that I don't feel what they are feeling so I can continue on throughout the day."

Participant 7: "This is the most difficult thing for me to do...I cry depending on the situation and excuse myself. Working as a student I see lots of deaths, and I go sit in the stairwell for like five minutes. I think you have to separate your work life from your real life, or it's going to make you sad thinking about it all the time."

Participant 8: "I think I have gotten numb to the situation (death). I don't feel that I am cold-hearted, but I feel like it's my job, and that's what I am here to do."

Participant 10: "...the code situation was difficult with the family right there, having to explain what is going on. If possible, I try to leave before family is brought in."

Discussion

Providing end-of-life care is a task that most health care providers will encounter at some time in their careers. However, some disciplines are tasked with this type of care much more frequently than others, such as respiratory therapists. Research has supported the need to include death and dying education into the respiratory therapy curriculum. However, the current climate of health care and associated struggles from the COVID-19 pandemic have solidified the need to prepare students for encountering the death of a patient. The students in this study completed all clinical rotations during a time that would be considered impacted by COVID-19 (Fall 2020-Spring 2022). During this time frame, the National Center for Health Statistics reported a peak death rate of 237.7 per 100,000 within the state of Texas.¹⁶ Within this context, this study has shown that these students have developed coping skills similar to more experienced therapists, such as separation from their personal life, acceptance of the inevitable, and seeking support from others.^{5,13} Separation or withdrawal from the reality of the situation is often utilized within these types of situations as an avoidance tactic. For a number of participants in this study, avoiding and/or separating themselves from the emotional aspects of the death and dying process was a profound form of coping. However, others within the study believed it was more beneficial to actually reflect on the situation as a form of coping. Within this strategy, some participants believed the reflective component allowed them the opportunity to learn and grow from the experience. Others believed the reflective strategy was based more on the acceptance of the inevitable and understanding that death is a natural process. A significant number of the participants in the study expressed their need to communicate and talk with others as a coping mechanism. These types of interactions were specifically related to those in close contact with the participants, such as family, friends, or co-workers. Similarly, previous studies have also found that health science students generally seek opportunities to discuss these types of stressful events with others as a way to manage the emotions associated with the death and dying process.¹

Although family interaction was regarded as a coping mechanism for some of the participants in this study, an area that the students reported as difficult to manage during the simulation experience and at clinic was their preparedness to interact and communicate with the family members of the dying patient. This may also be a result of these students having completed their clinical rotations during surges of COVID-19 infections, as many hospitals restricted visitors, which significantly impacted the student's ability to interact with those outside of the immediate care team. However, existing research (pre-COVID) as reported by Grandhige et al¹⁴ found that only 30% of RTs felt comfortable discussing end-of-life care with families. In a study by Leighton⁹, it was determined that one of the advantages of simulated death and dying experiences was having the opportunity to practice communicating with a dying patient as well as the patient's family members. Implementing these types of simulation exercises has the potential to impact the respiratory therapy student's use of effective coping skills when discussing end-of-life care with a patient's family.

Limitations

This study does present possible limitations. One limitation is centered on the participants within the study. The study utilized respiratory therapy students from one program in Texas; therefore, results cannot be generalized to all respiratory therapy students across all programs. Second, the study was conducted by the participants' current professors. This could have altered some responses based on what the students perceived as preferred answers. Additionally, the students' perceptions of coping skills are based on a simulation exercise. This could alter the views, perceptions, and actions of the students when compared to an actual patient death. Although simulation is not the same as real-life patient encounters, the use of simulation may help to increase student exposure to end-of-life skills.

Recommendations

Recommendations for further research regarding this study should focus on utilizing a more varied group of student participants. Ideally, future studies could incorporate students from varying respiratory therapy programs across the United States. This would allow a more generalized and comprehensive representation of the respiratory therapy student population. A potential recommendation for future studies could include alternative methods for data collection. This could allow for differing themes to emerge within the study or provide consistency with the themes identified in this study. Another recommendation would be the implementation of multiple simulation exercises and activities pertaining to the death and dying experiences. Providing students with a variety of endof-life simulations could support a more robust and thorough evaluation of the students' perceptions.

Conclusion

There is no "right way" for a health care provider to handle the death of a patient, whether it be a student encountering their first death or an RT with years of experience. There are numerous factors that contribute to how an individual learns to cope with death and dying. Despite the value of the lived experiences that the students are provided through their clinical rotations, not every end-of-life situation is the same. Therefore, there is a need to provide opportunities for students to encounter various end-of-life experiences in the learning environment. Highfidelity simulation provides an element of realism that can evoke similar emotions among participants while also allowing educators the ability to influence the experience to improve end-of-life skills.^{2,17} End-of-life simulation experiences allow students to prepare for these challenging situations while developing coping strategies that will benefit them not only as a student but also for years to come.

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Appendix A

Survey

- 1. What coping skills do you use when caring for a dying patient?
- 2. What was your experience with using coping skills in these scenarios?
- 3. How do different patient populations impact your ability to cope with providing end-of-life care?
- 4. How did the presence of family impact your ability to perform these tasks or utilize your coping skills?

Leadership Qualities in Respiratory Therapy: A Review of Student Perceptions

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Abstract

Background: Limited research exists specific to leadership qualities among respiratory therapy leaders. A qualitative study of student perceptions of leadership traits within respiratory therapy was completed. Students interviewed respiratory therapy leaders to expand their knowledge of professional leadership characteristics. The study aimed to identify student perceptions of leadership qualities prevalent within the field. Methods: IRB approval was obtained from Midwestern State University (MSU) and filed with Texas State University (TSU). A semi-structured interview guide was developed with questions specific to leadership in respiratory therapy. Students from two Texas baccalaureate programs used this guide to interview leaders during the 2019-2021 academic years. Student data were obtained from a written assignment detailing their perception of leadership qualities. After interviews were completed, student (n=120) identifiers were anonymized, and assignments were uploaded into an online qualitative data analysis program for thematic content analysis. Results: Saturation was obtained after 36 submissions: 18 from MSU and 18 from TSU. Analysis identified three dominant themes: individual leadership qualities, professionalism, and continuing education. Leadership themes were related to communication and accountability. Themes associated with professionalism were professional organization membership, relationships, and reinvesting in the profession. Continuing education was linked to growth through education, taking advantage of learning opportunities, and constructive criticism. Conclusions: Students identified three primary themes: individual leadership qualities, professionalism, and continuing education. Respiratory therapy education programs may consider the inclusion of identified key leadership themes in future leadership courses. Future respiratory therapy leaders may consider these areas when pursuing leadership roles.

Keywords: Leadership qualities, Student perceptions, Respiratory therapy, Professionalism, Qualitative research, Education

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Introduction

Respiratory therapy (RT) students are the future leaders of the profession. Yet, students may not fully grasp the actual value of being a professional leader. Leadership is sometimes seen as mystical and even undefinable; however, recognizable when encountered.¹ Unlike management, leadership does not always have an accompanying title or official role. Very simply, a good leader is defined as someone others want to follow.² Without set expectations and guidelines, it is difficult for RT educators to develop course objectives that encompass all the aspects of effective leadership.

Leadership courses taught in baccalaureate awarding programs teach students about health care reimbursement and leadership skills for serving on interprofessional teams.³ The leadership competencies for graduate RT students before graduation include: functioning as a team member, decisionmaking, effective written and verbal communication, and health care finance.⁴ Yet, how do students learn about leadership characteristics or qualities needed in RT leadership?

Leadership qualities are widely studied and vary extensively; however, limited research exists specific to identified leadership characteristics. Existing research has identified effective health care leadership characteristics as emotional intelligence or the ability to interact with others, possess a vision, and an understanding of "health care business."⁵ Despite existing research, there is a paucity of information specific to leadership skills, knowledge, or characteristics within respiratory therapy.

Purpose

The purpose of this study was to identify and determine student perceptions of leadership qualities and characteristics that are most prevalent within the profession of respiratory therapy. Ha and Pepin⁶ reported that health care leadership could be taught through interaction and observation of role models. This study seeks to share student insights associated with current professional leadership in respiratory therapy through individual interviews with RT leaders.

Methods

Data Collection

Prior to data collection, IRB approval was obtained from Midwestern State University (MSU) and filed with Texas State University (TSU). This study used a secondary dataset obtained from a leadership interview assignment conducted by respiratory therapy students enrolled in the Bachelor of Science in Respiratory Care (BSRC) programs at these Texas universities. The leadership interview assignment was conducted initially during the 2019-2020 and 2020-2021 academic years. Prior to analysis, all information was anonymized for the purpose of this study.

Leadership Interview Assignment

A semi-structured interview guide was developed specifically to address professional leadership in respiratory therapy. Students were assigned to an individual leader who volunteered to participate in the leadership interview assignment. These leaders were chosen from the Coalition for Baccalaureate and Graduate Respiratory Therapy Education (CoBGRTE), Texas Society for Respiratory Care (TSRC) Board of Directors, American Association for Respiratory Care (AARC) Board of Directors, and House of Delegates (HOD) as well as national respiratory therapy educators.

Semi-Structured Interview Guide

The interview guide items were used to engage and encourage interaction between students and leaders in respiratory therapy. The items were of specific interest to leaders within the health care industry. The interview guide included these items specific to respiratory therapy: (1) identification of current role/position, (2) leadership roles within respiratory therapy professional organizations, (3) natural ability versus learned leadership, (4) behaviors and character traits associated with a successful leadership career, (5) decision-making skills, (6) strategies for criticism, opposition, or failure, (7) continued motivation, and (8) rationale for leadership in respiratory professional organizations (Appendix A).

Data Analysis

A general inductive approach was utilized to analyze the data from the leadership interview assignment. A total of 120 interviews were obtained from the secondary dataset, which more than satisfied the number necessary to reach data saturation for this specific study.⁷ Thematic analysis serves two functions; first, to identify common themes concerning the project and second, to establish the importance of each theme by examining its recurrence in the data.⁸ The qualitative data analysis software program QuirkosTM software (<u>www.quirkos.com</u>) was used for coding and thematic analysis. Once completed, thematic mapping was done to describe common themes and sub-themes and identify any connections between the individual responses. Quotes were utilized to describe the themes and their connections to the subthemes.

Results

Of the 120 assignments, total thematic saturation was achieved after 36 (18 from MSU and 18 from TSU) projects were uploaded. Open coding resulted in the identification of three emerging themes: (1) individual leadership qualities, (2) professionalism, and (3) continuing education, with subanalytical themes of communication and constructive feedback, accountability, professional organization membership, relationships, educational opportunities, and reinvesting in the profession, shown in Figure 1.

Figure 1. Thematic Map of Respiratory Leadership Characteristics



Theme 1: Individual Leadership Qualities

Qualitative analysis of the interview assignment revealed a variety of leadership characteristics associated with the respiratory therapy profession. Thirty-three students (92%) cited at least one quality associated with a successful leadership style. Two significant sub-themes related to individual leadership qualities emerged from the analysis: communication and accountability.

Communication

Eighteen students (50%) highlighted the value of communication as a key characteristic in health care leaders, with ten (55.6%) noting communication as critical on more than one occasion. Timely availability and ease of access were frequent subjects noted. Four students (11%) noted the need for emotional intelligence as a key leadership trait in the following:

"Trying to understand the route of their opposition is essential because it helps the whole situation not be misinterpreted or miscommunicated."

"Emotional intelligence is absolutely vital for leading teams."

Twelve students (33%) commented on the importance of an inclusive dialogue:

"Great leaders allow other people's voices and opinions to be heard."

"She relies heavily on her associates that she can talk with about her ideas."

"Effective decisions are made through collaborative efforts."

Gathering complete information and including key stakeholders were identified as valuable characteristics of a health care leader by five students (14%). Two students noted an appreciation for an honest, transparent communication style. Two other students further noted an overall preference for a participative style leader.

Accountability

Eleven students (31%) identified accountability as a desirable trait in a health care leader. Ten students (28%) highlighted the term "integrity" as an essential concept associated with accountability. One student noted the value of good character, selflessness, and the ability to handle failure with grace as critical characteristics associated with a successful leader. Students also stated the following:

"A true leader does not put themselves first; they will do what is best for the group they are leading."

"The leader needs to care for the group and make sure they are first and be willing to sacrifice their own identity and personal initiatives to move the group forward."

Eleven students (31%) noted the value of a clear-cut sense of direction and the ability to make decisions. These students identified the value of high standards and consistency in the decision-making process as critical components of successful leadership.

"Set high standards and let everyone know your expectations. If you expect the minimum, they will only do the minimal."

"Being able to make decisions is an absolute necessity."

"Even no decision is a decision."

One student reflected that being indecisive as a health care leader could be a "death sentence." Another student added, "*a* strong decision-maker has the ability to make change and move the profession forward."

"One may not be able to change the world, but we should strive to improve the lives of those we come in contact with, leaving it better than we found it."

Seventeen students (47%) noted the importance of accepting criticism and reflection as part of the leadership role. One

student further referenced the value of constructive criticism in the evolution of memorable leaders within the industry.

"Leaders take personal accountability for their work; they contribute and generally deflect success to the team rather than themselves."

"In times of criticism, opposition, or failure, he believes that a good leader should approach each topic to gain a better understanding."

Theme 2: Professionalism

Twenty-seven (75%) students clearly identified professionalism as one of three outstanding leadership themes. Critical elements associated with professionalism were noted to be involvement in professional organizations, relationships, and reinvesting in the profession.

Professional Organization Membership

The role of professional organizations as a component of leadership within the respiratory care profession is clearly defined. Over half of the students (56%) recognized this role and identified being a member of a professional organization as an essential element of success in a respiratory care leadership role. Twenty students (56%) mentioned the importance of professional organizations on the local, state, national, and international levels. One student explained:

"As a member of the American Association for Respiratory Care Board of Directors, he is able to influence the future of my profession."

Other students noted:

"Everyone should have a stake in the game, and everyone's opinion should be counted."

"How is the profession ever going to move forward if people aren't involved?"

"Be the change you wish to see are words to live by."

Relationships

Twenty-five students (69%) identified the need for successful leaders to build relationships both within respiratory therapy and outside the discipline.

"For some decisions, data is simply not available; experience and collaboration with others are vital."

"Everyone has something special to bring to the table."

Seven students (19%) specifically discussed the value of mentorship as a leader within the profession of respiratory therapy.

"Find a mentor but find someone that you really enjoy talking to, that you respect, that is a known leader in our profession, and then use that person to meet other people and reach out."

"Listen to others who are willing to take the journey with you."

These seven students directly linked membership within professional organizations and the development of a robust, successful professional network.

Reinvesting

Another sub-theme identified was the belief that leaders should have a grateful nature and emphasize reinvesting in the profession. Twelve students (33%) identified the value of giving back or reinvesting with the following comments:

"One has to have the desire to serve and give something back to the profession."

"She strives to make an impact with her position and knows that what she is doing is meaningful, important, and making a difference."

"She loves what she does and believes we can make a difference."

Lastly, but maybe most importantly, one student added:

"If you want to improve patient care or increase access to RT care, get involved!"

Theme 3: Continuing Education

Ongoing Learning

Thirty-one students (86%) identified continued growth and ongoing learning as fundamental leadership traits for respiratory therapy leaders. An inquisitive nature and thirst for additional knowledge are two components of strong leaders. Students explained:

"Talented musicians and artists are born with a God-given gift, but the most successful ones also spend their lives practicing, rehearsing, and studying to become even better."

"Great leaders are constantly evolving and changing along with health care."

"The one thing that took me the furthest.... I asked why?"

Five students also explicitly recognized learning from failure (14%). The following comments were provided:

"Everyone has failures, but it is those failures that help us learn and grow to help us become better in whatever we are doing."

"It does not matter how many times you fail; what matters is what you learn from each failed attempt."

Discussion

This study focused on identifying student perceptions of professional leadership as part of a leadership interview project assigned in a senior-level course within the RT curriculum from each university. This study's focus on the students' observations as part of the interview process necessitated data analysis that was thematic and interpretive. Emerging from the research analysis, three distinct themes were identified: individual leadership qualities, professionalism, and continuing education. Identification of critical leadership characteristics can inspire future graduate respiratory therapists. Knowledge and awareness of instrumental leadership traits may further stimulate interest in a new generation of RT leaders. The questions included in the interview guide were developed for the student interview assignment and sought to identify common traits and characteristics of those established in leadership roles within the field of respiratory therapy. Interpretations of these data allowed for a greater understanding of the student's perception of leadership in the health care industry.

Individual Leadership Qualities

Leadership was identified as one of the essential competencies for future respiratory therapists by the second AARC 2015 and Beyond Conference.⁹ Merriam-Webster defined leadership as the power or ability to lead.¹⁰ A substantial majority of students noted leadership qualities to be a significant element necessary for success in an executive role. To lead successfully, students reported several interviewees identified value of two essential skills: communication and accountability.

Excellent communication skills were identified as a dominant characteristic by students associated with the interview project. The significance of communication went well beyond access. Students noted that communication was valued for transparency and ultimately led to a greater degree of trust with the leadership team. An open dialogue, as well as active collaboration, fueled an environment of collegiality and teamwork. The value of interprofessional communication was also noted as an element of communication essential for effective leadership in the health care setting.⁴ The students cited excellence in interprofessional collaboration as a precursor to the development of an outstanding health care leader. An additional aspect of communication, emotional intelligence, was mentioned as an advanced skill of a qualified health care leader. Emotional intelligence is defined as "a set of emotional and social skills that influence the way we perceive and express ourselves, develop and maintain social relationships, cope with challenges, and use emotional information in an effective and meaningful way."11 The value of clear and concise communication in the health care environment should not be ignored as future health care leaders enter the field.

Students also emphasized the value of accountability as a primary leadership quality. A level of trust was essential in developing relationships and ultimately establishing open communication. The value of communication was identified as a primary leadership element as part of the interview project. Students perceived these two characteristics as interconnected and valuable in developing new health care leadership talent.

Professionalism

Although identified as a specific theme within the study, professionalism was directly linked with leadership qualities. Students identified the value of engagement in a professional organization, building professional relationships, and giving back to the profession as critical qualities of successful leaders. A majority of students reflected on the value of membership in professional organizations while mentioning the AARC, state societies chartered through the AARC, such as the TSRC, the NBRC, and the CoBGRTE. Professional organizations encourage and promote professional excellence, advance the science and practice within the profession, and serve as an advocate for patients, their families, the public, and the health care professional.¹² Students also identified the value of professional organizations in creating relationships with "likeminded" individuals. Professionalism, more specifically noted as membership in professional organizations, lends itself naturally to the concept of building professional relationships and reinvesting in the profession. This study highlighted the value of reinvesting or service to the professionals with an emphasis on mentorship. Students reflected on the importance of mentorship as a specific quality highlighted by a large number of respiratory therapy leaders. The desire to move the profession forward through building a network of connections while ultimately building relationships with other leaders was identified as an important leadership trait.

Continuing Education

Health care is in a state of constant evolution, with new knowledge and technologies available on a daily basis. Ates & Alsal¹³ stressed that a lifelong, voluntary, and self-motivated pursuit of knowledge should be driven by personal and professional reasons. Students identified the concept of the lifelong learner as a key quality of the leadership interview project. Qualitative analysis identified this theme among the most important within the study. The ability to make knowledgeable informed decisions was noted to be essential in the role of an RT leader. The desire to continue to seek additional learning and maintain up-to-date knowledge within the field was also seen as a desirable attribute.

Limitations

This study was limited to two respiratory therapy programs from Texas and involved only baccalaureate-level students. Additional limitations noted include the potential for student sample bias in answers and self-selection bias by the interviewer. Interview guide questions could also influence interviewee responses.

Recommendations

A comprehensive study inclusive of RT educational programs at the associate, baccalaureate, and master entry level from a wider geographic area would be useful. A broader perspective of leadership qualities from a larger sample group could provide valuable insight into future respiratory therapy leadership characteristics. Respiratory therapy education programs may consider the inclusion of identified key leadership themes in future leadership courses. In addition, a review of the interview guide to include topics such as finance and quality improvement may also add value.

Conclusions

This qualitative study focused on discovering themes associated with student-reported respiratory therapy professional leadership qualities that were believed to have value and meaning for future therapists as well as other clinicians in the health care industry. This project allowed students to interview professional respiratory therapy leaders to expand their knowledge and insight into professional leadership characteristics. According to the 2020 AARC Respiratory Therapist Human Resource Survey¹⁴, one-half of those surveyed expect to depart from the field by 2032. It is vital that educators and respiratory leaders work together to develop future leaders within the profession. The addition of these critical leadership elements to future leadership courses within the RT curriculum may assist in the development of emerging health care leaders. Inspiring potential respiratory therapy directors through increased awareness and knowledge may be the key to advancing the RT profession. Future respiratory therapy leaders may consider these areas when pursuing leadership roles.

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Appendix A

Survey

- 1. Do you think leadership is personality-driven or a learned skill?
- 2. What behavior, or character traits, would you recommend my engaging in and developing in order to ensure a long and successful leadership career?
- 3. As a leader, how do you go about making decisions?
- 4. How have you handled times of criticism, opposition, or failure? Do you have any advice to offer?
- 5. How do you stay motivated and inspired? Are there any tips you can give to help me in this area, especially over the long haul?
- 6. Why do you think it is important to be a leader in our professional organizations?

A Qualitative Needs Assessment Study on Workforce Development of Respiratory Therapists in Singapore

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Abstract

Introduction: Respiratory therapists (RTs) are integral members of multidisciplinary health care teams and work in a variety of health care settings with an emphasis on critical care. Despite being an established profession in the United States, the growth of the respiratory therapy profession globally has been subdued, especially in Asia, where there are limited RT training programs. Without a formal RT training program in Singapore, the local RT workforce heavily depends on foreign RTs. This study examines the contextual background of the RT profession through the unique perspectives of the RTs on their experiences and perceptions. Through the study, we can assess the current needs for professional growth and examine the awareness of a need for a change in the RT supply through the Awareness, Desire, Knowledge, Abilities, and Reinforcement (ADKAR) Model in Singapore. Methods: A qualitative case study approach with semi-structured interviews was conducted using an interview guide over a video-conferencing platform for 15 RTs currently working in Singapore. Results: This study identified major challenges for the profession, which include: (a) an unsustainable staffing supply, (b) an inadequate awareness and recognition of the profession, (c) an unregulated profession, and (d) antagonistic strategies threatening the future of the profession. Conclusion: Challenges notwithstanding, most participants in this study remain optimistic since the identified challenges can also be regarded as opportunities for the development and growth of the profession through the continued use of the ADKAR model to inform policymaking in Singapore.

Keywords: training program, respiratory therapy, Singapore

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Introduction

Respiratory therapists (RTs) are skilled clinicians trained extensively to care for patients with cardiopulmonary conditions. They are integral members of interprofessional health care teams. RTs can typically be found across various care settings in hospitals and are especially indispensable in intensive care units (ICUs), where they are primarily responsible for the care and management of critically ill patients on mechanical ventilation.¹⁻³ The origins of the profession of respiratory therapy can be traced to 1947 when the Inhalation Therapy Association was legally chartered as a not-for-profit entity in Illinois; in 2020, it exists as the American Association for Respiratory Care (AARC) in its sixth iteration.²

The educational requirements for RTs in the United States have steadily evolved from a minimum standard of diploma level to an associate degree entry-level for eligibility to practice.⁴ At present, more than 356 community colleges award an associate degree in respiratory therapy, close to 60 baccalaureate programs in universities award degrees, and several programs offer degrees at the post-graduate level.⁴⁻⁵ Despite the proliferation of respiratory therapy training programs and the growing recognition of RTs in the United States and Canada, the respiratory therapy profession is still in its infancy in Asia, where it is neither formally recognized nor easily available.⁶⁻⁸ Among the few countries in Asia that boast of having RTs in the public health care system, Singapore is the only country that does not have a formal respiratory therapy training program despite having RTs employed in all of its public hospitals since the early 2000s.^{4-6,9-11} The only sources of RTs in Singapore are Singapore citizens on fully-funded scholarships for training in accredited programs in the United States or those who are trained and credentialed in other countries.9 However, sending students to the United States to be trained and credentialed as RTs is neither ideal nor feasible as a long-term solution, especially because only five or fewer students are sent to the United States to be trained annually.

Currently, the public health care system in Singapore relies heavily on foreign RTs from the Philippines and Taiwan, making up over 90% of the RTs working in Singapore.⁹ This is unsurprising since Singapore ranks high among countries with high proportions of foreigners relative to its native population in the world.¹² The heavy reliance on foreign workers in Singapore has received increased attention due to a 2012 strike led by migrant bus drivers who disrupted mass transportation services in Singapore for two days.¹³ Even though a foreign health care worker strike in Singapore is highly unlikely, the insinuation that there can be a disruption in any critical service fulfilled by a foreign majority workforce compels a closer examination of the supply and demand for RTs in Singapore.

Studies have shown that RTs play an instrumental role in reducing the duration of mechanical ventilation and ICU length of stay for critically-ill patients in countries where the profession has been firmly established and entrenched in the health care delivery systems.¹⁴⁻¹⁹ With a relatively short history among the health professions in the United States, the profession of respiratory therapy has grown significantly over the past 60 years, with various established educational pathways for entry to practice.² This professional development and growth of RTs in the United States is also evident in Canada, where the profession has proliferated since 1964.7 In stark contrast, the professional development and growth of respiratory therapy in other countries have been slow and halting, which can be partly attributed to the fewer venues for formalized respiratory therapy training.^{6,9} Studies focused on the development of the respiratory therapy profession in China have also highlighted the importance of professional licensure to clearly define the scope of practice, which is pivotal for professional recognition and demarcation of clinical duties. The clarity of professional roles and responsibilities of any health care profession is critical to allow for professional recognition and the future possibility of role expansion and professional growth.^{6,20-21} It is within this frame that the profession of respiratory therapy in Singapore is considered, which is unique because, despite the introduction of the profession more than 20 years ago, a formal respiratory therapy program has not been established.⁹

Currently, there are no studies examining the effect on patient care that has resulted from not having an adequate supply of respiratory therapists in Singapore, nor has the development of the profession been profiled locally. While Singapore has been predominantly dependent on foreign sources for respiratory therapy staffing in the public health system, the current supply format may not be sustainable in the long run, with severe implications on the future trajectory of the profession. While it may be premature to suggest that a change in the way RTs are trained for practice in Singapore is unavoidable, it remains unknown if there is a collective awareness of the presence of a potential problem with the supply structure of RTs for Singapore. A thorough investigation will be needed to examine how RTs are trained and supplied for the public health care delivery system in Singapore because the current supply model of RTs is not sustainable, and the Awareness construct of the Awareness, Desire, Knowledge, Abilities, and Reinforcement (ADKAR) framework model will be appropriate to assess the current perceptions and experiences of RTs in Singapore to determine if there is consensus based on their unique perspectives about their profession and their working experiences.²²

Research Questions

Given the paucity of information about the respiratory therapy profession in Singapore, the findings from this study will provide a contextual background of the respiratory therapy profession locally. To this end, the following descriptive research questions were addressed:

- 1. What are the typical training and work experience background of RTs in Singapore?
- 2. What are the enablers to training and working as RTs in Singapore?
- 3. What are the barriers to the training and working as RTs in Singapore?
- 4. What are the advantages of having a respiratory therapy training program in Singapore?

Methods

An application for review was submitted and approved by A.T. Still University Institutional Review Board before participant recruitment, data collection, and data analysis were conducted. Participants were eligible for recruitment if they were at least 18 years of age and were RTs currently working in Singapore, and had been working in Singapore for at least three years. The study was performed through a qualitative case study approach with semi-structured interviews conducted using an interview guide (Appendix A) consisting of 20 questions and probes to explore, understand, and account for the participants' experiences and perceptions. To increase confidence that the questions were appropriately worded for eliciting information pertaining to the study research questions, the interview questions were revised for clarity following a pilot study. All the interviews were conducted by the principal investigator to ensure consistency in instrumentation and enable the collection of rich, in-depth data from the unique perspectives of RTs working in Singapore.

To promote the rigor and robustness of this qualitative study, the four-dimension criteria proposed by Forero et al. (2018), consisting of credibility, dependability, confirmability, and transferability, were adopted.²³ To achieve credibility, the interview protocol was tested through two pilot interview sessions. Following the pilot study, several questions were amended for clarity to promote the collection of more meaningful data and information. To support the study's internal validity, information collected from all interviews was summarized for the participants through member checking to ensure the main points were captured without any misinterpretation or misunderstanding by the interviewer. Additionally, the thematic analysis and interpretations were reviewed by a panel of respiratory therapy faculty members to increase the dependability and repeatability of the findings. The study methods also included a detailed audit trail established specifically for the comprehensive documentation of the data collection process. The criterion of confirmability was addressed through the implementation of a reflexive journal to increase the confidence that the interpretive findings would be confirmed by other researchers. As the invited participants were all RTs with a vested interest in the development of the profession, their collective views may be transferable to other settings. The thorough description of the context and situation will facilitate consideration of transferability to other professions and locations.

Following the completion of the interviews, the investigator transcribed the recorded interviews verbatim, and the transcriptions were imported into NVivo software for analysis. The Framework Method was used for the interpretive thematic analysis through a process of deductive coding (derived from the theoretical framework and research questions to understand change at an individual level) and inductive coding (emerging themes from participants' discussion) to identify themes generated from collected data and attribute meanings to the participants' experiences.²⁴ A word cloud was generated in NVivo to facilitate a visual content analysis of the overall text data collected (Fig. 1). Subsequently, the data were subjected to open coding to organize the data into a more coherent pattern and identify hierarchically-structured themes and concepts. The iterative process of data collection, coupled with both inductive and deductive coding during the data analysis phase, reaffirmed the detection of salient themes through the similar terms used by participants to describe their individual perceptions and experiences, as indicated in the word cloud. In some instances, pertinent word trees were also generated to depict the connection of words in the data collected to provide context and structure to the collected data, allowing for a graphical representation of themes identified through exploratory analyses (Fig. 2).

Figure 1. Salient word frequency in RTs' interviews. Larger words indicated more frequent use.



A QUALITATIVE NEEDS ASSESSMENT STUDY ON WORKFORCE DEVELOPMENT OF RESPIRATORY THERAPISTS IN SINGAPORE



Fig. 2. Word tree generated from text query on the key term "regulated." Text to the left occurs immediately before the key term, while text to the right occurs immediately afterward.

A codebook was created in NVivo to display the codes and descriptions used to categorize the data, and the following seven parent codes were created to help categorize responses from the participants: (a) Training experiences, (b) Working experiences, (c) Challenges, (d) Perceived impacts, (e) Formalization of profession, (f) Nursing educational initiatives, and (g) Opportunities for growth. Child codes were created to facilitate the examination of data at a more granular level through the specific topics and themes that diverged from the parent codes.

Results

A total of 15 participants were recruited for the study through convenience sampling. The responses given by the participants were similar, and topical saturation was achieved after the 10th participant was interviewed and the subsequent five interviews performed confirmed the attainment of saturation without new information being elicited. The number of years working in Singapore as a respiratory therapist for the participants ranged from 3 to 18 years (Table 1). Of the 15 participants, only two reported having attained a master's degree, with the majority of the participants having earned a bachelor's degree in respiratory therapy. The majority of the participants had less than 10 years of working experience in Singapore, with the exception of a female participant who worked in Singapore for 18 years. Over 60% of the participants in this study were female, and there were equal representations of participants from the three age groups of 20 to 29 years, 30 to 39 years, and 40 to 49 years. Over two-thirds of the participants (n=10) were citizens and had received their formal education as a respiratory therapist in the United States as sponsored by the government, compared to the non-citizen participants in the study. The demographic profile of the participants is similar to the allied health professionals working in Singapore; therefore, the research results from this sample could potentially be transferable to evaluate similar circumstances for other health professions in Singapore.

Data were categorically analyzed through a constant comparison approach to identify and classify themes associated

Table 1. Demographic Profile of	
Respiratory Therapist Responden	Its

Demographics	N	Percent
Gender		
Male	6	40
Female	9	60
Educational Level		
Bachelor	14	93.3
Master's	1	6.7
Years in respiratory care practice		
0 – 5 years	7	46.7
6 – 10 years	2	13.3
11 – 15 years	1	6.7
16 – 20 years	5	33.3
Years of practice in Singapore		
0 – 5 years	9	60
6 – 10 years	5	33.3
11 – 15 years	0	0.0
16 – 20 years	1	6.7

with the RTs' perception of their working and training experiences in Singapore, along with their concerns and needs as RTs working in Singapore. Salient themes were extracted from the coded data, and verbatim quotes from the participants were used to support answers to the research questions. Citizenship status and the varied training backgrounds of the participants notwithstanding, the emergence of themes did not differ substantially between citizen and non-citizen RTs in Singapore. Therefore, the results are presented for the entire group. Theoretical saturation was achieved during the analysis, with no new codes being generated after the analysis of 10 interviews.

The participants in the study overwhelmingly agreed on the need for the RT profession to be formally regulated and licensed in Singapore, as shared by one participant: *"If we can have a governing body that can regulate our profession, it will be a giant*

step forward for the profession in Singapore." Another participant also suggested that the establishment of a formal training program would make it more compelling for the profession to be regulated: "Especially if we were to have a school here graduating our own RTs, there is a bigger need to have licensure to regulate the profession." One participant highlighted the importance of achieving a common standard for the RT profession through the establishment of a formal RT training program, which will be instrumental in growing and developing the profession:

"The general lack of standardization definitely has an impact on us being able to grow our profession, because you cannot really ask for certain standards when you cannot guarantee it as well. So, I think having a local program will definitely allow us to control the standards of RTs, which will make a big difference for us to be able to grow."

In addition to expressing concern for the absence of clear demarcation and regulation of the profession to govern and license who can be qualified to perform respiratory care in Singapore, the participants also indicated there was inadequate recognition of RTs by other health care professions working in the hospital, as shared by one participant: "Not many people know our identity in the hospital as RTs, and they also do not really understand the importance of what we do, which makes it really difficult for us to do our jobs properly." The participants have also indicated an urgent need to address what they characterized as a severe lack of opportunities for professional growth as RTs, with one participant sharing: "I think the opportunities are lacking for us, just because people are not aware of what we are capable of doing, regrettably so."

Participants in this study also consistently reported feeling disrespected and undervalued in their professional careers, primarily due to the nursing educational initiatives introduced to address the shortage in RT supply. These initiatives aimed to upskill nurses to assume some of the responsibilities and duties performed by RTs in ICUs. As mentioned by one participant: "the group of local RTs who do not think the profession is worth staying for, so they eventually leave... Because they are not paid enough to suffer all the indignity and anger ... " Perhaps more importantly, the rationale for training nurses to provide respiratory therapy services rather than attempting to recruit or train RTs is unknown and has serious implications for the future of the RT profession in Singapore, as well as the lack of regulation for the RT profession in Singapore that was consistently cited as the main barrier for the RT profession in Singapore. As one participant poignantly summarized: "The truth is that this is a very precarious profession with a high attrition rate..."

All participants agreed having a strong foundation is fundamental to being a competent and proficient RT, despite the varying standards practiced in Singapore owing to the different training backgrounds of RTs in Singapore. RTs in Singapore experienced numerous barriers and challenges, such

as (a) an unsustainable manpower supply, (b) an inadequate awareness and recognition of the procession, (c) an unregulated profession, and (d) antagonistic strategies that threatened the future of the profession. The only enabler for RTs in Singapore is the support rendered by physicians and institutions that have helped the existence of RTs in hospitals, despite the numerous challenges faced by the profession. Challenges and barriers notwithstanding, important opportunities for growth were also highlighted by most of the participants, indicating that establishing a local training program would address the problem of unsustainable manpower supply, which is the main limiting factor for the growth of the profession. The other major emergent theme was the importance of regulating the RT profession, which would allow for the attainment of a common standard of practice for RTs in Singapore, which could promote increased awareness and professional recognition of the profession.

Discussion

The themes identified in this study were common to all of the study participants, suggesting the current limited RT workforce supply can be directly attributed to the absence of regulation for the respiratory therapy profession and the lack of a formal training program in Singapore. Collectively, both factors were identified by the participants as major obstacles impeding the growth and development of the RT profession in Singapore. According to the participants, the genesis of these circumstances can be traced to an over-reliance on foreign RTs to fulfill the demands for RTs in Singapore. The study findings underscore the existential circumstances implying a change is needed in the way RTs are recruited and trained for professional practice in Singapore, in addition to the sole reliance on recruitment from foreign training sources. The themes allowed for a better understanding and provided justifications as to why a change is necessary, as well as emphasized the dire consequences of not changing. These findings address the element of awareness in the Awareness, Desire, Knowledge, Abilities, and Reinforcement (ADKAR) framework model developed by Hiatt and used in this study to investigate the potential need for a change in the supply model of the RT workforce in Singapore and communicate that need to pertinent stakeholders and policymakers.²²

The absence of official licensure and regulation acceptance of RTs in China was also emphasized by Li et al. (2010) as a significant obstacle for the formal recognition and acceptance of the profession.⁶ Similarly, because the RT profession is not regulated through licensure in Singapore, there is an absence of a common standard scope of practice to legitimize what RTs can do in hospitals. Indeed, without a clearly delineated and defined role, RTs working in Singapore not only have to adapt to different expectations and standards practiced in different institutions but have also needed to rationalize their practice to physicians who may have been exposed to different practices in previous institutions. This places them in the position of having to persistently justify their existence within the Singapore health care system. An absence of regulation for the profession also conveys the notion that the respiratory therapy profession is not protected and anyone can easily replace RTs in their roles, as indicated by the nursing educational initiatives to upskill nurses to assume some of the roles performed by RTs. The inconsistency in the roles and responsibilities of RTs in Singapore can be directly attributed to the absence of formal licensure to regulate the profession, which was confirmed by the study performed by Micken et al. (2018), who found that the inconsistency in the roles and responsibilities of allied health assistants in Australia can be attributed to the absence of formal licensure to regulate the profession.²¹

The absence of opportunities for professional growth and the perceptions of being undervalued have been identified as prominent drivers for a career change for RTs in the United States, and these factors can also be extrapolated to be drivers for a career change for local RTs in Singapore as well.²⁵⁻²⁶ There was also fear among participants that the reliance on foreign labor for the Singapore RT workforce is resulting in an unsustainable manpower supply, further contributing to the considerably high attrition rate of RTs. One of the main reasons for an unsustainable manpower supply for the RT workforce can also be attributed to the reliance on foreign labor because numerous factors beyond the shores of Singapore can greatly affect and disrupt the supply model currently in place. A possible disruption in the foreign supply of RTs in Singapore can occur similarly to the disruption in international mobility for migrant workers during the COVID-19 pandemic.²⁷ This is not strictly conjectured as Singaporean students who were traditionally sent to the United States to be trained as RTs were unable to travel there due to the implementation of travel restrictions during the pandemic, and potential students were also discouraged and swayed from the prospects of flying to the United States for various political and safety reasons.²⁸

The inability to secure a steady supply of RT graduates for the workforce in Singapore has resulted in a precarious situation for respiratory therapy services. Services performed by trained and credentialed RTs are considered indispensable and essential for the critically ill in the hospitals, and any interruption or deficit in respiratory care services may be potentially disastrous for patients and the collective health care system.¹ The challenges and barriers identified in this study collectively indicate a potentially grim future for the profession in Singapore unless the current supply model changes. Ultimately, the various challenges and barriers encountered by RTs in their professional work, and indeed, by the collective RT profession as a whole in Singapore, can also be optimistically viewed as opportunities for growth if these issues are strategically and systematically addressed.

Fundamentally, the findings from this study underscore the importance of achieving a common standard of practice for RTs through regulation and licensure of the profession, which will provide for progress in terms of professional acceptance and recognition in the health care system in Singapore. While it would be overly simplistic to say that all the issues discussed would be easily solved with the regulation of the profession, it is the first step to positively address them. While the findings from this study indicate overwhelming support for the establishment of a formal training program for RTs in Singapore, the participants widely believe this to be the ultimate solution to address the issues of over-reliance on foreign labor for the local RT workforce, which, in turn, will address the issue of unsustainable manpower supply for RTs in Singapore. This is understandably insufficient and inadequate for the authorities to take action on, and additional studies are needed to make a more compelling case. This is especially true since the "development of a field of study depends upon the level of inherent demand for skill sets or knowledge, community interests, and possible benefits to the participants and community."29 However, having a formal training program for RTs in Singapore would likely aid in firmly establishing a common standard of practice by training students for their specific role as RTs in Singapore's health care system. It could also potentially broaden the career advancement opportunities for RTs seeking to pursue careers in academic positions and job scopes beyond the ICUs.^{6,21,29}

Limitations

The nature of qualitative research is inherently dependent on the researcher, and the primary limitation of this study can be attributed to possible researcher bias. Specifically, because qualitative research is more readily influenced by any personal biases and idiosyncrasies the researcher may have, the interpretation of the study findings may be affected.³⁰⁻³¹ To mitigate this, reflexivity was practiced by the researcher throughout data collection and analysis. This was especially necessary because of the emic approach adopted by the researcher as an insider with shared professional experiences as the study participants. Central themes were reviewed by the researcher and a physician not involved in this study for other possible explanations and interpretations for the findings but did not yield additional plausible ones.

Furthermore, the literature review only included English articles from peer-reviewed journals, and potentially valuable literature about the status of the respiratory therapy profession in China and Taiwan may have been unintentionally excluded. However, all attempts were made to exhaustively review pertinent studies. Finally, by focusing only on RTs currently working in public health care institutions, the study did not include RTs working in non-clinical positions in corporate entities, whose work experiences and perceptions may have differed greatly.

Recommendations

Given that RTs do not work in silos, but in a team-based setting across the ICUs in Singapore, further qualitative study of the perspectives of physicians and nurses related to the respiratory care needs of patients and hospitals in Singapore is needed. Particularly, their perceptions about establishing formal licensure to regulate the RT profession in Singapore are crucial to understanding if they recognize or agree on the need for a change in the supply model to fully ascertain the feasibility of such a change through increased awareness of the situation. A follow-up study can also include their views related to establishing a formal training program for RTs in Singapore. Furthermore, major themes from this study can form the basis of a quantitative study performed to assess the responses from all RTs in Singapore through a mixed-methods study to triangulate data sources or a quantitative study to attain a more representative view of the collective profession about the issues identified in this study. Following the completion of the first objective of the awareness of the need for a change in the ADKAR framework model, the logical next step would be to perform a study to investigate the Desire for such a change in the supply model of the RT workforce in Singapore for all the pertinent stakeholders.22

Conclusion

While there exists a paucity of literature concerning the status of the respiratory therapy profession in Singapore, this exploratory study has provided insights into the various challenges and enablers encountered by RTs working in Singapore, highlighting their chief concerns of poor professional recognition and inconsistency in roles and expectations resulting in having their duties assumed by other health care workers. The main challenges identified by the participants were widely believed to have resulted due to the absence of formal regulation and licensure for the RT profession in Singapore. The varying standards of RTs and the lack of professional recognition were also thought to be further exacerbated by the highly diverse RT workforce originating from varying working and training backgrounds. The study participants agreed that the overreliance on foreign sources for the local RT workforce is the main reason why the current RT supply model is unsustainable, consequentially impeding the development and growth of the RT profession locally. Perhaps more importantly, this study has increased the awareness of the unsustainable supply model of the RT workforce and the possible consequences of not implementing change in the training and employment process for RTs in Singapore.

This study has also identified several implications for RTs working in Singapore due to the unique circumstances in which the profession exists in Singapore. It was apparent during the participant interviews that the day-to-day realities of working as RTs can often be demoralizing and difficult, especially when most participants cited the constant need to justify and defend their job scope. They described this as exhausting and often extracting an emotional toll. Several participants also expressed regret that the future of the RT profession in Singapore appears to be bleak due to a perception of instability and uncertainty. This outlook was attributed to the main challenges identified. Challenges notwithstanding, most participants in this study remain optimistic since the identified challenges can also be regarded as opportunities for the development and growth of the profession through continued use of the ADKAR model to inform policymaking pertaining to the supply and training of respiratory therapists in Singapore.

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Appendix A

Interview Guide

Thank you for agreeing to participate in the research study titled "Educational and Workforce Development for Respiratory Therapy in Singapore: A Qualitative Needs Assessment Study."

As you may know, results from this study can be used to inform strategies for improving opportunities for professional growth and development of RTs in Singapore, as well as ascertaining the feasibility of the establishment of a formal training program for RTs locally.

This study has been reviewed by the Institutional Review Board at A.T. Still University and is qualified and approved for the exempt status, effective from Oct. 14, 2020. To maintain your confidentiality and anonymity, you have already been assigned a unique identification number upon enrollment in this study, and the list with the participants' names and identification numbers will be maintained in an encrypted file on a password protected computer in the lock-secured office.

During the interview session, I may look down from the camera to take notes, and if I do so, please continue talking. If you need a break, you can also let me know as well. If you have no questions, we will proceed with the interview.

Education and Training

- 1. How did you first learn about the profession of respiratory therapy?
 - What motivated you to pursue a career as a respiratory therapist?
- 2. Please describe to me your clinical experiences as a respiratory therapy student?
 - How has your training program helped you to prepare for a career in respiratory therapy?
- 3. If you could, what would you change about the respiratory therapy curriculum you received?
 - Why? (Why not?)

Working Experiences

- 1. How did you end up working in your current place of employment as a respiratory therapist?
- 2. Please describe to me your job scope and responsibilities as a respiratory therapist in your current place of employment.
- 3. Please tell me how the work experiences you have had in Singapore differ from the clinical experiences you had either as a student or as an RT in other countries?
 - Do you prefer your current RT job scope in Singapore compared to what you have experienced in other countries?
 - Why? (Why not?)

4. Have you worked in more than one hospital in Singapore? If so, how have your working experiences varied?

Facilitators and Barriers

- 1. What are the barriers and challenges you have encountered as a respiratory therapist in Singapore?
 - How have these challenges and barriers affected your work as a respiratory therapist in Singapore?
 - What did you do to change/address these challenges?
 - PROMPT: If NIL; what do you believe would have been the optimal thing to do to reduce or eliminate the challenge/barrier?
- 2. What are the enablers to your work as a respiratory therapist in Singapore?
 - How did you capitalize on these enablers for your professional growth as a respiratory therapist?
 - PROMPT: If NIL; what would you have liked to do?
- 3. What are the positive impacts of practicing respiratory therapy in Singapore on your career?
- 4. What are the negative impacts of practicing respiratory therapy in Singapore on your career?

Opportunities for Growth

- 1. How do you see the current status and outlook of the respiratory therapy profession in Singapore?
 - What specific experiences have you had to support your opinion?
- 2. Can you describe to me how RTs are currently supplied to the workforce in Singapore?
 - Is this supply model sustainable?
 - Why or why not?
- 3. What do you believe the profession of respiratory therapy will be like in Singapore in the next 10 years?
 - Why do you think this might happen?
- 4. What do you see as the opportunities for growth for the profession of respiratory therapy in Singapore?
- 5. How do you think the COVID pandemic has affected the profession of respiratory therapy and its reputation in Singapore?
 - Why is that so?
- 6. RTs have been a core member of the ICU in Singapore for the past 2 decades, and Singapore does not have formal training programs for RTs. Do you think the lack of formal training for RTs in Singapore has affected the development of the profession?
 - Why or why not?

- 7. There have been at least 2 public hospitals in Singapore that have tried to train nurses to assume some of the responsibilities of RTs in Singapore.
 - How do you feel about that?
 - Why do you think that is?
- 8. What are your professional development plans for the next 5-10 years?
- 9. What else would you like to share about your perceptions, training, and working experiences as a respiratory therapist?

Ventilator Graphics Interpretation Confidence and Knowledge Among Respiratory Therapy Students

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Abstract

Background: Education to identify and resolve patient-ventilator asynchrony (PVA) may expand clinical knowledge and potentially decrease mechanical ventilator days. Waveform education may provide respiratory therapists the ability to analyze asynchronies, improve patient outcomes, and decrease health care costs. Objective: The purpose of this research study was to assess the confidence and knowledge of students enrolled in a respiratory therapy associate degree (AS) program and students enrolled in a respiratory therapy degree advancement (DA) program to correctly identify modes of ventilation, PVA, and lung compliance and airway resistance issues using mechanical ventilator waveform graphics. Methods: A survey research design involved respiratory therapy students from 10 community colleges and one university. An online, multiplechoice assessment tool was made available to approximately 85 AS students and 190 DA students. Participants were asked to complete the assessment tool by recognizing ventilator modes, common asynchronies, and lung compliance and airway resistance issues. Results: A total of 49 students participated, with 27 AS students and 22 DA students. Confidence and knowledge in interpreting ventilator waveform graphics were similar between AS and DA students. The overall mean score was 6.76 (SD=2.17) out of a possible 10. Independent t-tests revealed no significant differences between AS and DA students for the total score or subscale scores. Conclusions: Confidence and knowledge in interpreting ventilator waveform graphics to identify PVA were similar between AS and DA students participating in this study. Experience, as defined by AS students compared to DA students with one or more years of respiratory therapy experience, does not appear to be a factor in correctly interpreting ventilator waveform graphics.

Keywords: respiratory therapy education, registered respiratory therapists, degree advancement, mechanical ventilation, patient-ventilator asynchrony, ventilator waveform analysis

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Introduction

The management of mechanical ventilation by respiratory therapists is a cornerstone in the treatment of acute and chronic respiratory failure from a wide range of medical or surgical etiologies. Properly managing patient-ventilator interaction may help reduce unnecessary complications associated with positive pressure ventilation. Patient-ventilator asynchrony (PVA) occurs when there is a mismatch between the timing of the patient's breathing effort and the ventilator response to that effort.¹ Optimizing mechanical ventilation through a reduction in PVA is fundamental in this regard. Unfortunately, PVA is ubiquitous and often goes undetected.

Holanda et al.² described common types of PVA related to triggering, cycling, and flow. PVA can occur during any phase of the breath cycle. Trigger asynchronies include ineffective triggering, double triggering, and auto-triggering. Cycle asynchronies include premature and delayed cycling. Flow asynchrony results from the insufficient or excessive inspiratory flow. PVA is common throughout mechanical ventilation and may occur in 25% to 80% of mechanically ventilated patients.^{3,4} Failing to address PVA may lead to discomfort, sleep disruption,⁵ increased need for sedation,⁶ increased time on mechanical ventilation, increased length of stay in the ICU,^{7,8} and increased mortality.^{8,9}

Respiratory therapists are primarily responsible for the initiation and management of mechanical ventilation under the direction and supervision of a physician. Respiratory therapists have an essential role in monitoring the patient-ventilator interaction and detecting PVA. Respiratory therapists receive formal academic training in mechanical ventilation that includes learning concepts and theory with application in laboratory and clinical settings. However, research suggested only 16% to 28% of practitioners, including respiratory therapists, correctly analyzed ventilator waveform graphics.^{10,11} Algahtani et al.¹² found that approximately 39% to 47% of respiratory therapists in Saudi Arabia were able to correctly identify common PVA types. Ineffective triggering was identified correctly most often, followed by double triggering and then auto-triggering. Gardner et al.¹³ reported that only 10.5% of registered respiratory therapists could correctly identify all four PVA types presented (missed trigger, flow asynchrony, auto triggering, and double triggering), with not quite 60% able to identify a single PVA. Findings from previous research suggest a gap in knowledge and understanding of how to use ventilator waveform graphics to identify PVA. The gap in knowledge may suggest that more instruction and training are needed to equip respiratory therapists working in critical care with the tools necessary to mitigate PVA.

Barnes et al.¹⁴ indicated that respiratory therapists must be proficient in operating various modes of ventilation, understanding the physiology associated with the modes,

understanding the various approaches to monitoring, evaluating ventilator waveform graphics, and recommending ventilator adjustments to reduce PVA. Furthermore, these competencies should be achieved prior to graduation and entry to practice.¹⁵ Barnes et al.¹⁶ found that nearly all respiratory therapy entry-level AS programs taught students how to apply all ventilator modes (96%), interpret ventilator data (95%), and make recommendations based on waveform graphics and pulmonary mechanics (94%). These findings were slightly lower than respiratory therapy baccalaureate degree programs, but the differences were not statistically significant. Based on this information, one may conclude that the competencies are being achieved as recommended. However, as previous research suggested, practicing respiratory therapists are not proficient in correctly identifying PVA.¹⁰⁻¹³ These findings suggest a discrepancy may exist between what respiratory therapy students are being taught regarding recommended ventilator competencies and how this is being applied in practice. Respiratory therapy DA programs are the next step for AS degree graduates to provide greater depth in their knowledge and skills.

Detection of PVA can be accomplished by analyzing the three common scalar waveform graphics that include pressure vs. time, flow vs. time, and volume vs. time.¹⁷ The purpose of this research study was to assess the ability of students enrolled in an AS program and students enrolled in a DA program to correctly identify modes of ventilation, PVA, and issues related to lung compliance and airway resistance using mechanical ventilator scalar waveform graphics.

Methods

This study used a non-probability, descriptive survey research design to collect data. Prior to data collection, Institutional Review Board approval was obtained through the participating university and community college Institutional Review Boards. Informed consent was included at the beginning of the online assessment tool prior to participation in the study. Participant recruitment was conducted by contacting the program directors of each respiratory therapy program to request their assistance in distributing the study invitation announcement and link to access the assessment tool.

Study Participants

Students enrolled in their second year of AS respiratory therapy programs in a large community college system, and students enrolled in university-based baccalaureate and graduate respiratory therapy DA programs were invited to participate in the study. There were 14 community college AS programs and two university-based DA programs available at the time of this study. All 14 community college AS programs were contacted, with 10 agreeing to distribute the study invitation to their second-year students in their last semester of the program. The remaining 4 AS programs did not participate due to COVID-19 restrictions. The one university contacted to participate agreed to distribute the study invitation to their DA students. Each program director emailed students the study invitation that included a link to the assessment tool in SurveyMonkey. The lead investigator did not contact the study participants directly, but study participants could contact the lead investigator with questions or concerns regarding the study. Approximately 85 AS and 190 DA students were invited to participate in the study.

Instrumentation

Participants were asked to indicate the degree they were seeking and to select the range of years of experience working as a practicing respiratory therapist. An option to select "none" was provided for AS respiratory therapy students. Confidence and knowledge in using ventilator waveform graphics to identify modes of ventilation and PVA were evaluated with an 11-item assessment tool. Confidence in interpreting ventilator waveform graphics was measured with one 5-point rating scale item, with scores ranging from 1 =not at all confident to 5 =very confident. Ten ventilator waveform scenarios and corresponding multiplechoice items were used to measure knowledge in interpreting ventilator waveform graphics for a total possible score of 10. Waveform scenarios selected were determined by a review of the literature and competency recommendations for respiratory therapists. Common PVA types were selected based on previous studies cited in the literature assessing respiratory therapists and other ICU health professionals' ability to interpret ventilator waveform graphics.^{10,11,18} Ventilator waveform graphics depicting modes of ventilation and issues related to compliance and resistance were included to assess foundational knowledge expected of respiratory therapists and required for interpreting more complex ventilator waveform graphics.^{14,16}

The Hamilton G5 simulator (Hamilton Medical AG, Switzerland) was used to produce the ventilator waveform graphics presented in this study. Depictions of 4 basic modes of mechanical ventilation were included: pressure control, pressure support, volume control, and synchronized intermittent mandatory ventilation (SIMV). Three PVA waveform graphics representing ineffective triggering, double-triggering, and auto-PEEP were presented followed by three waveform graphics for lung compliance and airway resistance identification. AS and DA students participating in the study were asked to select the best answer from multiple-choice items containing one correct response and three distractors.

Statistical Analysis

IBM SPSS 27.0 statistical software (Chicago, IL) was used for data analysis. Descriptive statistics were used to present response frequencies and percentages. The median and interquartile range were used to report confidence in interpreting ventilator waveform graphics. Two-tailed independent t-tests were conducted to analyze differences between groups by degree (AS vs. DA) on the dependent variable of participant total and subscale scores on the assessment tool. Data were evaluated for missing values, normality (skewness and kurtosis), and outliers. Bonferroni correction was used to adjust for multiple comparisons. Internal consistency for the multiple-choice items was measured using Kuder Richardson 20 (KR20) test. Tests were considered statistically significant if the p value was less than .05. Bonferroni correction adjusted statistical significance for a p value less than .0125 with four comparisons.

Results

A total of 49 students returned a completed assessment; 27 (55.1%) were enrolled in an AS program, 10 (20.4%) were enrolled in a baccalaureate DA program, and 12 (24.5%) were enrolled in a graduate DA program. The students enrolled in the DA programs were practicing registered respiratory therapists (RRTs), with 70% indicating 11 years or more of experience as a clinician. Confidence in interpreting ventilator waveform graphics did not vary between AS and DA students (Md=3, IQR=2), indicating the study participants were somewhat confident.

The average total score on the ventilator waveform assessment for all participants (n=49) was 6.76 (SD=2.17), ranging from the lowest total score of 2 to the highest total score of 10, with only two participants achieving a total score of 10. Of the ventilator modes, pressure control was correctly identified most often (73.5%), while pressure support was correctly identified least often (49%). Slightly over 40% of all AS and DA students were able to identify all four ventilation modes, whereas nearly 50% could only identify two or fewer modes (Table 1). For students enrolled in AS programs, 37% (n=10) identified all 4 ventilator modes correctly, while 3.7% (n=1) could not identify any modes correctly. A higher percentage but the same number of DA students (45.5%, n=10) identified all four modes, but 18.2% (n=4) could not identify any ventilation modes (Figure 1).

PVA caused by auto-PEEP was more likely to be identified by all AS and DA students (85.1%), and ineffective effort was identified least often (65.3%). Of the AS students, 51.8% (n=14) identified all three PVA types compared to 45.5% (n=10) of DA students (Table 2). All AS and DA students could identify at least one PVA. Identifying issues related to lung compliance and



Figure 1. Number of Correctly Identified Ventilator Waveform Graphics by Degree Program

Table 1. Percent of Participants Correctly Identifying
Ventilator Modes

Ventilator Mode	Total (n=49)	AS (n=27)	DA (n=22)
Pressure Support	49.0%	48.2%	50.0%
SIMV	67.4%	66.7%	68.2%
Volume Control	71.4%	77.8%	63.7%
Pressure Control	73.5%	74.1%	72.7%
Note. SIMV = synchronized intermittent mandatory ventilation			

Table 3. Percent of Participants Correctly Identifying Changes in Lung Compliance and Airway Resistance

Patient-Ventilator Asynchrony	Total (n=49)	AS (n=27)	DA (n=22)
Lung Compliance (COPD)	62.2%	59.3%	59.1%
Lung Compliance (IPF)	55.1%	44.4%	68.2%
Airway Resistance (Kinked ETT)	67.4%	70.1%	63.3%
Note: COPD = chronic obstructive pulmonary disease, IPF = idiopathic pulmonary fibrosis, ETT = endotracheal tube			

Table 2. Percent of Participants Correctly Identifying
Patient-Ventilator Asynchrony

Patient-Ventilator Asynchrony	Total (n=49)	AS (n=27)	DA (n=22)
Auto-PEEP	85.7%	81.5%	90.9%
Ineffective Effort	65.3%	63.0%	68.2%
Double Triggering	79.6%	88.9%	68.2%

Table 4. Means, Standard Deviation, Independent T-Tests for Ventilator Waveform Graphics Subscales

Assessment Sub-Scales	AS Students (n=27) M (SD)	DA Students (n=27) M (SD)	t-test
Ventilator Modes	2.67 (1.77)	2.55 (1.63)	.771
Patient-Ventilator Asynchrony	2.33 (.78)	2.27 (.78)	.787
Lung Compliance/ Airway Resistance	1.74 (1.02)	1.95 (.79)	.425
*p<.05 Bonferroni adjusted p value = .0125 Note. M = mean, SD = standard deviation			

airway resistance was more challenging for AS and DA students in this study. Increased airway resistance caused by a kinked endotracheal tube (ETT) was identified by most of the AS and DA students. Decreased lung compliance caused by pulmonary fibrosis was recognized the least often (55.1%) by all students (Table 3). Only 25.9% (n=7) of AS students and 27.3% (n=6) of DA students could identify all three lung compliance and airway resistance problems using ventilator waveform graphics.

Visual inspection of the descriptive statistics suggested that students performed similarly when interpreting ventilator waveform graphics regardless of the degree program. Independent t-tests were performed and revealed no significant differences between AS students (M=6.74, SD=1.89) and DA students (M=6.74, SD=1.89) in total scores, t(47)=0.051, p=.961. Comparison of subscales for ventilator modes, PVA types, and lung compliance and airway resistance issues were not statistically significant by degree program (Table 4).

Internal consistency of the multiple-choice items was evaluated using the KR20 test. Multiple-choice items were coded into dichotomous choices. Internal consistency for the 10 total items was .607. The subscales of ventilator modes, PVA, lung compliance, and airway resistance revealed internal consistency values of .714, .178, and .227, respectively.

Discussion

This descriptive research study assessed confidence and knowledge in interpreting ventilator waveform graphics to identify PVA among students enrolled in AS and DA respiratory therapy programs. The majority of AS and DA students reported their level of confidence in interpreting ventilator waveform graphics similarly, as "somewhat confident." This finding is different from a previous study indicating that respiratory therapists in Saudi Arabia rated themselves as highly confident; however, their ability to correctly identify PVA was limited.¹⁸ The author expressed concern that a perceived high level of confidence may result in respiratory therapists not engaging in additional educational opportunities to improve their knowledge of PVA.

AS and DA students performed better in identifying PVA compared to ventilator modes and issues related to lung compliance and airway resistance. Auto-PEEP was identified with the highest frequency, followed by double triggering and then ineffective effort. When comparing the groups, DA students scored higher on auto-PEEP compared to AS students, who scored highest on double triggering. AS students identified ineffective effort least often (63%). Similar results were found in DA students who identified ineffective effort and double triggering only 68.2% of the time. Mohammed¹⁸ found that about 80% of respiratory therapists in Saudi Arabia identified double triggering, which is higher compared to the DA students (RRTs) in this study. Ramirez et al.¹⁰ reported that health

care professionals (physicians, nurses, and physiotherapists) identified double triggering most often (58.2%) compared to ineffective effort (48.6%). Alqahtani et al.¹² found that respiratory therapists identified ineffective effort most often (47.4%), followed by double triggering (42.1%). The results of this study fall within the range of previous research.

The majority of AS and DA students in this study identified all 3 PVA types presented, with more DA students (81.8%) compared to AS students (51.9%). Neither group had anyone who could not identify at least 1 PVA. Gardner et al.¹³ indicated that only 10.5% of RRTs in their study identified all 4 PVA types presented, while approximately 15% identified 2 PVA types, but none identified 3 PVA types. In addition, Mohammed¹⁸ found that less than 2% of respiratory therapists identified all 5 PVA types presented, followed by 11.8% for four types and then 26.1% for three types.

Of the three categories of ventilator waveform graphics, identifying issues related to lung compliance and airway resistance was the most challenging for AS and DA students in this study. AS and DA students were more likely to identify increased airway resistance caused by a kinked endotracheal tube. AS students identified decreased compliance associated with idiopathic pulmonary fibrosis less often, while DA students struggled to identify increased compliance caused by COPD. A surprising finding in this study was the inconsistency of AS and DA students correctly identifying mechanical ventilation modes. The majority of AS and DA students identified volume control, pressure control, and SIMV. However, pressure support was identified only about half of the time in both groups. The authors cannot definitively explain why participants in this study had difficulty identifying pressure support since there was no pattern detected in the participants' selection of the incorrectly identified modes. One possible explanation may be that newer modes of mechanical ventilation are replacing pressure support as the primary mode for weaning. Lack of regular use of pressure support in weaning from mechanical ventilation may lead to less recognition over time. Recent research suggests that newer modes (i.e., volume support ventilation, proportional assist ventilation) are significantly more effective in terms of weaning success compared to pressure support in reducing weaning time, the number of patients requiring re-intubation, ICU length of stay, and days on mechanical ventilation.¹⁹⁻²¹

In comparing AS and DA students' total scores and subscale scores for modes of ventilation, PVA types, and issues related to lung compliance and airway resistance, no statistically significant differences were found in this study. One might expect that DA students, who are RRTs with experience in clinical practice, might perform better. However, on the other hand, AS students in their last semester may have recently covered relatable topics and had supervised instruction during clinical rotations on mechanical ventilation that includes ventilator waveform graphics and detection of PVA. Previous research has explored prior critical care experience and specific training related to ventilator waveform analysis and detection of PVA as factors influencing the number of PVA types detected; however, the results were mixed. Mohammed¹⁷ found that neither experience nor training were significant factors. More recent research indicated that prior training on ventilator waveform graphics and PVA detection was a significant factor in the number of PVA types detected while prior critical care experience remained not relevant.^{12,13}

Kacmarek²² highlighted the expectation that respiratory therapists should be experts in all areas of mechanical ventilation, including technical aspects of the mechanical ventilator, modes of ventilation, initiation, and adjustment of mechanical ventilation, disease-specific management, analysis of ventilator waveform graphics, identification and correction of PVA, and provision of lung protective strategies. Furthermore, Kacmarek²² emphasized that in addition to being experts in mechanical ventilation, respiratory therapists should be the ones to provide consultation for all other health professionals in this area.

The expectation for respiratory therapists to be experts in mechanical ventilation and be proficient in the majority of recommended critical care competencies before graduation may be challenging considering several barriers that exist in overcoming the gap in knowledge. This study and previous research have demonstrated gaps in knowledge among AS and DA students in using ventilator waveform graphics to identify common PVA types. Mohammed¹⁸ reported that several barriers exist, such as lack of knowledge and experience, limited responsibility and autonomy, sedation levels, staffing shortages, and increased RRT workloads. Unfortunately, failure to close the knowledge gap will continue to result in poor outcomes for patients on mechanical ventilation.⁵⁻⁹

While there are several studies assessing the ability of respiratory therapists and other health care professionals to correctly identify PVA with ventilator waveform graphics, this is the first study, to the authors' knowledge, assessing the ability to interpret ventilator waveform graphics identifying mechanical ventilation modes, PVA, and issues related to lung compliance and airway resistance among AS and DA respiratory therapy students.

Limitations

This study has several limitations. First, the study assessment tool was developed using screenshots of ventilator waveform graphics without including any patient information or other monitoring parameters. Second, the assessment tool was selfadministered without any controls over participants being able to use available resources to potentially find waveform graphics similar to the ones used in the assessment tool. Third, this study targeted a small population of respiratory therapy students enrolled in AS and DA programs located in one state. The sample size was small and may not be able to detect statistically significant differences. However, the findings are consistent with recently reported studies. Fourth, there were four respiratory therapy entry-level AS programs that did not participate in the study due to the onset of the COVID-19 pandemic. However, the AS students participating were in the last part of their final semester in the program. While the onset of the pandemic may have altered the remainder of their educational experience, students are typically finishing up competencies and preparing to graduate at that point in the semester. The authors do not believe that the COVID-19 pandemic negatively impacted AS students' knowledge and confidence levels in interpreting ventilator waveform graphics. Finally, the assessment tool used in this study has limited internal consistency. The overall internal consistency for the assessment tool was moderate, with some improvement on the ventilator mode subscale, but the PVA and lung compliance and airway resistance subscales had poor internal consistency. Caution should be taken in interpreting and attempting to generalize the results to the larger population of respiratory therapy AS and DA students.

Conclusion

AS and DA respiratory therapy students performed similarly on interpreting ventilator waveform graphics to identify ventilator modes, PVA, and issues related to lung compliance and airway resistance in this study. The overall inconsistency in AS and DA students' ability to interpret ventilator waveform graphics is concerning and warrants further investigation to determine additional instruction and training needs in respiratory therapy entry-level and degree advancement education programs as well as continuing education. This study, along with previous research, highlights the need to place more emphasis on closing the knowledge gap and achieving the expectations of respiratory therapists as experts in all aspects of mechanical ventilation.

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Prevalence and Factors of Imposter Syndrome Among Health Science Students: A Scoping Review

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Abstract

Background: The aim of this scoping review is to analyze existing literature associated with imposter syndrome (IS) among students in health science studies, including graduate and undergraduate students, in order to identify the prevalence of IS occurrence, contributing factors, and opportunities for future research. Methods: A scoping literature review was conducted focusing on IS in health science students. Search terms were entered into PubMed, CINAHL, and Google Scholar without date or geographic restrictions. Two reviewers independently screened studies and identified 16 publications meeting the inclusion criteria. The authors independently performed qualitative and quantitative synthesis consistent with best practice recommendations for scoping reviews. Inclusion and exclusion criteria were determined through discussion. Included articles were summarized in a data extraction table for presentation in an understandable way (Appendix A). Results: Dependent on the screening tool and symptom assessment, prevalence rates of IS varied from 29.5% to 51%. Impostor syndrome was frequently observed in both men and women, although more predominantly in women. Impostor syndrome was also found to have a definitive correlation with psychological traits such as anxiety, depression, low self-esteem, poor self-efficacy, and perfectionism. **Conclusions:** IS is present and on the rise among health science students. An in-depth understanding of IS would provide guidance for faculty in health science education programs at both the undergraduate and graduate level.

Keywords: Imposter(or) syndrome, Imposter(or) phenomenon, Mental health, Medical students, Health science students, University students, Undergraduate, Graduate

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Introduction

Imposter syndrome (IS), also known as imposter phenomenon, was identified over 40 years ago in research by Clance & Imes¹ and described as a psychological experience of intellectual and professional fraudulence. Individuals suffering from IS have a distinct fear of exposure as "frauds" with a perceived inability to replicate their success.² Those suffering from IS frequently demonstrate an inability to realistically assess their competence and skill level. They often attribute success to external factors such as luck and downgrade their own performance. Additional characteristics associated with the syndrome are issues with self-doubt and self-sabotaging behaviors.²

University health science students pursue high-stakes career pathways filled with anxiety-provoking assignments and expectations. Competence and performance are stressed in the educational environment, with students developing a fear of failure secondary to a perceived negative outcome. The intensity of these stressors only elevates as they advance through their often-strenuous curriculums.

Imposter syndrome has been studied widely and from a variety of different perspectives. In an effort to evaluate the full impact IS has on university-based health science students, we conducted a scoping review in an attempt to identify relevant literature associated with the phenomenon. The purpose of this study was to perform a complete analysis of all published studies associated with IS in health science educational programs found in higher education. As health science students experience intense pressure to achieve, does imposter syndrome develop? What factors contribute to the development of this phenomenon?

Methods

Study Design

A scoping review is defined as a type of research synthesis that aims to map the literature on a particular topic or research area and provide an opportunity to identify key concepts, gaps in research, and types and sources of evidence to inform practice, policymaking, and research.³ This style of rapid review allows for quick analysis of research activity associated with a specific area of interest. As a best practice, we referred to Arksey and O'Malley⁴ to determine an appropriate framework for completing the scoping review. Essential steps for completion of the project were determined to be: (1) identifying the research question; (2) identifying relevant studies; (3) study selection; (4) charting data; and (5) collating, summarizing, and reporting the results.⁴

Identifying the research question

The dominant focus of this scoping review was to identify published research associated with IS in university health science students. An emphasis was placed on the identification of prevalence and attributes associated with IS in this specific student population. First and foremost, what is the prevalence of IS in university health science students? In addition, what are the most common factors that contribute to the development of IS? We placed focus on university health science students as a unique population secondary to the rigorous nature of the health science curriculum and perceived pressure for competency perfection.

Identifying Relevant Studies

A systematic search was conducted in February 2022 involving three electronic databases: PubMed, CINAHL, and Google Scholar. This search was noted to be inclusive of peer-reviewed journal articles focused on IS in university-based health science programs. Reviewers utilized the following Boolean search query: "imposter syndrome," "impostor syndrome," "imposter phenomenon," "imposter syndrome medical students," or "imposter syndrome college students." The language was limited to English, with no date or geographic restrictions applied. Reference lists associated with recent publications were also reviewed to identify additional potentially relevant studies for inclusion.

Study Selection

Two reviewers analyzed both qualitative and quantitative peer-reviewed journal articles noted to be associated with IS or imposter phenomenon. A total of 11,615 potential manuscripts were identified, with 11,500 from Google Scholar, 92 from CINAHL, and 21 from Pubmed. Reviewers identified 320 publications during the initial search process. These publications were reviewed by title as well as abstract to exclude research that did not meet the inclusion criteria. Inclusion criteria for manuscripts reviewed focused on studies specific to universitybased health science students to include both undergraduate and graduate programs (Table 1).

Table 1 Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Scholarly journal article	No validated survey instrument
Written in English	No inclusion of students
Full-text available	Students not in the health sciences
Population to include students in the health sciences at either the graduate or undergraduate level	
Quantitative or qualitative exploration of imposter phenomenon	

Of those initially identified, 66 were identified for inclusion in the scoping review. The remaining studies were excluded secondary to the topic or poor quality (Figure 1).

Figure 1 Study Selection Process



Charting Data

In an effort to present data in a meaningful way, the reviewers utilized the "descriptive-analytic" model described by Arksey and O'Malley⁴ for data extraction and presentation. Two reviewers independently analyzed selected IS studies identifying patterns, trends, and meanings. Reviewers maintained open communication in case clarification of study information was required. As recommended by best practice guidelines, general information was extracted from each study to include author, year of publication, study type, study population, location or area, purpose, and major findings.⁴

Publication review focused on the following questions:

- 1. What is the prevalence of IS in health science students in university-based health science programs?
- 2. What factors significantly contribute to the development of IS in this population?

Collecting, Summarizing, and Reporting the Results

A thorough review and analysis of identified articles associated with IS and university health science students were conducted in an effort to determine the effect of IS on academic achievement in this population. Article reviews focused on the aforementioned study questions.

Conclusions focused on not only findings but identification of areas for future research.

Results

An analysis of identified studies revealed that 68% (11) of manuscripts included as part of this scoping review were published in 2020 or more recently. Fourteen of these publications were from the United States, one from Grenada, and one from Nepal. Studies associated with medical students or residents represented the majority, with 75% (12) of the data reviewed. Other studies evaluated IS in university health science study programs such as pharmacy, dental, chiropractic medicine, nursing, occupational therapy, social work, and massage therapists. A variety of publications were included: (1) surveys, (2) literature reviews, (3) scoping reviews, (4) systematic reviews, (5) articles, (6) interviews, (7) workshops, and (8) commentary.

Prevalence of IS in university health science students

In an effort to determine the prevalence of IS in university health science education programs, six studies utilized the Clance Impostor Phenomenon Scale (CIPS).^{5,10,15,17,18,19} Although not specifically developed for the health science population, the CIPS is one of the most commonly used assessments of IS within this population. The CIPS is valid and reliable and was created to help individuals determine whether or not they have IS characteristics as well as the extent of the IS. Statements within the CIPS attempt to acknowledge an individual's fear of evaluation and feeling less capable than their peers. After taking the Impostor Test, responses to each of the 20 statements ranging from 1 to 5 points are added together. "If the total score is 40 or less, the respondent has few Impostor characteristics; if the score is between 41 and 60, the respondent has moderate IP experiences; a score between 61 and 80 means the respondent frequently has Impostor feelings; and a score higher than 80 means the respondent often has intense IP experiences. The higher the score, the more frequently and seriously the Impostor Phenomenon interferes in a person's life."10 Two additional studies incorporated the Young Imposter Scale (YIS)^{6,16} as part of the project, one as a learning tool and one as an assessment tool. The YIS is a valid and reliable scale for determining the presence of IS. It is an 8-item questionnaire to assess IS among young individuals. "Participants are considered having IS if they scored five or higher using the 8-item 'yes' or 'no' questions."6 The overall prevalence of IS utilizing these above-mentioned assessment tools was noted to range from 29.5% to 51% among their respective study participants.

Factors Contributing to the Development of IS in this Population

Of the 16 studies reviewed, 100% showed strong evidence of a relationship between psychological traits and the presence of imposter syndrome. These psychological factors varied from study to study. However, there was prevailing evidence to demonstrate several key characteristics and psychological traits that were predominantly related to the development of IS. These included anxiety, depression, low self-esteem, poor self-efficacy, and perfectionism. The 16 reviewed articles identified these psychological traits as not only factors contributing to IS, but also as progressively developing traits after the development of IS.⁷ One study elaborated on this by describing individuals with IS as those with faltering self-confidence, low self-esteem, and constant stress, anxiety, and depression. In an effort to minimize their potential failures, those with IS tend to work longer and harder to seek perfection. This extreme emphasis on perfection often results in unachievable standards and unrealistic goals, which ultimately lead to continual stress, anxiety, and low selfesteem.7

Discussion

A significant prevalence of IS in university-level health science education programs was identified as part of the scoping review process. A wide variety of health care disciplines were included as part of the review process. Up to 50% of students involved in health care education programs experienced some level of IS during their time in higher education. A dominant characteristic throughout the scoping review was the prevalence of mental health or psychological attributes in conjunction with the development of IS. Of the 16 articles reviewed, 100% discovered clear associations between identifiable psychological traits and IS. A strong correlation between anxiety and IS was noted in 75% of the research studies reviewed. Several studies suggested an elevated occurrence of pre-existing anxiety disorder that heightened as a result of IS. This translated to extreme feelings of apprehension, concern, and constant pressure to succeed in health science students, ultimately increasing levels of stress and anxiety. In contrast, 11 of the 16 studies found concrete associations between depression and IS. Noteworthy, all 11 of these studies cited anxiety as a common factor; however, the root cause of IS development may be depression rather than anxiety in some cases. Feelings of self-disappointment, low self-worth, and incompetence were linked to depression as a contributing factor in the prevalence of IS. Additionally, several articles found that those with a history of IS often continue their behaviors throughout their careers. The excessive workaholic actions typically led to exhaustion, increased risk of burnout, and a poor work-life balance, which ultimately led those with imposter syndrome to view both life and work as undesirable. In an effort to keep one's IS undetected, many attempt to create

a facade of success and happiness. Unfortunately, maintaining this image often leads to more anxiety and unachievable goals, resulting in further burnout and complete withdrawal from more prominent positions within the workforce.⁷ Awareness and acknowledgment of the challenges associated with IS should be considered as part of the curriculum planning for all health science disciplines in an effort to counter the negative psychological effects of the syndrome. Health science education programs have the opportunity to implement strategies to reduce the potential for the development of IS in high-risk student populations. Identification of attributes commonly associated with the development of the syndrome early within the curriculum could provide the opportunity for timely intervention. The inclusion of information associated with IS as part of new student orientation, along with mental health resources available to students, should also be considered.

Limitations

A review of limitations is critical when considering the data presented as part of this project. An exhaustive review of existing scholarly publications was attempted in order to determine the prevalence of IS as well as identify trends in health science students. Limitations could be noted as associated with the keywords, search process, and the three search engines utilized. Please note, reviewers were limited to studies published in the English language with full text available. Two authors completed a joint review of existing literature in February 2022. As a result, there is a remote possibility that additional studies may have been published more recently.

Recommendations

An essential component of the scoping review process is the evaluation and assessment of the need for future research. Due to the identification of a significant number of research studies focused on IS and medical students, future studies could benefit from exploring the existence and consequences associated with IS in other university health science education programs. Additional research is needed to investigate the prevalence and effects of IS in varying groups of health science students, such as respiratory therapy, radiologic sciences, and physical therapy. The addition of multiple disciplines would not only increase insight from a larger population but could also pinpoint precise indicators for students at greatest risk for the development of IS. Identification of IS in these student populations could provide an opportunity for health science programs to enhance academic achievement and improve attrition, as well as improve the overall mental health of future health care providers. Early interventions in the academic environment may also provide the groundwork for reducing eventual burnout in health care students as working professionals.

Additionally, exploring IS in a qualitative manner could allow for a better understanding of potential causation. Discovering the complex relationships between the root cause of an individual's experience with IS and specific variables such as anxiety, depression, self-esteem, self-efficacy, and perfectionism could provide potential strategies for prevention as well as opportunities for resolution.

Conclusions

An in-depth understanding of the prevalence of and contributing factors associated with IS in health science students has the potential to positively affect success in both undergraduate and graduate student populations. This scoping review identified and isolated current research while highlighting the prevalence and causation associated with the phenomenon. The possibility of an association between IS and academic achievement in health science career curriculums provides the rationale for additional research. The intent of this study was to provide an initial evaluation to determine the prevalence and identify determinants of IS in health science programs across the nation. Based on evidence noted as part of this literature scoping review, further research is warranted.

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