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ABSTRACT

Background: Respiratory care (RC) is a healthcare discipline that specializes in providing treatment for patients with acute and chronic cardiopulmonary abnormalities. Today, RC possesses a solid skill base and an expansive depth of knowledge, enabling them to provide safe, team-based, evidence-based effective care for patients. This study explores perceptions of RC students (RCS), RC faculty (RCF), and RC professionals (RCP) regarding Interprofessional Education (IPE) and Interprofessional Practice (IPP). Additionally, it identifies factors that affect perceptions of knowledge, skills, and abilities related to IPE and IPP among RCS, RCF, and RCP.

Methods: A mixed method (embedded) design was used. An online email survey questionnaire was emailed to the program directors to distribute it among their students, alumni, and faculty. The total of 421 program directors were reached via email. Three hundred forty-five surveys were returned, with 208 surveys eligible for analysis.

Results: The findings showed a significant main effect of professional status on the Interdisciplinary Education Perception Scale (IEPS) overall score regardless of the IPE exposure. However, there was no significant difference in the average score on the competency and autonomy, perceived need for cooperation, or perception of actual cooperation. Qualitatively, it was revealed that simulation was the most useful IPE experience for promoting IPP. Additional factors such as time, attitude, experiences, cooperation, and cost were believed to affect the infusion of IPE into the academic environment.

Conclusion: Regardless of the status of RCS and RCPs exposure to IPE during their professional education, all perceived IPE as positively supporting IPP. Qualitatively, for those directly exposed to IPE, simulation was identified as the most useful IPE experience for promoting IPP.

Recommendations: IPE should be continued implemented as a strategy for the promotion of IPP, as well as the necessity for further documentation and assessment of the IPE techniques used in the academy to guarantee learning outcome accountability.

Keywords: *Respiratory Care, Respiratory Therapists, Interprofessional Education, Interprofessional Practice, Team-Based, Evidence-Based Effective Care, Interdisciplinary Education Perception Scale*.

Introduction

Study Background

A Respiratory Care Professional (RCP) is a healthcare professional who specializes in treating patients with acute and chronic cardiopulmonary abnormalities (WHO, 2010). This includes taking arterial blood gases to analyze patients' gas exchange and performing pulmonary function tests to measure and evaluate lung function (Wilkins et al., 2009). RCPs scope of practice as members of the patient-centered healthcare team includes, but is not limited to, patient assessment, treatment, disease management, and diagnostic testing, as well as patient and community education, interprofessional collaboration, and communication (Barnes et al., 2011).

The demand for RCPs expertise has increased because of the multiple expansions seen in technology associated with respiration, which has enhanced and developed further RC treatment options (Kacmarek et al., 2009). Today, RCPs possesses a solid skill base and an expansive depth of knowledge, enabling them to provide safe, team- and evidence-based, effective care for patients (Oandasan, I., & Reeves, 2005).

Four competency domains for Interprofessional Collaborative Practice (IPCP) were identified by an interprofessional education collaborative expert panel in 2011, including values/ethics for interprofessional practice, roles and responsibilities, interprofessional communication, and teams and teamwork (Panel, 2011). Although health-care accreditation bodies urge educational institutions to incorporate IPE in their healthcare programs that focuses on these four areas, the specifics of how this must be done are not regulated (Holthaus et al., 2015; Makino et al., 2015). Many organizations, including The International Association for Interprofessional Education and Collaborative Practice, The Center for the Advancement of Interprofessional Education, and the European Interprofessional Education Network, work to promote IPE and interprofessional collaboration (IPC) in education, research, and practice on a global scale. All of these organizations have the same underlying goal: to promote IPP through IPE (Barnsteiner et al., 2007; Ho et al., 2008). To promote the objective of spreading IPP, the commissions on accreditation for RC (CoARC), has engaged in this purpose and now mandates RC programs nationally to incorporate IPE in order to achieve accreditation requirements for IPE. CoARC, on the other hand, does not specify how programs must or can meet these requirements (CoARC, 2015).

Additionally, locations, where RCPs practice has expanded include diverse medical industries, academic institutes, and research centers (Doucel et al., 2014). To date, there are no published studies that specifically explore and identify the perceptions of RCS, RCF, and RCP regarding IPE in prompting IPP. This study focuses on addressing this gap. The Theory of Planned Behavior (TPB) and Adult Learning Theory are combined as a conceptual framework to explore and understand the application of IPE and its impact on IPP. The principal aim of this study was to explore the perceptions of RCS, RCF, and RCPs regarding IPE and its ability to support IPP. A secondary aim was to determine factors that influence perceptions of knowledge, skills, and abilities toward IPE and IPP among RCS, RCF, and RCPs.

This study specifically addressed five primary quantitative questions:

RQ1: Is there a significant difference in RCS and RCP **perceptions** toward competency of IPE in RC as identified by the IEPS overall score?

RQ2: Is there a significant difference in RCS, RCF and RCP with and without IPE **exposure** based upon the IEPS overall score?
RQ3: Is there a significant difference in RCS, RCF, and RCP with and without IPE exposure based upon the IEPS competency and autonomy score?
RQ4: Is there a significant difference in RCS, RCF, and RCP with and without IPE exposure based upon the IEPS perceived need for cooperation score?
RQ5: Is there a significant difference in RCS, RCF, and RCP with and without IPE exposure based upon the IEPS perception of actual cooperation score?

Additionally, five secondary qualitative questions were explored:
RQ6. Do you believe IPE promotes IPP? Yes/ No. Please explain your response
RQ7. What type of IPE experience do you believe promotes IPP?
RQ8. What factors do you believe impact the infusion of IPE experiences in the academic environment?
RQ9. What professionals do you believe RCS should be exposed during their academic preparation to support IPE and IPP? Please explain your response.
RQ10. Would you recommend that all respiratory students participate in IPE experiences? Yes/No. Please explain your response.

Methods

Research Design

The current study used a convergent mixed method (embedded) design to answer the research questions. This design is described as a collection and analysis of both quantitative and qualitative data to obtain a complete understanding of the research problem (Creswell & Clark, 2018).

Participants

Participants in this study consisted of three groups. The first group was RCS from accredited RC programs in the U. S. The second group of participants were RCF who worked at credentialed institution. The third group of participants were RCPs who had recently graduated from an accredited RC program in the U. S.

Data collection

The quantitative approach used the IEPS tool, which employs a 5-point Likert scale (from 1, “strongly disagree,” to 5, “strongly agree”). In addition, qualitatively, the participants were asked to answer three open-ended questions to explore their individual point of view. The convergent mixed-method design based on the research literature provides a great amount of data that can allow us to understand findings more intensely (Creswell & Clark, 2018; Reeves et al., 2015). Because the literature regarding IPE and IPP in RC is limited, using the convergent mixed method design helped to establish a foundational base of knowledge that may further strengthen the study’s overall outcome. Specifically, the quantitative approach helped the researchers to understand research problems, whereas the qualitative approach helped the researchers to explore the participants’ point of view.

Procedure

For this study, the participants we asked to complete an online survey that contained three separate sections: demographic profile; IEPS survey, and open-ended questions. Specifically, a letter of solicitation that provided the Qualtrics survey link to the instrument tool IEPS, demographic questions, and open-ended questions was emailed to all RC program directors in the United States. The RC program directors' emails were obtained from the CoARC website which is open to the public. At the time of the study, there were approximately 67 accredited bachelor's degree programs, seven accredited master's degree programs, and 354 associate degree programs in the United States, according to the CoARC and reflected on their website. The RC program directors via this email communication were asked to forward the letter of solicitation which included the study survey link to the current students, faculty, and all program graduates. A remainder email was sent every week for 3 weeks to the program directors. The IEPS tool that used in this study is a remodeled version of the one first published by Luecht et al. in 1990 (McFadyen et al., 2007). The tool has a 12-item instrument with a scale of six points to create further stability (Vaughan et al., 2014). The IEPS comprises four major subscales: (a) perceived need for cooperation, (b) competency and autonomy, (c) understanding other roles, and (d) the perception of actual cooperation (Hawk et al., 2002).

The dependent variable for this study was the overall score on the IEPS. The scoring system for the IEPS is divided into six categories: First, a score 12 is the lowest level of agreement, indicating a poor perception toward IPE and IPP. Second, a score between 13 and 24 is a low level of agreement, indicating a poor perception toward IPE and IPP. Third, a score between 25 and 36 is a moderate level of agreement, indicating a somewhat fair perception toward IPE and IPP. Fourth, a score between 37 and 48 is a high level of agreement, indicating a good perception toward IPE and IPP. Fifth, a score between 49 and 60 is a very high level of agreement, indicating a very good perception toward IPE and IPP. Finally, a score between 61 and 72 is the highest level of agreement, indicating an excellent perception toward IPE and IPP. The demographic profile was created by the PI and included several questions to identify participants' characteristics and several open-ended questions that sought to identify specific factors that might influence the participants' perception of IPE. The characteristics section included age, gender, and years of experience. The demographic factors, which can be called independent variables (IV) in this study, were professional status (RCS, RCPs), and structured instruction in IPE.To establish content validity of the demographic profile and the open-ended questions, an expert panel of three health-care educators with research methods backgrounds reviewed the profile for clarity, organization and content correctness seeking to reach an 80 % consensus, which was achieved after two rounds of review (using Delphi Process).

Data Analysis

Quantitative Approach

In this study, the demographic profile for participants was analyzed using descriptive statistics. Thereby, means and frequencies of participants' responses were reported for each item in the demographic profile. Before the inferential statistics were computed, several criteria were met: (a) the data was interval or ratio, (b) the sampling distribution was normally distributed, and (c) homogeneity of variance was achieved. After meeting the assumption of normality, the parametric approach was used. SPSS statistical software (version 26) was used to analyze the

quantitative approach. RQ1 used two-tailed independent *t-test* analysis, whereas RQ2 thru RQ5 used two-way analysis of variance (ANOVA).

For all statistical tests, the PI tested the normality of the data by running the Kolmogorov-Smirnov (K–S) test and the Shapiro-Wilk (S–W) test. Both tests were generated in SPSS. Then, the PI conducted a Levene's test to check for differences in variances in different groups (the assumption of homogeneity of variance). The Levene's test was used if the results were non-significant, as variances would be equal and the assumption of homogeneity of variances is tenable (Field, 2009).

Qualitative Approach

The last five questions (RQ6 thru RQ10) employed a qualitative approach. Participants were asked to answer each question. The PI sought to categorize participants' responses to either predetermined themes obtained from the literature or new themes that emerged from their responses. Predetermined codes or themes were created from the literature reviews and theories (Kolb, 2001; Panel, 2011). Intercoder agreement was performed between the PI and the research team. The main goal was to achieve a high level of agreement between independent coders (80%). In addition, each theme was tallied, and frequencies were reported (Creswell & Clark, 2018).

Ethical considerations

This study was reviewed and approved for ethical consideration by the Seton Hall University Institutional Review Board (IRB).

Results

Demographic characteristics

Three hundred forty-five surveys were returned, with 208 surveys eligible for analysis and 137 surveys excluded because they were incomplete. Out of 208 participants, 156 participants were identified as female (75%) and 52 males (25%). Concerning participants' age distribution, more than 85% of the participants identifying as over 29 years old. The number of participants holding associate, bachelor, and master's degrees are similar, with only a few participants holding doctorates (8.2%). Almost 73% of the participants have more than five years of experience as licensed RC. 51.4% of the participants were exposed to IPE during their professional education, whereas 48.6% were not.

Table 1: Demographic characteristics

Item	Frequency	Percentage
Gender		
Male	52	25.0
Female	156	75.0
Age Groups		
18–28 years	28	13.5
29–39 years	36	17.3
40–50 years	60	28.8
> 50 years	84	40.4
Educational Level		
Associate degree	51	24.5
Baccalaureate degree	53	25.5
Master's degree	52	25.0
Doctorate	17	8.2
Years of Experience as Licensed Respiratory Care		
Two years or less	12	5.8
2.1-5 years	9	4.3
> 5 years	152	73.1
IPE Exposure		
Yes	107	51.4
No	101	48.6
Total	**208**	**100**

Source: Survey (2020)

Quantitative Data Analysis

Responses to the question "Is there a significant difference in RCS and RCP perceptions toward competency of IPE in respiratory care as identified by the IEPS overall score?". The results showed a difference in perceptions of RCS and RCP toward competency of IPE. An independent sample t-test found a significant difference between the means of the two groups (t (206) = 3.07, p =.002 <.05, r =.98). On average, the reported RCS perception toward IPE competency (M = 5.40, SE =.08) was significantly higher than RCP (M = 4.92, SE =.07).

Responses to the question "Is there a significant difference in RCS, RCF, and RCP with and without IPE exposure based upon the IEPS overall score?" The main effect of the professional status was significant, F (2,202) = 3.15, p <.05, partial h^2 =.03. Therefore, the PI rejected the null hypothesis. Secondly, the main effect of the IPE exposure was not significant, F (1,202) = 0.03, p =.87, partial h^2 =.001. Neither independent variable influenced the outcome; therefore, the PI accepted the null hypothesis and concluded no interaction between professional status and IPE exposure on IEPS overall score.

Responses to the question **"**Is there a significant difference in RCS, RCF, and RCP with and without IPE exposure based upon the IEPS competency and autonomy score?". The results showed no significant main effect of the professional status on the competency and autonomy score in IEPS, F (2,202) = 2.99, p =.052, partial h^2 =.03. Second, there was no significant main effect of IPE exposure on the competency and autonomy score in IEPS, F (1,202) =.0001, p = 1.0, partial h^2 =.0001. Based on the results of the two-way ANOVA, the null hypotheses were retained.

Responses to the question "Is there a significant difference in RCS, RCF, and RCP with and without IPE exposure based upon the IEPS perceived need for cooperation score?" The results showed no significant effect of the professional status on the perceived need for cooperation score in IEPS, F (2,202) = 2.12, p =.12, partial h^2 =.02. Second, there was no significant main effect of IPE exposure on the perceived need for cooperation score in IEPS, F (1,202) =.004, p =.95, partial h^2 =.0001. Based on the results of the two-way ANOVA, the null hypotheses were retained. Responses to the question "Is there a significant difference in RCS, RCF, and RCP with and without IPE exposure based upon the IEPS perception of actual cooperation score?". The results showed no significant effect of the professional status on the perception of actual cooperation score in IEPS, F (2,202) = 2.72, p =.07, partial h^2 =.03. Second, there was no significant main effect of IPE exposure on the perception of actual cooperation score in IEPS, F (1,202) =.10, p =.75, partial h^2 =.001. Based on the results of the two-way ANOVA, the null hypotheses were retained.

Qualitative analysis

The five open-ended questions were designed to explore the participants' perceptions about how IPE affects IPP. Of the 208 participants, 131 answered the first open-ended question. Most responses fell under the Values/Ethics category, followed by Roles/Responsibilities. Among the 150 participants who answered the second open-ended question, the participants may have had multiple experiences that would enable the PI to code them under more than code. Upon review, most of the responses fell under the learning strategy category. Among the 135 participants who answered the third open-ended question, most responses were fell under the climate of trust, respect, and sharing experience category. Among the 151 participants who answered the fourth open-ended question, the participants may have had multiple answers that would enable the PI to code them under more than one code. Upon review, nurses were the most frequent answer, followed by physicians. Out of the 91 participants who answered the fifth open-ended question, most of the responses fell under the Values/Ethics category, followed by the Team and Teamwork category, which were derived from the literature.

Discussion

The purpose of this study was to explore the perceptions of RCS, RCF, and RCP regarding IPE and its ability to support IPP. The study's quantitative results revealed variations of composite scores among groups concerning perceptions of RCS, RCF, and RCP with and without IPE exposure regarding IPE competency. The results of this study confirmed that exposure to IPE throughout the entirety of professional education is significant to RCS career prospects because it enables them to acquire the knowledge, skills, and experience required to succeed as professional respiratory therapists. These results are consistent with Clark et al. (2015), which indicated that exposure to IPE in academic environments better prepares students to engage in real-life situations after graduation. Therefore, IPE should be embedded into healthcare programs curricula.

Concerning factors that affected their IPE experiences in the academic environment, most qualitative responses were categorized under time availability, nature of scheduling, and mode of accreditation. Factors such as lack of time and lack of familiarity with the IPE process may influence the introduction of a new curriculum. Similar findings have been noted in the research on healthcare professionals (Kent & Keating, 2013). Providing an effective communication strategy is essential in the clinical environment. According to a collaborative expert panel in IPE, communication is one of four domains needed for healthcare professionals to provide person-centered care (Panel, 2011). Finally, most participants identified nurses, physicians, and physical therapists (PT) should be exposed to RCS during their academic to promote IPP. While it is essential to exposure RCS to these identified professionals, it is also essential to increase their exposure to other professionals to ensure effective team-based care (Hertweck et al., 2012).

The study was framed by theories of planned behavior and adult learning which influence individuals' perceptions towards attitudes, behaviors, and actions. Understanding how students develop skills, knowledge, and capacities in interprofessional practice is clearly important to RCS, RCF, and RCP (King, Conrad, & Ahmed, 2013; Klima et al., 2014). Furthermore, the participants in the research acknowledged the importance of "doing" in learning and implementing what they had learnt in clinical situations. As a result, the findings of this study are supported by experiential learning theory, which states that learning happens via "doing." Perceptions, experiences, and behaviors are all brought together in this learning paradigm to create a focal point for the learning process (Kolb, 1984; Kolb, Boyatzis, & Mainemelis, 2001). This theory helps to establish a method for the education programs for delivering IPE to enhance the learning capacity of health-care students.

Limitation

This study, like many other research studies, has its limitations. While the results of this study were based on the IEPS tool's composite scores, the usage of three subgroups of scores may be more successful in deciding the responses. Furthermore, while the IEPS instrument has superior psychometrics, it may be more appropriate for students who have never been exposed to IPE in the classroom or clinic. Thus, in the population examined, experimenting with various methods to measure IPE and IPP perceptions could be more successful. We presume that the replies to the self-administered questionnaire used to secure the data were accurate and genuine. Finally, the data of this study was collected at a single point in time, we were unable to account for the possibility of inherent biases influencing the participants' replies.

Future Research

This study mainly focused on RCS and RCP perceptions of IPE. Therefore, the generalizability is limited. Future research can exploring varied and diverse IPE experiences, large students sample to investigate effect of IPE in RC and evaluate their ability to support IPP. Additional research may also evaluate the general impact of IPE on RC practice and overall work life balance.

Conclusion

RCS and RCF showed highly positive agreement towards IPE in promoting IPP. Qualitatively, those directly exposed to IPE chose the IPE simulation experience as the most helpful pedagogical forms for fostering IPP. Nonetheless, several aspects, such as schedule problems, attitude, collaboration, experience, leadership, and cost, were identified as impacting IPE incorporation into

the academic environment and demand additional research. The findings of the study add to the body of knowledge on IPE, leading the authors to propose that IPE should be continued integrated as a strategy for the promotion of IPP, as well as the necessity for further documentation and assessment of the IPE techniques used in the academy to guarantee learning outcome accountability.

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