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The Need for and Interest in the Advanced Respiratory Therapist Practitioner

F Herbert Douce MS RRT-NPS RPFT FAARC

Georgianna Sergakis, PhD, RRT

Crystal Dunlevy, EdD, RRT

Sarah M. Varekojis, PhD, RRT

Abstract

Background: Graduate education in respiratory therapy is emerging as the roles and responsibilities of RTs expand and as the profession increases in complexity. The purposes of this project were to explore the need, anticipated roles, benefits and demand for an advanced Respiratory Therapist Practitioner (RTP) and to determine student interest in completing an education program designed to prepare an RTP. **Method:** An electronic survey addressing the need for and the benefits of an RTP was sent to RT department directors in Ohio. A separate electronic survey was sent to program directors and forwarded to students in baccalaureate RT programs in the United States. Students were asked to indicate their interest in completing graduate education that would lead to practice as an RTP. **Results:** Our response rate was 55%, and 62% of respondents indicated a need for 403 RTPs. Respondents represented a variety of hospital sizes, types, and locations in Ohio. Respondents identified six roles and responsibilities and 10 benefits of having an RTP at their facilities. We received 157 responses from students graduating with a bachelor's degree in RT. The responses came from 20 colleges and universities in 16 states. One hundred fifty-two (97%) respondents indicated an interest in a clinical Master of Respiratory Therapy program. **Conclusions:** The results of our study suggest there is a widespread need for advanced RTPs in Ohio, there are significant benefits to patients and employers of RTPs, and there is strong student interest in completing a clinical Master of Respiratory Therapy program designed to prepare an RTP. This needs assessment has informed the development of a degree proposal for the Master of Respiratory Therapy graduate program at The Ohio State University. Our results may support the need for graduate-level educational programs for RTPs in other states.

Key words: advanced practice respiratory therapist, respiratory therapy education, respiratory therapist practitioner, graduate education

F Herbert Douce, MS, RRT-NPS, RPFT, FAARC
Associate Professor-Emeritus
The Ohio State University, College of Medicine,
School of Health and Rehabilitation Science,
Respiratory Therapy Division, Columbus, Ohio

Georgianna Sergakis, PhD, RRT
Assistant Professor
The Ohio State University, College of Medicine,
School of Health and Rehabilitation Science,
Respiratory Therapy Division, Columbus, Ohio

Crystal Dunlevy, EdD, RRT
Associate Professor
The Ohio State University, College of Medicine,
School of Health and Rehabilitation Science,
Respiratory Therapy Division, Columbus, Ohio

Sarah M. Varekojis, PhD, RRT
Assistant Professor
The Ohio State University, College of Medicine, School of
Health and Rehabilitation Science, Respiratory Therapy Division, Columbus, Ohio

Correspondence and Request for Reprints:
Sarah M. Varekojis PhD, RRT, RCP
The Ohio State University
School of Health and Rehabilitation Science
Respiratory Therapy Division
453 W. l0th Ave.
431 Atwell Hall Columbus, Ohio 43210

Introduction

Until recently graduate education for respiratory therapists (RTs) has been primarily focused on preparing therapists for roles in education and in administration of hospital departments, relying primarily on the fields of allied health, business, education and health administration. Emerging recently in the United States is graduate education in RT, including Master's degrees for entry into the profession and Master's degrees designed to prepare administrators, educators and leaders specific to RT.[1] In addition, the American Association for Respiratory Care (AARC) has described the expected clinical roles and responsibilities of RTs in the future.[2] It is anticipated that the respiratory therapy profession will emphasize the science of respiratory care as it continues to evolve and increase in complexity. Evidence-based practice by protocol is expected to be the most common method of care delivery in RT. This creates a need for advanced level clinicians who are informed, empowered and experienced to provide such care.

It is also expected that in the future health care market, the RT professional will be increasingly required to provide and manage patient care through independent supervised practice.[3] Fewer specialty physicians in community medical settings combined with a reduction in the number of medical resident hours in other health care settings has created a practice gap that can be filled by an advanced practice RT.[4] RTs now practice in a much broader spectrum of settings, including industrial, educational, and research settings as well as more traditional medical settings such as acute care, outpatient, rehabilitation, skilled nursing, home health, and outpatient diagnostic laboratories and clinics. The increasing demands of the profession require that the RT be capable of complex problem solving, critical inquiry, and decision making in order to practice more independently.[5]

In 2009, the Ohio Respiratory Care licensing Board (ORCB) was interested in determining the current demand for respiratory therapy clinical staff in Ohio's hospitals and in determining expected future needs for clinical staff.[6] Included in the survey instrument completed by hospital-based department directors and managers was a question related to the future need for a "practitioner-level advanced respiratory therapist." Results indicated that 100 respondents (49%) did foresee a future need for this type of practitioner with the authority and privileges under Ohio law that would be similar to nurse practitioners and physician assistants. The respondents who indicated a need were distributed throughout all regions of the state, hospital locations and hospital types. Based on these pilot data, we became interested in further exploration and development of the concept of an advanced Respiratory Therapist Practitioner (RTP). The purposes of this project were to explore the anticipated roles and responsibilities, the benefits, and the demand for an RTP. In addition, we wanted to determine student interest in completing an education program designed to prepare an RTP. These needs assessments were developed to guide the creation of a graduate-level advanced clinical educational program for RTPs.

Methods

In 2011 and 2012, surveys were developed to determine the interest in and the need for RTPs. An electronic survey research method was used. In October 2011, a survey invitation was sent to the RT department directors and managers of all acute care hospitals in Ohio. The list of acute care hospitals was determined from The Ohio Hospital Association roster. One hundred sixty directors and managers received an email with the survey invitation and link. The invitation included a request that the recipient also forward the survey invitation and link to the medical director for their department. A follow-up email reminder was sent to the participants as a reminder to complete the online survey by the deadline. Survey questions included demographic information about the person completing the survey (involvement in respiratory care, primary practice setting, and clinical specialty) as well as some information about the location and size of their facilities. Respondents were asked to indicate on a five-point Likert-type scale their agreement with a series of statements regarding the anticipated roles and responsibilities of an RTP and the benefits of having an RTP at their facility. Those who indicated a need for the RTP were also asked to indicate how many would be needed at their facility initially and in five years. The survey was developed and reviewed by a panel of experienced directors and managers prior to distribution.

A separate survey and invitation to participate was sent to the program directors of Commission on Accreditation for Respiratory Care (CoARC) accredited baccalaureate RT educational programs in the United States. In January 2012, there were 55 program directors who received the survey invitation. The program directors were asked to forward the survey invitation and link to currently enrolled and graduating students. A follow-up email was sent as a reminder to forward the online survey to the students before the deadline. The survey included a description of the anticipated roles and responsibilities of an RTP as well as a short description of a possible RTP curriculum and potential admission requirements. Survey participants were asked to indicate their interest level in pursuing a clinical Master of RT that would lead to practice as an RTP, as well as their interest in clinical specialties. Additional questions included information about their willingness to attend an on-site full-time program. The survey was developed by a panel of ex-

perts and reviewed by RT students prior to distribution.

SurveyMonkey® was used to conduct both surveys. Data collected were imported into SPSS® version 21 for analysis. Descriptive statistics were calculated to address the purposes of the project.

Results

We received 88 (55%) responses from the 160 directors/ managers of RT services of Ohio hospitals. Fifty-five (62%) respondents indicated a current need for 139 RTPs and an additional 264 practitioners projected to be needed in the next five years. These respondents included 47 (85%) directors and managers and eight (15%) medical directors. The locations of their hospitals included 29 (52%) urban and suburban and 23 (42%) rural; their average size was 301 (SD 276) beds, and the average respiratory therapy staff was 38.3 (SD 44.5) full-time equivalents. Thirty (54%) respondents described their hospitals as community hospitals; 13 (23%) as teaching, and six (11%) as children's hospitals. The 55 respondents who indicated a need for RTPs identified the six anticipated roles and responsibilities in Table 1 and the 10 benefits of having an RTP in Table 2.

We received 157 responses from students planning to graduate with a bachelor's degree in RT. The responses came from 20 colleges and universities in 16 states, including two of the four programs located in Ohio. One hundred fifty-two (97%) respondents indicated an interest in a clinical Master of Respiratory Therapy program; 102 (65%) indicated "Very Interested" and 50 (32%) indicated "Somewhat Interested." One hundred twenty-two (80%) respondents provided their email address to receive future information about the program. One hundred (65%) indicated a preference for full-time enrollment, and 48 (32%) indicated they would locate to The Ohio State University in Columbus, Ohio for the program. Table 3 describes the student interest in the seven clinical specialties with adult critical/emergent care being the most popular.

Discussion

We performed this research to determine if there is a need for and interest in a clinical Master of Respiratory Therapy graduate degree program at The Ohio State University. We have experienced that some of our best graduates choose to enter nurse practitioner and physician's assistant graduate programs to further their health care careers because no such option exists to advance as a clinician in respiratory therapy. Having a practitioner-level program in RT may help retain these therapists in RT. Furthermore, a graduate program

Table 1

Roles and Responsibilities of Advanced Respiratory Therapist Practitioners

Roles and Responsibilities	N (%) *
Order diagnostic tests & respiratory care services including discharge instructions & orders	53 (96%)
Provide consultation to physicians and practitioners in decision making/planning for clinical respiratory care services	53 (96%)
Assume a leadership role in applying evidence-based practice to improve patient care	53 (96%)
Manage patients using clinical protocols for medical gas, hyperinflation, bronchopulmonary hygiene, airway medication, and ventilation therapy	52 (94%)
Initiate consults/referrals to other health care providers	52 (94%)
Authorize licensed Respiratory Care Professionals to provide respiratory care under clinical protocols	48 (87%)

* Number and percentages are "Strongly Agree" + "Agree"

Table 2

Benefits of Having Advanced Respiratory Therapist Practitioners

Benefits	N (%) *
Improve patient care.	52 (94%)
Facilitate compliance with new Medicare national coverage guidelines for COPD outpatient pulmonary rehabilitation.	52 (94%)
Better assure evidence-based best RT practices are followed.	52 (94%)
Improve CMS Core Measures for respiratory care patients.	51 (93%)
Facilitate implementation of clinical respiratory medication protocols.	51 (93%)
Improve communication between prescriber and therapists.	50 (91%)
Certify continuing treatment effectiveness and compliance with prescriptions for third-party reimbursements.	49 (89%)
Facilitate weaning patients from mechanical ventilation.	48 (87%)
Improve timeliness of providing respiratory patient care.	45 (82%)

* Number and percentages are "Strongly Agree" + "Agree"

Table 3
Student Interest in Advanced Clinical Specialties

Clinical Advanced Practice Specialties	N (%) *
Adult critical/emergent respiratory care	116 (76%)
Pediatric critical respiratory care	86 (57%)
Pediatric respiratory care	71 (47%)
Neonatal critical respiratory care	68 (45%)
Primary respiratory care	66 (43%)
Neuromuscular respiratory care	51 (34%)
Sleep disorders testing and therapeutic intervention	41 (27%)

* Respondents could choose more than one.

for the advanced RTP built upon a baccalaureate degree in respiratory therapy would require significantly fewer graduate credits than nurse practitioner and physician assistant education programs. We also know that changing the Ohio RT licensing law to recognize and empower the RTP will be necessary; that effort has begun.

Directors and managers of RT services participating in the study from a variety of hospital types, locations and sizes indicated an immediate and anticipated need for 403 RTPs within five years. This suggests a wide variety of employment opportunities for the RTP in several settings including community, teaching and children's hospitals. Directors and managers agreed that all six RTP roles and responsibilities identified in Table 1 would be needed for RTP practice. That "Order diagnostic tests & respiratory care services" was among the most needed roles of an RTP was not surprising, since this is a distinguishing and attractive role of a limited practitioner. That "Authorize licensed Respiratory Care Professionals to provide respiratory care under clinical protocols" was the least important role was also not surprising, since staff therapists may not need an RTP to work under some protocols. These RTP roles and responsibilities support an evolution of respiratory therapy practice and parallel the rapid changes in the health care environment. The documents "*Creating a Vision for Respiratory Care in 2015 and Beyond,*"[2] and "*Thinking Outside the Box: Moving the Respiratory Care Profession Beyond the Hospital Walls*"[5] outline the expected roles and responsibilities of respiratory therapists in the future. The vision described in these documents is consistent with the anticipated needs of the respiratory therapy profession which emphasizes that the science of respiratory care is expected to continue to evolve and increase in complexity. Evidence-based practice by protocol and pulmonary disease management are expected to be needed areas of respiratory care. Therefore, there is an expected need for advanced RTPs that are informed, empowered and experienced to provide such care. Furthermore, these roles and responsibilities are consistent with the roles of other mid-level

providers such as nurse practitioners and physician assistants and are consistent with the proposed CoARC standards for the advanced practice respiratory therapist.[7]

The preponderance of participants agreed on the 10 listed benefits of having the RTP as part of their health care team. The anticipated benefits recognized by the researchers were affirmed by the stakeholders participating in the study. All 10 represent benefits to patients and employers including improved patient care, improved communication, increased efficiency and appropriateness of respiratory therapy provided. The RTP could improve the delivery of safe, efficient and evidence-based respiratory care by acting as a liaison between medical practitioners and clinical staff. These benefits may be similar to those experienced by nursing. The nursing literature describes benefits of advanced practice nursing as reduced length of stay and reduced cost of care for hospitalized patients, and improved quality of patient care.[8]

A majority of students participating in the needs assessment were interested in the MRT program; 102 indicated that they were very interested, with 100 preferring full-time enrollment. Employers indicated 403 RTPs would be needed in five years, and our anticipated class size is 20 students per year. These results indicate a strong interest and likelihood of sufficient applications for admission to enroll students for several classes. Based upon our results, our program will not be able to meet the demand by employers or students; additional graduate programs will be necessary to meet Ohio's demand for RTPs. Most students were interested in the adult critical/emergent respiratory care advanced practice specialty. These practice areas also reflect clinical areas in which physician shortages are anticipated that further substantiates the need for RTPs.[4] In contrast to existing Master's degrees available to respiratory therapists, the proposed MRT degree will include a significant clinical component in these areas.

These results are consistent with professional statements regarding the future of respiratory therapy education. In 2002, the AARC, the National Board for Respiratory Care

(NBRC), and Commission on Accreditation for Respiratory Care (CoARC) together recognized the continuing evolution of the respiratory care profession and issued statements of support for advanced education and credentialing.[9] In 2003, the Coalition for Baccalaureate and Graduate Respiratory Therapy Education (CoBGRTE) of the AARC published a white paper, "Development of Baccalaureate and Graduate Degrees in Respiratory Care" that recognized the bachelor's degree in respiratory therapy as desirable for entry into the profession and graduate education appropriate for advanced practice.[10] CoBGRTE asserted that graduate education in respiratory therapy is needed to advance the practice of respiratory care and to increase knowledge in the discipline.

Limitations

Our employer-demand results were limited to Ohio, and the need expressed in Ohio could exist in other states. This survey is a snapshot of one graduating class, and the interest could exist among future baccalaureate students. A small number of medical directors responded to the survey; a separate follow-up survey directed to medical directors would provide additional information. There were limited student responses from programs that have master's degrees designed to prepare administrators, educators and leaders specific to respiratory therapy. If their students had had the option of expressing interest in a clinical master's degree, our results may have been different.

Conclusion

The results of our study suggest there is a widespread need for an advanced RTP in Ohio. The advanced roles and responsibilities of RTPs identified are consistent with the roles of nurse practitioners and physician assistants and are consistent with the proposed standards for the advanced practice respiratory therapist. There are expected significant benefits to patients and employers of RTPs, and there is strong student interest in completing a clinical Master of Respiratory Therapy program designed to prepare an RTP. This needs assessment has informed the development of a degree proposal for the Master of Respiratory Therapy graduate program at The Ohio State University. Our results may support the need for graduate level educational programs for RTPs in other states.

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Let's Get Beyond Tobacco: A Needs Assessment of Tobacco Use Among Lesbian, Gay, Bisexual, and Transgender (LGBT) Young Adults in Columbus, OH

Crystal Dunlevy, EdD, RRT, RCP

Abstract

Background: According to the CDC, tobacco use among the LGBT community is significantly higher than it is in the general population. Despite this, few tobacco-cessation programs address the needs specific to this population. The purpose of this study was to conduct a needs assessment about tobacco use in the LGBT community. **Methods:** We conducted four focus groups and collected 20 individual surveys from current and former LGBT smokers, aged 18–26. Questions were reviewed by a panel of experts to ensure content validity. Researchers analyzed the responses individually and identified common themes. **Results:** The majority of respondents smoked approximately one pack of cigarettes per week. Twenty-one respondents (64%) have tried to quit — 94% quit "cold turkey." While the majority believed that there is a need for an LGBT-specific tobacco-cessation program, only 64% would use such a program. **Conclusions:** Although the number of tobacco users in the LGBT community is higher, individuals smoke far less compared to the general population. While participants believed that they smoke for the same reasons as heterosexuals (stress relief and in social situations), those reasons are exacerbated in the LGBT community. Respondents stated that the tobacco-cessation program should be facilitated by former smokers from the LGBT community, offered and marketed in LGBT-friendly spaces, and include a component on stress management. Subjects reported that the main barrier to implementation of such a program would be participation because LGBT smokers believe that they are less addicted and able to quit on their own.

Key Words: LGBT tobacco, tobacco cessation, LGBT needs assessment, smoking cessation

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Crystal Dunlevy, EdD, RRT, RCP
Health Sciences Division
The Ohio State University
Columbus, OH

Correspondence and Request for Reprints:
Crystal Dunlevy, EdD, RRT, RCP
The Ohio State University
453 W. Tenth Ave
Columbus, OH 43210
dunlevy.1@osu.edu

Introduction

In September 2012, The Centers for Disease Control and Prevention (CDC) released its National Adult Tobacco Survey, providing the first national surveillance data on lesbian, gay, bisexual, and transgender (LGBT) tobacco use. Data from the 2009–2010 survey confirmed that tobacco use was significantly higher among LGBT respondents than in the general population. The National Adult Tobacco Survey reported that 32.8% of LGBT individuals smoked cigarettes compared to 19.5% of the general population; and 12.2% of the LGBT population smoked cigars, cigarillos, and/or small cigars compared to 6.6% of the general population. Further, 38.5% of LGBT respondents reported any tobacco use while the number fell to 25.2% among the general population.[1]

A systematic review of 42 studies of smoking prevalence among LGB (lesbian, gay, and bisexual) populations found higher smoking rates compared with the general population.[2] While there are fewer studies on transgender individuals, the results are similar.[3] More recently, Bryant and colleagues conducted focus groups with 36 LGBT participants in Atlanta, concluding that there was a need for culturally sensitive LGBT-specific tobacco-cessation programs and smoke-free spaces for LGBT individuals to socialize.[4]

Smoking rates among LGBT youth parallel this trend (28% LGBT vs 16.7 general population). The National Youth Advocacy Coalition (NYAC) 2010 report, "Coming Out About Smoking," surveyed 989 LGBT individuals between the ages of 18 and 24. The report found that most respondents were light smokers, with 77% smoking fewer than 10 cigarettes per day. Eighty-three percent of respondents were more likely to smoke while drinking at a club, and 87% reported that they smoked due to stress. Almost none of the respondents were aware of the smoking rate disparity between LGBT and straight people.[5]

A search of the literature revealed that only one LGBT-specific tobacco cessation has been developed and evaluated. "The Last Drag" is a seven-session, six-week-long group education and support intervention designed for LGBT smokers. Based on the American Lung Association's Freedom from Smoking program, "The Last Drag" was developed to counteract the negative experiences that LGBT individuals may have had in mainstream venues (not being accepted or included in group discussions, feeling judged, etc.). According to data collected from 233 participants, 59% were smoke-free at the end of the six-week intervention, and 36% remained smoke-free six months post-intervention. The authors of the evaluation concluded that this LGBT-specific intervention produced cessation rates comparable to or better than mainstream smoking-cessation interventions.[6]

The latest National Adult Tobacco Survey was historic in its inclusion of LGBT population data. The numbers that it reported confirmed the fact that LGBT individuals smoke cigarettes at rates that are 68% higher than the general population and use tobacco at rates that are 50% higher compared with the general population. Despite these findings, there is a lack of research addressing what the LGBT community wants and expects in a tobacco-cessation program, including marketing strategies and choice of venue.

This study focused on LGBT young adults because their smoking habits may not be as well established as in older smokers. The purpose of this study was to determine the smoking habits of LGBT young adults and their awareness about tobacco use in their cohort. The study further sought to ascertain their needs and wants for an LGBT-specific tobacco-cessation program, how such a program should be marketed, and what obstacles might threaten the success of the program.

Methods

A 28-item questionnaire was developed based on the literature review and solicited information on demographics, smoking patterns, and qualitative data. The questionnaire was reviewed by seven experts in the respiratory therapy (RT) and LGBT communities in order to ensure content validity, and was modified based on their comments. The questionnaire appears in Appendix A. Recruitment materials were developed to advertise focus groups; subjects received a $20 gift card to Starbucks for their participation in a focus group. Individuals who wanted to participate in the study but were unable to attend a focus group completed individual surveys. Campus Institutional Review Board approval was obtained.

Subjects were recruited from The Ohio State University main campus (both through LGBT organizations and among the general student population) and LGBT-friendly locations in downtown Columbus using the following inclusion criteria: identification as LGBT, aged 18–26, and designation as a current or former smoker. Focus groups were conducted by the author on the main campus in a private room. Individual surveys were collected either electronically or in-person.

Combined focus group and survey responses were independently analyzed by six RTs, common themes were identified, and inter-rater reliability by percent agreement was calculated.

Results

Thirty-three subjects met the inclusion criteria and participated in the study via four focus groups and 20 individual surveys. Subjects included 12 males and 21 females; 19 students and 14 non-students; 14 current smokers and 19

Table 1
Tobacco Use Among Participants (N=33)

Tobacco Product	Use (%)
Cigarettes Only	56
CIgarettes & Some Other Tobacco Product	29
Hookah Only	11
Cigars, Cigarillos, Small Cigars	4

former smokers. Six RTs, including three respiratory therapy educators and three RRTs, independently evaluated both the focus group and individual survey responses. Inter-rater reliability by percentage agreement was 90% overall.

Eighty-six percent of participants reported that they smoked or currently smoke cigarettes, averaging 1.3 packs per week for 2.2 years. Seventy-nine percent of respondents did not believe that they were addicted to tobacco, with 94% of former smokers reporting that they quit "cold turkey." Table 1 contains information about respondents' tobacco use by product.

Almost all respondents reported that they smoked for stress relief or social acceptance. Less than half of the respondents (43%) were aware that smoking prevalence rates were higher among LGBT individuals compared with the general population, although nearly 80% believed the LGBT community to be more tolerant of tobacco use than their straight counterparts.

While 72% of participants believed that there is a need for LGBT-specific tobacco-cessation programs, only 64% would use such a program. The majority of respondents believed that an LGBT-specific tobacco-cessation program should be led by a former smoker from the LGBT community (94%) and held in a group setting in an LGBT-friendly environment (86%). Ninety-four percent of respondents believed that a successful program should include components on stress management and social issues faced by the LGBT community.

Subjects reported that LGBT-specific tobacco-cessation programs should be marketed in LGBT-friendly venues, including gay clubs and bars, LGBT organizations, LGBT community centers, and LGBT-friendly coffee shops, restaurants, and gyms. Sixty percent of respondents identified the LGBT community's awareness of the need for a tobacco-cessation program as the main barrier to implementation.

Conclusions

Similar to the NYAC report, our study found that although smoking prevalence among LGBT individuals is higher than in the general population, the young LGBT adults who participated in our study do not smoke heavily and do not believe that they are addicted to tobacco. Because 94% of the former smokers in our study quit cold turkey, this may explain the failure of some to see the need for a tobacco-cessation program developed specifically for the LGBT community. Because of these low levels of perceived addiction, focusing efforts on prevention rather than cessation may be a better use of resources.

The reasons for tobacco use among the LGBT population mirror those in the general population (stress relief and social inclusion). However, these reasons may be exacerbated in the LGBT community due to the stress associated with coming out and the fact that bars and nightclubs, where smoking is widely accepted, are some of the few non-discriminatory places available to LGBT individuals for social interaction.

Limitations to the study include small sample size and limited geographic area. Although sample size was small, clear and repeated themes were identified from participants' responses. Even though the study was limited to Columbus, Ohio, UCLA's Williams Institute ranks Columbus 16th in its list of the 20 most gay-friendly cities in the United States.[7] Future research should replicate this study using a larger sample size, including a wider range of age groups over a larger geographic area.

Hopefully, the findings reported in this study and others like it will drive the development and implementation of LGBT-specific tobacco prevention and cessation programs, and/or encourage RTs to implement programs like "The Last Drag" in their communities.

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Appendix A
Let's Get Beyond Tobacco Questionnaire

Age _____
With which gender do you identify?   M   F
Are you currently a student?   Y   N
Are you a current or former smoker? current   former
If you currently use tobacco, what do you use (cigarettes, cigars, smokeless tobacco, hookah, etc.)?
How much of the tobacco products listed above do you use/smoke?
_____ cigarettes/packs/other (please circle one) per day/week (please circle one)
If you circled "other," please list the tobacco product(s) here:

For how long have you smoked or used tobacco products?

Have you ever tried to quit?   Y   N

1. Are you aware that smoking prevalence rates are much higher among the LGBT community?
How do you feel about that?

2. Are you aware that tobacco companies target the LGBT communities in their advertising/promotion efforts?
How do you feel about that?

3. Do you think that the LGBT community is more tolerant of smoking? How do you think the community views individuals who use tobacco? Why or why not?

4. Do you think that smokers in the LGBT community smoke for different reasons than the non-LGBT community? If so, what are the reasons?

5. Why do you/did you smoke?

6. Why did you start smoking?

7. If you are a former smoker or you've tried to quit, what worked for you? What didn't work?

8. Do you think that there is a need for LGBT-specific tobacco-cessation programs?

9. Would you try to quit/would you have used such a program if one was available?

10. For those who think LGBT-specific programs are needed, what should such a program look like? (What information should it contain, who should be the facilitator, where should it be offered, and how should it be marketed?)

11. What do you anticipate to be obstacles/barriers to the creation of an LGBT-specific tobacco-cessation program?

Thanks for participating in our focus group/survey today! Your answers are very important to us.

COPD Outreach Through Service-Learning in Respiratory Therapy: Student and Community Perceptions

Jessica Liddil, MS, RRT, RCP
Sarah M. Varekojis, PhD, RRT, RCP
Jill Clutter, PhD, MCHES
Georgianna Sergakis, PhD, RRT, RCP

Abstract

Background: COPD remains the third-leading cause of death, supporting the crucial need for prevention and early intervention efforts. Anticipated role expansions will impact the education and expected competencies of future RTs related to COPD prevention and management. The purpose of this study was to determine the impact of service-learning on RT students and community participants. **Method:** Based on a needs assessment, four second-year RT students designed and implemented a service-learning event at two community dining centers. Twenty first-year RT students facilitated the event. All students completed pre-/post-surveys and post-experience reflections. Community participants completed evaluations. **Results:** All community participants stated they enjoyed the event and would recommend it to others. A total of 73.6% of participants stated they would make a change because of what they learned. RT students had increases on mean competence scores; and paired t-tests revealed statistically significant (p≤.05) changes on 12 of the 19 survey items, including those civic engagement skills, leadership skills, health issues, neighborhood local issues, education and literacy, and poverty. Inductive analysis revealed four emerging themes from student reflections: cultural competence, health communication, professional skill development, and value to RT education. All students recommend the continued use of service-learning in the RT curriculum. **Conclusions:** The positive impact of service-learning on the personal and professional growth of RT students makes it exceptionally valuable to RT education and future role expansion. Furthermore, feedback from community participants suggests it may be a useful tool for patient pulmonary education and COPD prevention and early intervention efforts.
Key Words: service-learning, respiratory therapy education

Jessica Liddil, MS, RRT, RCP
The Ohio State University Wexner Medical Center, Columbus, Ohio

Georgianna Sergakis, PhD, RRT, RCP
Assistant Professor
The Ohio State University, College of Medicine, School of Health and Rehabilitation Science, Respiratory Therapy Division, Columbus, Ohio

Sarah M. Varekojis, PhD, RRT, RCP
Assistant Professor
The Ohio State University, College of Medicine, School of Health and Rehabilitation Science, Respiratory Therapy Division, Columbus, Ohio

Jill Clutter, PhD, MCHES
Assistant Professor
The Ohio State University, College of Medicine, School of Health and Rehabilitation Science, Health Sciences Division, Columbus, Ohio

Correspondence and Request for Reprints:
Georgianna Sergakis PhD, RRT, RCP
The Ohio State University
School of Health and Rehabilitation Science
Respiratory Therapy Division
453 W. 10th Ave.
431 Atwell Hall Columbus, Ohio 43210

Introduction

In 2008, chronic obstructive pulmonary disease (COPD) became the third-leading cause of death in the United States. Unfortunately, this status has remained unchanged.[1,2] The American Lung Association recently reported that in addition to the 12 million already diagnosed, 12 million more Americans are unknowingly living with COPD.[3] Prevalence of COPD is highest among individuals over 55 years of age and for individuals living in poverty.[4] Due to the high incidence of COPD and related mortality rates, community education and awareness has become progressively imperative. Early awareness and early treatment for COPD may decrease the trajectory of the disease-related disability caused by moderate-to-severe pulmonary disease. Estimates report that "76% of COPD patients and 69% of doctors agree there is 'strong need' for better patient education about their condition and treatment."[5] Multiple studies have indicated that educational interventions may have positive impact on COPD outcomes including improved quality of life, decreased hospitalizations, and increased overall knowledge of the disease.[6-8]

Respiratory therapists (RTs) play an active role in the diagnosis, treatment, and management of COPD. As the American Association for Respiratory Care (AARC) expressed in their position statement "Health Promotion and Disease Prevention," in addition to their clinical responsibilities, RTs are expected "to take a leadership role in pulmonary disease teaching, smoking-cessation programs, second-hand smoke awareness, pulmonary screening for the public" and other aspects of community outreach.[9] Anticipated expansions in health promotion and disease management will have a profound effect on the education and preparation of future therapists.[9] Moreover, predictions suggest that in "*2015 and Beyond*" there will be even higher expectations for graduating therapists to excel in these expanded professional roles.[10] Therefore, educational programs will need to expand disease management training and community experiences for students in order to assure an expanded clinical repertoire and professional preparation.[11]

The need for improved community COPD outreach and increased preparation of RT students in health promotion and disease management presents challenges and opportunities for RT education. An innovative educational strategy to meet these needs and address these challenges is service-learning. Service-learning is "a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities."[12] Service-learning is often used to combine community and student education. Current literature in health professions education describes positive outcomes for students and community participants following these experiences, thereby supporting service-learning as a mutually beneficial educational method.[13-17] Although there is an abundance of service-learning literature in other health fields, including nursing, physical therapy, and occupational therapy, there is limited evidence of such research in respiratory therapy. Recently, Sergakis et al. reported findings that suggest RT educators should consider service-learning as an educational method that contributes to the personal and professional growth of RT students by reinforcing classroom material and introducing new educational subjects that are better learned outside the classroom environment.[18] The purpose of this study was to examine the perceptions of RT students and community participants following COPD screening and education through service-learning in respiratory therapy education.

Methods

This was a descriptive study that utilized a mixed methods approach. This study was approved by the Ohio State University Institutional Review Board. The two populations for the study included: 1) members of a socioeconomically challenged community in a large urban Midwestern city and 2) undergraduate respiratory therapy students in a baccalaureate program. Community members were invited to participate in the pulmonary education experiences at non-profit, agency-sponsored community dining centers. The community area was selected for this study because of the diverse and socioeconomically challenged population demographics, the anticipated need for COPD screening and awareness, and a longstanding relationship with the school. At the time of the study, 20 students who were enrolled in their first year and four students enrolled in their second year of the respiratory therapy program were invited to participate in this study. Community participation and second-year RT student involvement was voluntary, while first-year RT student participation was a requirement as part of a course. Four second-year students involved in the study conducted a needs assessment at the selected dining centers before designing and implementing the pulmonary service-learning event. Based on the results, the event covered topics regarding COPD management, general lung health, and tobacco dependence. The 20 first-year students received an event orientation prior to participating in the service-learning experience. Ten first-year and two second-year students were assigned to each participating dining center. At the event, students were expected to interact with community participants, assist with health history and COPD screening paperwork, provide health information, and answer questions from community attendees.

COPD Outreach Through Service-Learning in Respiratory Therapy: Student and Community Perceptions

Instrumentation

To assess the needs of the community with respect to their breathing, a brief survey was administered several weeks before the community outreach events. Instrument face validity was established by a panel of experts prior to utilization. The COPD Population Screener was used to assess community participants' risk for COPD.[19] This instrument is valid and reliable with a test-retest correlation of 0.91 and was recommended by The COPD Foundation as an effective tool for risk assessment. As the screener directions designate, an individual is considered at high risk for COPD if scores are 5–10, while scores ranging from 0–4 are considered to be at low risk for COPD. Another survey was administered to community participants at the end to assess perceptions of the interactions with the RT students. The open-ended questions allowed participants to comment on their experience and share their opinions about the experience. The questions were reviewed by a panel of experts and field-tested with community members prior to utilization.

To assess student perceptions and the impact of the experience, the College Student Survey (CSS), an adapted version of the "Great Cities Great Service College Student Survey" was administered before and after the service-learning experience. The original instrument was developed by the Great Cities – Great Service Consortium, a program that reaches 14 Ohio campuses and involves students and communities in volunteer and service-learning experiences. It is reported to be reliable and has been widely used.[20] The 19-item survey measures attitudes and beliefs about service-learning experiences. The instrument measures nine construct areas on a 5-point Likert scale. The constructs include: civic engagement skills, problem solving skills, leadership skills, other academic skills, neighborhood/local issues, environmental issues, education and literacy, poverty, and health issues. Part 1 of the CSS requires the students to indicate their level of competency on skill-related items using a scale from 1 (very low) to 5 (very high). The second part of the CSS requires that students indicate the number that corresponds to where they consider themselves on a continuum. The continuum ranges from thinking about how an issue affects the community (indicated by a 1) to acting on it (indicated by a 5). If the specific issue is not a concern, they indicate a 0. In addition to the CSS, students were asked to complete a reflection assignment, which included guided questions and required a two to three page written reflection regarding their experience. The reflections differed slightly between first- and second-year students based on their differing responsibilities at the events. Both reflection assignments were reviewed by a panel of experts prior to utilization to assure content validity.

Data Analysis Procedures

The data obtained from the COPD Population Screener and the CSS was scored in accordance with each instrument's standards. Pre- and post-CSS data were analyzed using SPSS by conducting paired t-tests to determine statistically significant (p≤ .05) changes. Qualitative data from the post experience survey and the student reflection assignments were recorded and evaluated for related themes.

Results

A total of 53 community members, 22 males and 31 females, participated in the event. Participants' ages ranged from 26 to 90, with an average age of 69. With regard to highest completed education level, only six participants (11.3%) had obtained a four-year degree, while 9 (17%) had some college education and 17 (32.1%) had obtained a high school diploma or GED. Over half of the participants indicated they were current or former smokers. A notable 87.5% of the current smokers had thought about quitting. A total of 13.2% (n= 7) of participants admitted to having COPD, which included only two of the eight current smokers and four of the 21 former smokers. However, the COPD Population Screener determined that five of the current smokers and 12 of the former smokers were at high risk for COPD.

All but one of the 53 participants felt they learned what they wanted to learn at the pulmonary event. All (100%) of participants enjoyed their experience with the RT students and would recommend the event to others. The participant comments regarding their interactions with the students were all positive. They commented on their high level of knowledge, their great attitudes, and how nice it was to interact with young adults. A total of 39 (73.6%) participants stated they would do something different because of what they learned at the event including: try to quit smoking, improve their cough etiquette, teach others about what they had learned, use a spacer with medications, talk to their doctor about COPD, and stay away from second-hand smoke.

All students (n=24) completed both pre- and post-College Student Surveys (CSS). Tables 1 and 2 display the results of data analysis. As an entire group, the RT students had increases on all pre- to post-mean scores with statistically significant changes on 12 of the 19 items. Significant changes were seen in six of the nine constructs: civic engagement skills, leadership skills, health issues, neighborhood local issues, education and literacy, and poverty. Additional breakdown by first- and second-year responses are reflected in Tables 1 and 2. It is important to note the second-year students had higher pre mean scores than the first-year students on all but six of the items. Higher second-year post

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Table 1
CSS Section 1 Competency/Skill Level (Second year n=4 First year n = 20)

Construct	Competency/Skill		Pre Mean	Post Mean	p-value
Civic Engagement Skills	Championing or campaigning for a good cause				
		First year	3.15	4.10	.002*
		Second year	3.50	4.25	.319
	Planning effective service projects				
		First year	2.95	3.75	<.001*
		Second year	3.75	4.00	.718
	Recognizing both rights and responsibilities as citizens				
		First year	3.80	4.25	.058
		Second year	3.50	4.25	.444
	Fostering a commitment to lifelong service				
		First year	3.55	3.95	.104
		Second year	3.75	4.25	.182
	Responding to real community needs				
		First year	3.30	4.00	<.001*
		Second year	3.75	4.50	.215
Problem -Solving Skills	Solving challenging problems				
		First year	3.55	3.85	.055
		Second year	3.75	4.25	.182
	Comparing different approaches to solving a problem				
		First year	3.80	3.95	.186
		Second year	4.00	4.50	.182
Leadership Skills	Using leadership skills				
		First year	3.80	4.25	.009*
		Second year	4.00	4.00	
	Communicating across cultures				
		First year	3.60	4.05	.004*
		Second year	3.50	4.25	.215
	Understanding values of people different from you				
		First year	4.15	4.35	.104
		Second year	4.00	4.50	.182
	Working as part of a team				
		First year	4.25	4.60	.069
		Second year	4.25	4.25	
Other Academic Skills	Expressing ideas, opinions, and facts in writing				
		First year	3.70	3.80	.577
		Second year	4.50	4.25	.718
	My ability to analyze ideas				
		First year	3.95	4.15	.330
		Second year	4.25	4.75	.182
	Applying principals from courses to different situations				
		First year	3.95	4.15	.359
		Second year	4.00	4.50	.182

(1=Very Low, 5=Very High)

Table 2
CSS Section 2 Continuum Ratings (Second year n=4 First year n=20)

Topic		Pre Mean	Post Mean	p-value
Neighborhood/Local Issues				
	First year	2.85	3.40	.045*
	Second year	3.00	2.50	.495
Environmental Issues				
	First year	2.70	3.00	.186
	Second year	2.50	1.75	.215
Education and Literacy				
	First year	2.95	3.80	<.001*
	Second year	2.25	2.75	.604
Poverty				
	First year	2.70	3.45	<.001*
	Second year	2.75	1.75	.092
Health Issues				
	First year	3.65	4.20	.017*
	Second year	4.25	4.50	.391

(0=Not an Issue, 1=Think, 5=Act)

mean scores were also found, as compared to first-year post mean scores, on 12 of the 19 items.

All first- and second-year RT students completed a reflection assignment containing guided questions regarding their experiences at the service-learning event. A panel of experts applied inductive analysis and ultimately reached consensus on four emerging themes from their reflections: cultural competence, health communication, professional skill development, and value to RT education. The list of themes and sample comments are included below:

Cultural Competence
Cultural competence was represented heavily throughout the reflections of the RT students. The students felt they had learned the importance of considering cultural competence, and more specifically health literacy, when planning service-learning events. Multiple students also expressed how the service-learning event helped mold their opinions on culture as well as how to interact with those of a different cultural background than their own. Student reflections included the following revelations:

"I had to be a bit creative when it came to making the posters and interactive materials because I had to find the fine line between being engaging and treating grown adults too much like children. It was also challenging to decide how in-depth my information should be, since the level of educa-

tion we worked with fell on the lower end of the spectrum."

"This was the first time I tried to educate a person about how to quit smoking when they spoke a different language. A fellow student was helping to translate, and I did the best I could to speak to the patient and allow her to simply interpret. I think that small experience is so important and we should have as many experiences with different demographics as possible."

"I realized that your culture can be so much more than simply your nationality. Through interacting with the people at the service-learning event, I found that everyone has a slightly varying culture even if you are from the same general place. Because everyone has their own cultural background, it's really important to try to just treat everyone in a respectful manner."

Health Communication
Communicating health information in a way that would be most beneficial to this community was mentioned in a majority of the reflections. Many students shared what they felt were the best ways to communicate their message. They learned that "the same method of teaching will not work for everyone." Also, many of the students referred to the obstacles they encountered while communicating their pulmonary topics to the community members. Several students compared their approach to health communication to

that of the individual's doctor; specifically discussing the impact that intimidation has on communicating health-related information. Representative comments included:

"In developing the material for the service event, I was able to learn how to create materials that were specific for the community in regards to knowledge level."

"…this experience has given me more tools for participating in community education with a greater understanding of what approaches are most effective."

"The experience had us alter our presentation to the person based on their individual understanding and background to help them best comprehend the information we were teaching them."

"I think when their doctors tell them about their lung disease they get intimidated… so, in the end they do not ask any of the necessary questions. However, when they came to me they were asking all sorts of things…. They were a lot more comfortable talking to us."

Professional Skill Development

The development of leadership skills was mentioned in many of the RT students' reflections. A second-year student noted:

"As a leader, I grew in my ability to teach others how to teach without giving them word-for-word instructions. I also found myself coaxing the first-year students to fully engage all people at their station, as many seemed to focus on one person and neglect the rest. This improved a lot after the first few people arrived."

Some of the students discussed how apprehensive they felt when talking to others about their health issues and how the service-learning experience directly impacted their feelings. "Before this experience I was somewhat nervous talking to people about their health issues… this experience helped me with talking about health matters and giving advice…."

Many students directly related their experience to their profession and future interactions with patients in the clinical setting.

"It was nice to hear the kinds of questions the residents asked. I think it has given me a better feel for what these types of patients will be concerned about if they are admitted for care."

"Talking with those adults at the Hilltop made me realize that a bunch of my patients do not understand a lot of what I am saying. I realize that I have to explain in a way they can understand better. Because of this trip, I have learned how to talk to the older community and my patients. Overall, this trip has definitely increased my confidence talking with patients."

Value of Service-Learning to RT Education

All of the RT students felt service-learning should continue to be a part of RT curriculum. One student described service-learning as "a way for us to see the world from a different perspective." Other students reflected on the importance of service-learning to the RT profession, while others compared learning through service-learning to learning in the classroom environment:

"Learning about smoking cessation in class was informative, but actually going out in the real world and talking to people about it gave me a better perspective."

"More practical and more engaging than learning in the classroom."

"A lot of your job as a respiratory therapist is to educate people on their disease… and this experience did just that. I believe this type of experience should be a part of the curriculum; it was a great way to get outside of the box and really take the things we've learned to a new level."

Discussion

This study reinforces the literature regarding the prevalence and decreased awareness of COPD by community members. As seen in this study, service-learning may be used as a method to reach the millions of undiagnosed Americans by increasing awareness of COPD and providing resources to those at high risk, thereby encouraging and initiating early intervention. As current literature suggests, educational interventions can decrease the number of COPD-associated hospitalizations, thus reducing these costs significantly.[6] Undiagnosed, and therefore uncontrolled, COPD increases the incidence of COPD exacerbations, causing a need for costly medical interventions. Many participants in this study stated they planned to make significant changes because of the education they received through service-learning. When used as a form of prevention and early intervention, health information delivered through a service-learning experience may effectively decrease the costs associated with undiagnosed, untreated, and/or uncontrolled COPD.

Nearly all participants in this study who were identified as being at high risk for COPD self-identified as current or former smokers. The incidence of COPD is strongly as-

sociated with smoking tobacco; therefore, tobacco education is a necessary component of any pulmonary education event. Service-learning can provide the community access to knowledgeable respiratory therapy students who have been trained in tobacco cessation. Early interventions, such as tobacco education and the use of motivational interviewing techniques, can help move individuals toward quitting and are the key to disease prevention or slower progression of COPD. These interventions may ultimately decrease associated medical costs and mortality rates.

Early interventions, such as those involving health promotion and disease prevention, can take place in many locations including doctors' offices and hospitals. However, service-learning uniquely allows this education to take place within an individual's community. The safety, convenience, and comfort this provides participants allow them to be more open to receive health information and feel more comfortable asking questions. The community environment also allows for adequate time to be spent on individualized educational sessions without the threat of busy schedules or future appointments, which often distract health care professionals from providing such services in health care environments. Furthermore, the RT students in this study reflected that participants felt more at ease asking the students questions about their health.

This study illustrated the nature of positive impact varies between those with service-learning experience and novices. It is clear that the education received through service-learning has a long-term impact on students and continues to be uniquely beneficial every time it is experienced. Therefore, service-learning can be used as an effective educational method by RT educators throughout a student's RT education.

The impact of service-learning on participating students in this study is congruent with the results of current literature in other health fields. The results of this study indicate that RT students in both their first- and second-year benefit from service-learning with regard to their personal and professional attributes and competencies. Service-learning can be used as an educational strategy that would expand the role of future respiratory therapists. The personal and professional skills developed by students during service-learning are crucial attributes for current and future respiratory therapists. Anticipated role expansions will lead to higher expectations for graduating therapists.[10] Educational programs need to prepare current and future RTs for successful integration of these expanded roles. One way this can be done is by rethinking how RT education is delivered. The findings from this study indicate that by creating an engaging, experiential learning experience for current millennial RT students, service-learning has exceptional value in respiratory therapy education. Skills such as leadership, civic engagement, problem solving, and effective communication cannot simply be learned from a textbook. Service-learning allows learning to extend past classroom walls, giving students the opportunity to develop these skills through experiential learning in the community setting. Not only is education through service-learning imperative to the skillset required by future therapists, current RT students welcome the change.

Limitations

There were multiple limitations related to this study. The students involved in the study were enrolled in The Ohio State University's Respiratory Therapy Program and were not randomly selected. Also, community participation was completely voluntary. These factors limited the generalizability of the findings to participating individuals only. Therefore, results may not have been representative of the target population. The study was conducted with only one cohort and a small number of second-year students, which limits data analysis and additional generalizations. Lastly, the interpretation of class assignment results was a limitation based on the assumption that students were motivated to complete the class assignment in a thoughtful manner.

Conclusions and Implications

RT educators should blend service-learning with the more traditional methods they are used to in order to appeal to the learning preference of current RT students. Service-learning allows students to work together in an engaging, active environment, while providing a valuable service to the community. Not only did every student in this study feel service-learning should continue to be a part of RT curriculum, many of them mentioned they preferred this type of experiential learning over traditional education in the classroom. Suggestions for future research include an outcomes study on the long-term health behavior change of community participants after experiencing service-learning would contribute to literature regarding the impact of service-learning on the community. This would require recruiting community participants willing to have long-term involvement in order to track health outcomes. Also, future studies should include a larger number of RT students and explore the impact of multi-visit service-learning experiences.

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The Effectiveness of Patient Educational Handouts on How to Use Dry-powder Inhalers with Patients with Chronic Obstructive Lung Disease and the Patient's Ability to Generate Adequate Inspiratory Flow Rates

Archana B. Patel, MSRT, RRT-NPS

David L. Vines, MHS, RRT, FAARC

Brian Stein, MD, MS

Ellen A. Becker, PhD, RRT-NPS, RPFT, AE-C, FAARC

Abstract

BACKGROUND: This pilot study tested the effectiveness of the American College of Chest Physicians (ACCP) device-specific patient education handouts in correcting dry-powder inhaler (DPI) technique in COPD patients. It also evaluated whether patients could generate the minimum peak inspiratory flow rate (PIFR) required for DPIs. **METHODS:** This study recruited participants from a pulmonary function laboratory and outpatient clinic in an urban academic medical center. Study participants were asked to demonstrate inhaler technique and graded with a device-specific checklist developed from the ACCP handout steps. All study participants also performed three PIFR maneuvers using the In-check DIAL™ to evaluate their ability to generate minimum PIFRs to ensure optimal drug delivery. **RESULTS:** 28 study participants participated in the study. There were differences in pre-post mean scores for study participants diagnosed with COPD using Advair® Diskus® (pre-intervention, = 6.79 ± 1.19, post-intervention, = 7.71 ± 0.91, n = 14) and Spiriva® (pre-intervention, = 6.07 ± 1.93, post-intervention, = 7.38 ± 1.33, n = 13). These increases in mean score after the intervention with the ACCP handout were statistically significant for both Advair Diskus (P=0.002) and Spiriva (P = 0.005). All study participants were able to generate the minimum PIFR necessary for medication delivery. **CONCLUSION:** The ACCP handouts alone without any verbal instructions significantly improved inhaler technique in the COPD population, although the sample is limited. For most patients seen in an outpatient clinic, peak inspiratory flow rates should not limit drug delivered from DPIs.

Key Words: Dry powder inhaler technique, patient education, chronic obstructive pulmonary disease, peak inspiratory flow rate.

Archana B. Patel, MSRT, RRT-NPS
Department of Respiratory Care Services
Virginia Commonwealth University Medical Center
Richmond, VA
patel.1005@gmail.com

David L. Vines, MHS, RRT, FAARC
Department of Respiratory Care, Rush University
Chicago, IL
David_Vines@rush.edu

Brian Stein MD, MS
Rush University Medical Center
Division of Pulmonary and Critical Care Medicine

Chicago, IL
Brian_Stein@rush.edu

Ellen A. Becker, PhD RRT-NPS RPFT AE-C FAARC
Department of Respiratory Care
Chicago, IL 60612
Ellen_Becker@rush.edu

Correspondence and Request for Reprints:
Ellen A. Becker, PhD, RRT-NPS, RPFT, AE-C, FAARC
Department of Respiratory Care
AAC Suite 750
600 S. Paulina Street
Chicago, IL 60612
Ellen_Becker@rush.edu

Introduction

Patients with chronic obstructive pulmonary disease (COPD) are often prescribed medications that are delivered by a dry-powder inhaler (DPI). Effectiveness of drug delivery through these devices depends upon proper technique.[1] Several studies have shown a large variability in correct inhaler use regarding DPIs despite patients feeling confident regarding proper technique.[2–4] One observational study enrolled 3811 patients who had been treated with an inhalation device for at least one month. They reported 49–55% of the patients using DPIs made at least one error in its use.[5] Others evaluated inhalation techniques as either "good," "adequate," or "poor" rating for asthma patients of all age groups using metered-dose inhalers (MDIs), Rotahaler® (GlaxoSmithKline, Research Triangle Park, NC), spacer devices, Turbuhaler® (AstraZeneca, Wilmington, DE), and Diskhaler® (GlaxoSmithKline). They found an overall of 25% of the patients had inadequate technique for all types of inhalers, with 19% unable to use the Diskhaler and 4% unable to use the Turbuhaler DPI at all.[6] While another study assessed inhalation technique of 20 hospitalized adults with asthma or COPD after written instructions alone, after written and verbal instructions, and the clinical use of the Diskhaler and Turbuhaler and found that 68 and 94% patients using the Diskhaler and Turbuhaler, respectively, performed inhalation technique incorrectly after written instructions alone.[7] Hesselink et al., conducted a cross-sectional study to assess prevalence on incorrect technique using a standardized inhaler-specific checklist, pulmonary function testing, and questionnaires. They found that 4% of patients had incorrect technique with the Diskhaler, and 31% of patients had incorrect technique with the Turbuhaler.[3] The variability in these findings may be due to differences in research design, assessment techniques, and population differences.

There are multiple causes for incorrect inhaler technique including low health literacy,[8,9] insufficient inhaler education,[10] and multiple inhaler devices with differing instructions for use.[11] Incorrect inhaler technique is associated with poor disease control and increased use of unscheduled health care resources in patients with asthma and COPD.[12] To address some of these issues, the American College of Chest Physicians (ACCP) created handouts with visual and written instructions for multiple inhaler devices; however, the effectiveness of these handouts for improving patient technique has not been studied. Research on the effectiveness of DPI handouts for education in the COPD population is limited; however, one study demonstrated that verbal and written instructions improved DPI inhaler technique for at least five weeks.[1] Often, patients receive only written instructions for inhaler use in health care providers' offices.

Therefore, it is important to understand the impact of written instructions on patients' use of inhalers.

In addition to proper inhaler technique, patients must be able to generate sufficient inspiratory flow rates with a DPI to ensure adequate medication delivery to the lung. COPD is characterized by progressive expiratory airflow limitation; and patients with COPD may also have reduced inspiratory flow,[10] which could influence deposition of the inhaled drug. Various studies demonstrate different variables that may influence the patient's inability to generate adequate inspiratory flow. These include, in part, disease severity, age, sex, and inhaler resistance.[13–17] It is important to establish whether patients with COPD can generate adequate peak inspiratory flow rates (PIFRs) in order to determine whether particular DPIs are appropriate for that patient. For Advair® Diskus® (GlaxoSmithKline), manufacturer specifications recommend inspiratory flow rates of 30 L/min – 90 L/min.[16] According to the prescribing information for Spiriva® HandiHaler®[18] (Boehringer Ingleheim Pharmaceuticals, Ridgefield, CT), a minimum inspiratory flow of 20 L/min is needed to deliver this medication. A different drug-delivery device, such as a metered-dose inhaler may be more appropriate if patients cannot generate adequate flows.

The primary aim of this study was to assess the effectiveness of the ACCP handouts on improving inhaler technique. The secondary aim was to assess the ability of patients with COPD to generate the minimum PIFR required to obtain the therapeutic dose from their inhaler based on manufacturer specifications.

Methods

All study participants were recruited from the pulmonary function laboratory and outpatient pulmonary clinic at an urban academic medical center. All study participants signed an informed consent and HIPAA authorization form approved by an Institutional Review Board.

Study participants were included for study if they had a diagnosis of COPD and demonstrated comprehension of the written word by reading and paraphrasing one paragraph from the informed consent. Obstructive disease was confirmed by lung function testing and medical history. Spirometry was performed with study participants if their spirometry data were older than six months or they had missing spirometry data. Study participants were excluded if they did not have a diagnosis of COPD, did not demonstrate airway obstruction on spirometry, were not currently prescribed a DPI, (study participants with their first prescription for a DPI on the day of enrollment were also excluded), had an exacerbation of COPD or respiratory illness in the past seven days or hospitalization for COPD within past four weeks. These exclusion criteria were based on a previous study.

All study participants were asked to demonstrate DPI use using a placebo device. They were graded on their technique based on a device-specific checklist (Appendix A) derived from the ACCP educational handouts. One researcher performed all the technique evaluations and used the checklist as a scoring guide, giving the participant a point for every step completed correctly. A total score for each evaluation was computed by taking the sum of all correct steps. Advair Diskus had a total of nine possible points and Spiriva HandiHaler had a total of 10 possible points on the grading scale. Following their assessment of inhaler technique, participants received and were instructed to read an ACCP handout corresponding to their inhaler. Participants were allowed to take as much time as needed to read the materials. No feedback or questions were answered about the handout material or inhaler technique until the post-intervention technique evaluation was completed. If the study participant performed the technique accurately, a post-intervention technique evaluation was not performed. After reviewing the ACCP handout, the study participants re-demonstrated the use of their DPI and were rescored using the same checklist. Any errors in inhaler use such as omitted or improper sequencing of steps in the DPI technique were verbally corrected and study participants had the opportunity to ask any remaining questions. Next, participants were asked to perform three PIFR maneuvers using the In-Check DIAL™ (Clement Clark International, UK) to determine if they could obtain the adequate peak inspiratory flow rate for their prescribed DPI. The values for study participants who exceeded the threshold for the In-Check DIAL™ (PIFR >120 L/min) were recorded as 120 L/min.

Table 1
Study Participant Demographic Information for ACCP Handout Evaluation

	Advair Diskus (n = 14) Mean ± SD	Spiriva (n = 13) Mean ± SD,
Age (years)	71.5 ± 10.62	67.92 ± 8.1
Height (inches)	65.04 ± 4.89	64.73 ± 3.80
Weight (pounds)	187.21 ± 46.57	153.31 ± 33.78

Means and standard deviations were reported for continuous variables. A paired t-test using an alpha level of ≤ 0.05 was used to determine if there was a significant change in mean score after reading the ACCP handout. The proportion of patients who could generate the recommended minimum PIFR was calculated.

Results

Thirty-seven participants were enrolled in the study; nine were excluded from data analysis as they did not meet the diagnostic criteria for COPD. Although the excluded patients had a diagnosis of COPD in their medical record, these participants had FEV_1/FVC ratios $\geq 70\%$ on spirometry, which according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines does not support a diagnosis of COPD.[10] Twenty-eight study participants were included in the final analysis, 17 females and 11 males. Study participant demographics are summarized in Tables 1 and 2. One study participant from the Advair

Table 2
Study Participant Demographic Frequencies for ACCP Handout Evaluation

	Advair Diskus n (%) n = 14		Spiriva n (%) n = 13	
Sex				
Female	10 (71.4)		7 (53.8)	
Race				
Caucasian	7 (50.0)		7 (53.8)	
African American	4 (28.6)		5 (38.5)	
Asian	1 (7.1)		1 (7.7)	
Hispanic	2 (14.3)			
COPD GOLD Grade*	Pre FEV_1[†]	Post FEV_1[‡]	Pre FEV_1[†]	Post FEV_1[‡]
GOLD I ($FEV_1\% \geq 80\%$)		1 (7.1)		
GOLD II ($FEV_1\%$ 50–79%)	1 (7.1)	7 (50)		3 (23.1)
GOLD III ($FEV_1\%$ 30–49%)	2 (14.3)	2 (14.3)	1 (7.7)	2 (15.4)
GOLD IV ($FEV_1\% <30\%$)		1 (7.1)		7 (53.8)

*GOLD stage based upon Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global Strategy for the Diagnosis, Management and Prevention of COPD.
[†] Patient did not have post-bronchodilator spirometry, so pre-bronchodilator FEV_1 value was used to assign COPD GOLD grade.
[‡] Post-bronchodilator FEV_1 value used to assign COPD GOLD grade.

Table 3
Commonly Missed Steps

ADVAIR® DISKUS®	Pre-Intervention n (%)	Post-Intervention n (%)
Turn head and breathe out normally. **NEVER BREATHE OUT INTO THE DISKUS**	Completed: 0 (0)	Completed: 3 (21.4)
Remove Diskus from mouth. **HOLD** your breath for 10 seconds. If you cannot hold your breath for 10 seconds, hold your breath as long as you can. Turn your head, and breathe out	Completed: 8 (57.1)	Completed: 13 (92.9)
Rinse your mouth with water. Spit the water out; do not swallow it.	Completed: 10 (71.4)	Completed: 12 (85.7)
SPIRIVA® HANDIHALER®		
Press the button on the side of the HandiHaler just **ONCE.** This will break the capsule open and release the powder for you to breathe in.	Completed: 7 (53.8)	Completed: 13 (100)
Sit up straight or stand. Breathe out all the way. Make sure you **NEVER BREATHE** OUT into the HandiHaler.	Completed: 4 (30.8)	Completed: 6 (46.2)
Remove the HandiHaler from your mouth and **HOLD** your breath for 10 seconds. If you cannot hold your breath for 10 seconds, hold your breath as long as you can.	Completed: 6 (46.2)	Completed: 9 (69.2)
To make sure you got all the medicine, re-peat steps 7–9.	Completed: 6 (46.2)	Completed: 6 (46.2)
After you have taken the medicine, pull up on the mouthpiece and dump capsule in a trash can. Do not touch the capsule. Close the mouthpiece and the dust cap for storage.	Completed: 7 (53.8)	Completed: 9 (69.2)
Wash your hands after using this device	Completed: 0 (0)	Completed: 3 (23.1)

Diskus group had a perfect score on the pre-intervention technique evaluation and was excluded from analysis of the primary aim of the study, which evaluated the effectiveness of the ACCP handouts but was included in the secondary aim analysis that evaluated whether patients with COPD could generate adequate PIFRs.

Inhaler Technique

The Advair Diskus pre-intervention and post-intervention scores for 14 participants showed means and standard deviations (in parentheses) of 6.79 (1.19) and 7.71 (0.91), respectively. For Spiriva, the pre-intervention and post-intervention scores for 13 participants had means and standard deviations (in parentheses) of 6.07 (1.93) and 7.38 (1.33), respectively. The study found that there was a significant increase in mean score after the intervention with the ACCP handout for Advair Diskus (paired t_{13} =3.789, p=0.002) and Spiriva (paired t_{12} = 3.423, p=0.005).

Peak Inspiratory Flow Rate

For both Advair Diskus and Spiriva, 100% (n = 27) of patients were able to generate the minimum PIFR stated by their respective manufacturers.

Discussion

Providing the study participants the ACCP handout resulted in a statistically significant improvement on inhaler technique for using Advair Diskus and Spiriva. The percent change in rated scores ranged from 0 to 50% in study participants using Advair Diskus and 0 to 200% in study participants using Spiriva. Only two study partici-

pants using Advair Diskus and one study participant using Spiriva achieved a perfect score after intervention with their respective ACCP handout.

While the ACCP handout significantly improved patient technique, verbal feedback may still be necessary to ensure and reinforce technique. Table 3 lists the number of study participants who correctly completed commonly missed steps for each device. While some steps did show improvement post-intervention, others did not. One key step that did not show improvement in either Advair Diskus or Spiriva was to exhale away from the inhaler prior to taking the maximal inhalation. Common mistakes made in this step were not exhaling at all or exhaling while facing the inhaler. Significant improvements were made in the breath-hold step for both Advair Diskus and Spiriva. We acknowledge that some steps may be more important than other steps with regard to DPI use. For example, exhaling away from the inhaler should be considered less important than charging the Diskus or loading the HandiHaler correctly. Nonetheless, the intervention did show improvement in steps that would be considered critical for adequate drug delivery including the breath-hold step for both Advair Diskus and Spiriva and the "Press the button on the side of the HandiHaler just **'ONCE'** step" for Spiriva.

All study participants (n = 28) were able to generate the minimum PIFR as stated by both the inhaler manufacturers. Previous studies showed that age, gender, and disease severity all have an impact on PIFR; however, in this study, no relationship was seen. This could potentially be explained by differences in sample size and methods of analysis. Although Malmberg and colleagues reported in their study that most patients with COPD could generate an adequate PIFR, they also concluded that age and gender were greater determinants of PIFR than disease severity.[14] The study by Janssens and colleagues included a sample of elderly males (n = 40) who ranged from 70–87 years old,[13] and the study by Jarvis et al. enrolled 53 patients including males and females ranging from 65–89 years with a mean age of 73.5 years.[15] Jarvis concluded that there was a significant indirect relationship between age and PIFR, and Janssens et al. concluded that PIFR is decreased in the elderly population independent of a diagnosis of COPD. Although both of these studies demonstrated an inverse relationship between age and PIFR, our findings differed. The current study included males and females ranging from 47–88 years old. Our broader age range and small sample size may explain why we were unable to demonstrate a relationship between age and PIFR.

While we assessed whether or not the study participants were able to generate the minimum PIFR needed to obtain a therapeutic dose, many had PIFRs exceeding the recommended flow rates and required coaching to not exceed recommended flow rates. Many of our participants inhaled at flows that exceeded the maximum flow provided by the manufacturer of the DPI (90 L/min for Advair[16] and 45.6 L/min for Spiriva[18]). This finding is in contrast to a 2007 study from UK that concluded that patients with COPD, particularly those with moderate to severe obstruction, have trouble achieving the minimum PIFR.[17] Our conflicting findings may be attributed to differences in sample size and variability among our participants. The UK study was comprised of 163 study participants with largely moderate (40%) and severe (38%) disease while our study included only 27 patients in the secondary aim with mostly moderate (n = 10 37%) and very severe (n = 9, 33%) obstruction. A small difference in our study sample classification method may explain our divergent findings. We categorized patients based on GOLD spirometric severity, while the UK study classified their study participants into three groups: mild (FEV$_1$ 50–80%), moderate (FEV$_1$ 30–49%), and severe (FEV$_1$ <30%), which may have resulted in finding more participants with severe COPD. Therefore, patients classified as mild, moderate, and severe in the UK study would have been classified as moderate, severe, and very severe in our study.

Another explanation as to why the study participants in this study had no trouble generating the minimum PIFR could be that this study enrolled only patients who were not experiencing any respiratory illness or COPD exacerbation at time of participation. Patients were carefully screened to ensure that patients who were not at their normal baseline were excluded. If study participants had a respiratory illness or COPD exacerbation, there would be a greater chance that some study participants would fail to generate the minimum PIFR. The UK study used patients with "stable" COPD, which was defined as not requiring oral prednisone or a change in inhaled medications in the previous four weeks.[17] This difference in patient selection may contribute to why our results were different.

Another potential explanation could be the timing of the PIFR measurement. In this current study, participants completed their PIFR measurements after they were educated on proper inhalation technique and were given feedback on their technique, which may have influenced patient effort during the PIFR measurement.

Limitations

Limitations of this study include the small sample size and convenience sampling. Recruitment of patients was severely limited by patient time constraints and scheduling during their clinic visit. Because the sample was one of convenience, the current sample may not be representative of all patients with COPD, thus limiting the generalizability of our findings. It is important to note that not all patients

had post-bronchodilator PFTs within the past six months, which limited our ability to accurately assess the severity of our sample in accordance with GOLD guidelines. We cannot entirely generalize our findings to other DPIs such as the Turbuhaler or Twisthaler® (Merck & Co. Inc., Whitehouse Station, NJ). However, while our sample did not use these devices, the PIFRs generated by our participants would have been adequate for these devices as well.

The importance of assessing the effectiveness of the ACCP inhaler handouts or other written instructions for inhaler use remains clear. The focus of further research should be on steps that are clinically meaningful such as charging the device, breath holding, and placing mouth in correct spot on device rather than steps that are less important such as exhaling away from the inhaler. The long-term effectiveness of the handouts should also be assessed to determine whether use of the handouts improves clinical outcomes. Determining whether patients can generate adequate PIFRs is clearly important. More data are needed to clearly define risk factors for not being able to generate the minimum PIFR for adequate drug delivery. Assessing PIFR in the inpatient population could also be beneficial to ascertain whether patients currently experiencing respiratory illness or a COPD exacerbation can generate a sufficient PIFR when DPIs are used.

This study showed that the ACCP handout is an effective teaching tool and reinforces the benefit of providing written handouts to patients during inhaler education sessions. A surprising finding was that COPD patients were able to generate adequate PIFRs in order to receive the appropriate medication dose from their respective DPIs. Respiratory therapists and other chronic disease educators need to consider measuring PIFR periodically and when lung function changes.

Conclusions

The ACCP handouts alone without any verbal instructions had a statistically significant improvement in correct inhaler technique for patients with COPD who use DPIs. However, the clinical significance, of this improvement remains unclear and was not measured in this study. Irrespective of patient age, gender, or disease severity, all study participants were able to generate the minimum PIFR needed to ensure drug delivery as stated by the inhaler manufacturer.

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APPENDIX A - ACCP Checklist

		COMPLETED	NOT COMPLETED	COMPLETED INCORRECTLY
	DISKUS®			
1	Hold in 1 hand, put thumb in grip, push open.			
2	Hold Diskus level w/ mouthpiece facing you.			
3	Slide lever away (click). DO NOT TIP.			
4	Turn head — breathe out.			
5	Put mouthpiece between lips, seal, fast and deep			
6	Remove from mouth, breath hold 10 sec.			
7	Slide grip back (click).			
8	Rinse mouth, spit, don't swallow (corticosteroid).			
9	Check dose counter to see remaining number of doses.			
	Total Points			

		COMPLETED	NOT COMPLETED	COMPLETED INCORRECTLY
	SPIRIVA HANDIHALER			
1	Open HandiHaler and mouthpiece.			
2	Remove one capsule, making sure other capsules remain sealed.			
3	Place capsule in center chamber. Close mouthpiece until you hear click.			
4	Press button ONCE to break capsule open and release powder.			
5	Sit/stand up straight. Breathe out completely. Don't breathe out into HandiHaler.			
6	Put mouthpiece between lips. Make tight seal. Breathe in FAST AND DEEP.			
7	Remove HandiHaler from mouth and hold breath for 10 seconds or as long as possible.			
8	Repeat 5–7 to make sure you got all the medicine.			
9	Pull up mouthpiece, dump capsule in trash can. Do not touch capsule. Close mouthpiece and dust cap.			
10	Wash hands.			
	Total Points			

Predictors of Success in a Baccalaureate Respiratory Therapy Program

Christine K. Sperle, MEd, RRT, AE-C

Abstract

Background: The purpose of this study was to examine the relationship between select program admission criteria and success in the professional phase of a baccalaureate respiratory therapy program. **Methods:** This study examined the records of a total of 52 students admitted to a four-year RT program from 2003–2009. Pearson's correlation coefficient (Pearson's r) statistical tests and multiple regression analyses were utilized for this study at a 0.05 level of significance. **Results:** The criterion with the greatest predictive strength for success in the respiratory therapy program was science GPA. Moderate correlations were also found between RT GPA and CRT examination scores, RT GPA and WRRT examination scores, clinical GPA and CRT examination scores, and clinical GPA and WRRT examination scores. **Conclusions:** The results of this study suggest that science GPA and prerequisite GPA continue to be useful predictors of RT GPA and may also be valuable predictors of clinical GPA and success on national board examinations. However, including criteria such as high school rank and student perception of academic ability along with interview scores and reference letters may increase the predictive strength of these criteria. Implications for further research regarding predictors of success in a baccalaureate respiratory therapy program will be discussed.

Key Words: respiratory therapy, program success, admission criteria, GPA, CRT, WRRT

Correspondence and Request for Reprints:
Christine K. Sperle, MEd, RRT, AE-C
Assistant Professor
Director of Clinical Education
Respiratory Therapy Program
University of St. Mary
St. Alexius Medical Center
Bismarck, ND 58506
csperle@primecare.org

A major challenge for respiratory therapy education programs is to produce professionals with the knowledge and skills to function effectively in the current health care environment. Although the application process varies among schools, respiratory therapy applicants typically submit transcripts of previous course work. While education programs are careful to select those candidates most likely to succeed, it is critical to determine which factors are more likely to be correlated with success in the program and on the national licensing examinations.

Predictors of academic success have traditionally consisted of cognitive measures such as high school grade point average (GPA), pre-admission GPA, GPA in select courses such as math and science, and standardized test scores such as the American College Test (ACT) and Scholastic Assessment Test (SAT). Non-cognitive measures such as reference letters and personal interviews have also been used in addition to cognitive measures to predict academic performance. However, many programs still rely on these traditional measures and put a great deal of emphasis on overall GPA and science GPA.[1–3]

Although research has demonstrated that cognitive measures are the best predictors of academic performance,[4–6] little attention has been given to predictors of clinical performance in respiratory therapy programs. Since the completion of an academic program precedes becoming a successful therapist, previous academic performance has been the fundamental process for assessing an applicant's suitability. However, success in the clinical environment depends not only on academic achievement but also on the student's ability to develop the skills necessary to function in the clinical environment.

Currently, no standard admission criteria have been adopted by the Commission on Accreditation for Respiratory Care (CoARC). The lack of a standard set of admission criteria can result in the admission of students unable to succeed in the program both academically and clinically. Providing admission committees with sound admission guidelines may ensure that only those students most likely to succeed in the program and pass licensure examinations would be admitted.

The purpose of this study was to explore the relationship between program admission criteria and success in the professional phase of a baccalaureate respiratory therapy program. This study analyzes the correlation between GPA in select admission criteria and success in the professional phase of a baccalaureate respiratory therapy program as measured by respiratory therapy program (RT) GPA, clinical GPA, and licensure examination scores.

Research Questions
1. Is there a significant correlation between program admission criteria and success in the professional phase of a baccalaureate respiratory therapy program?

2. Which program admission criteria are the best predictors of success in the professional phase of a baccalaureate respiratory therapy program?

Methods

This study was retrospective in design, using existing data from student files of the respiratory therapy program and from a National Board for Respiratory Care (NBRC) data base available to the program. The student data collected were part of the information that is maintained for each student accepted into the program, including high school transcripts, ACT scores, and college transcripts. In addition, NBRC examination scores, which are available to all accredited programs through an online database, were collected for all subjects. All data collected was held in strict confidence and reported in aggregate form such that individual subjects could not be identified.

Subjects
Data was collected from all students who graduated from a four-year respiratory therapy program over a seven-year period (2003–2009), which involved a total of 52 students. The average age of the students was 21.07 years (SD 3.30); 44 (85%) were female and eight (15%) were male students. The majority of students included in this study were Caucasian (94.2%).

Data Analysis
A longitudinal data base was created using existing records of all 2003–2009 graduates of the respiratory therapy program. Applications for admission into the professional phase of the respiratory therapy program include copies of all college transcripts. Pre-requisite GPA as well as English GPA and math GPA were calculated for each student based on college transcripts. Science GPA was calculated by averaging final grades in two semesters of an introductory sequence of chemistry, two semesters of human anatomy and physiology, and one semester of a physics course. If a student took a course more than once, the final grades in both attempts were averaged.

Information regarding high school transcripts and ACT scores were obtained from student files sent to the program after students were accepted. High school rank, entering credits, and student perception of academic ability were self reported values included on the application for admission. Students were asked to check a box indicating their high school rank (upper third, middle third, or lower third) along with a ranking of their academic ability based on a scale of 1 (poor) to 10 (excellent).

Cumulative RT GPA and clinical GPA were calculated for each graduate based on existing records maintained by the program. Cumulative RT GPA is the grade point av-

Table 1

Correlations Between Academic Criteria and Predictors of Success

Criterion	RT GPA (r)	(N)	(p)	Clinical GPA (r)	(N)	(p)	CRT Score (r)	(N)	(p)	WRRT Score (r)	(N)	(p)
HS GPA	.589	40	.000*	.456	40	.003*	.432	40	.005*	.168	38	.313
# Credits	-1.27	52	.368	-.166	52	.241	.017	51	.905	-.003	48	.985
ACT comp	.402	37	.014*	.204	37	.226	.462	37	.004*	.364	35	.032*
ACT read	.352	37	.033*	.191	37	.258	.398	37	. 015*	.199	35	.253
ACT math	.475	37	.003*	.324	37	.051	.463	37	.004*	.436	35	.009*
ACT science	.409	37	.012*	.214	37	.203	.515	37	.001*	.554	35	.001*
Prereq GPA	.656	52	.000*	.445	52	.001*	.652	52	.000*	.545	48	.000*
Math GPA	.459	49	.003*	.321	41	.041*	.499	41	.001*	.332	37	.045*
Eng GPA	.430	52	.001*	.269	52	.054	.398	52	.003*	.205	48	.143
Sci GPA	.683	52	.000*	.468	52	.000*	.628	52	.000*	.600	48	.000*
Stud. Percep.	.476	49	.001*	.260	49	.072	.581	49	.000*	.525	45	.000*
HS Rank	.490	50	.001*	.368	52	.009*	.563	50	.000*	.285	46	.055
RT GPA	---	---	---	.887	52	.000*	.680	52	.000*	.588	48	.000*
Clinical GPA	.887	52	.000*	---	---	---	.522	52	.000*	.455	48	.001*
CRT	.680	52	.000*	.522	52	.000*	---	---	---	.754	48	.000*
WRRT	.589	48	.000*	.589	52	.000*	.754	48	.000*	---	---	---

* $p < .05$

erage in all respiratory therapy courses, including clinical courses, taken in the professional phase of the program. Cumulative clinical GPA is the grade point average in all respiratory therapy clinical courses.

A total of 52 NBRC certified respiratory therapist (CRT) scores and 48 written registered respiratory therapist (WRRT) examination scores were collected for 2003–2009 graduates. The examination scores were obtained from the NBRC through a password protected online database, which is available to all accredited programs.

Various data were missing for some students. ACT scores were not obtained from 15 students who had transferred from other institutions; perception of academic ability information was omitted from three of the students' applications; eight students received college credit for college algebra after successful completion of the College-Level Examination Program (CLEP) examination; and three students had not taken the WRRT examination at the time of this study. Even though data were missing from some students, all available data were used for this study, which accounts for the different number of participants for these variables.

In order to determine if there was a correlation between selected admission criteria and success in the professional phase of a baccalaureate respiratory therapy program, a Pearson's r correlation statistical test was conducted and correlation coef-

ficients were calculated. Walker and Almond's interpretation of coefficients was adapted to describe the association between variables (i.e. strong >.80; moderate .50 to .79; weak <.49).

Cumulative RT GPA, clinical GPA, CRT and WRRT examination scores on the first attempt were the dependent variables of this study. The independent variables included all admission criteria (overall pre-professional GPA; English GPA; math GPA; science GPA; number of credits completed prior to entrance into the professional phase of the program, high school GPA; high school rank; ACT reading, math, and composite scores; and student perception of academic ability). Additionally, correlation coefficients were calculated to determine the relationship between success in the program (RT GPA and clinical GPA) and success on CRT and WRRT examination scores. After completing the statistical correlation analyses, variables with significance levels < .01 were entered into multiple regression analyses to examine which academic criteria were the best predictors of academic success.

Results

Based on Pearson's r correlation analyses between admission criteria and success in the respiratory therapy program shown in Table 1, the criterion with the greatest predictive strength for success in the respiratory therapy program as in-

Table 2

Multiple regression analysis for variables predicting success

Predictor Variable	RT GPA ($R^2 = .49$; n=40)	Clinical GPA (R^2 .30; n=40)	CRT ($R^2 = .50$; n=47)	WRRT ($R^2 = .42$; n=33)
Sci GPA	.250 (1)	.085 (4)	.256 (2)	.480 (1)
HS GPA	.190 (3)	.087 (3)	---	---
Pre GPA	.247 (2)	.137 (2)	.147 (4)	-.181 (3)
HS Rank	.100 (4)	.236 (1)	.260 (1)	---
Stud. Perc.	---	---	.181 (2)	.074 (4)
ACT sci.	---	---	---	.358 (2)

dicated by RT GPA, clinical GPA, CRT examination scores, and WRRT examination scores was science GPA ($r = .683$, $p = .000$; $r = .468$, $p = .000$; $r = .628$, $p = .000$; $r = .600$, $p = .000$ respectively). However, significant correlations were also found between prerequisite GPA, student perception of academic ability, high school GPA and program success (see Table 1). Moderate correlations were also found between RT GPA and CRT examination scores ($r = .680$, $p = .000$), RT GPA and WRRT examination scores ($r = .588$, $p = .000$), clinical GPA and CRT examination scores ($r = .52$, $p = .000$), and clinical GPA and WRRT examination scores ($r = .589$, $p = .000$).

Results of regression analysis as shown in Table 2 indicate that the combination of science GPA, high school GPA, prerequisite GPA and high school rank account for 49% of the variation in RT GPA $F=8.39 (4,39)$, $p = .000$ and 30% of the variation in clinical GPA $F=3.74 (4,35)$, $p = .012$. On the other hand, the combination of science GPA, student perception of academic ability, prerequisite GPA, high school rank, and ACT science reasoning scores accounted for 50% of the variance in CRT examination scores $F= 10.8 (4,42)$, $p = .000$ and 42% of the variance in WRRT examination scores $F = 5.16 (4,28)$, $p = .003$ (see Table 2).

Discussion

Results of this study indicate that it may be possible to predict academic performance in a baccalaureate respiratory therapy program. The finding that science GPA and prerequisite GPA were most strongly correlated with RT GPA is consistent with the literature.[2,5,6]

Since respiratory therapy is a science-based curriculum, the relationship between science GPA and program success is not surprising. A recent study by Wettstein et al.,[7] found a significant association between a strong science background and Watson-Glaser™ Critical Thinking Appraisal scores; the investigators suggested that a strong science background might be useful in selection of students for respiratory care programs.

Although a moderately strong correlation was found between prerequisite GPA and RT GPA, prerequisite GPA added little to the predictive strength of the regression model. This finding is most likely due to intercorrelations between prerequisite GPA and science GPA, since a large proportion of the prerequisite GPA consists of science courses.

If one accepts that past behavior is the best predictor of future behavior, the use of past academic performance as a predictor of future success seems reasonable. Traditional admission criteria, such as high school GPA, high school rank, and standardized achievement tests have typically been used to predict success in the first year of college;[8–10] however, their use in predicting success in a baccalaureate respiratory therapy program has not been widely studied.

The results of this study show moderate correlations between high school rank, high school GPA, and RT GPA. Additionally, multiple regression analysis revealed that high school rank had the second greatest predictive strength for the likelihood of academic success in the respiratory therapy program. This finding was somewhat surprising due to the controversy regarding the use of high school rank as an admission criterion.[10,11] Disparities among schools in their grading practices and rigor of courses can potentially result in acceptance of students that appear to be prepared for college but who are actually unprepared. Conversely, students with low class ranks actually prepared for college may not rank high enough for admission. However, a study by Shaw and Prewitt[10] found a significant relationship between high school rank and graduation from an allied health program and recommended that students in the lower quartile of high school rank should not be accepted into the professional program. Therefore, our finding that high school rank, combined with science GPA, predicts program success is consistent with the literature.

Another interesting finding in our study was the relationship between RT GPA and student's perception of his or her own academic ability. Although self-reported perceptions of

academic ability may not be accurate, they are an expression of a person's self image, and people tend to behave in a manner consistent with their self impressions.[12–14] This criterion may, therefore, be valuable in selecting program candidates who will be successful.

Another surprising finding was that the number of credits taken prior to acceptance into the program was not significantly correlated with RT GPA. A study by Renzi et al.,[15] found that students obtaining a bachelor's degree prior to admission to a doctor of pharmacy curriculum performed better academically than those with lower levels of education. These investigators speculated that their findings were explained by maturity of students and greater experience with courses at a higher academic level.

With regard to clinical performance, the moderate correlation between science GPA and clinical GPA indicates that it may be possible to predict clinical GPA. However, approximately 22% of the variance of clinical GPA could be accounted for by other variables. Confounding factors such as ineffective interpersonal and communication skills required of the student in the clinical setting and the reliability and validity of clinical grading practices may have a greater influence on clinical GPS. Although success in the clinical setting is largely attributable to a student's ability to apply theory to practice, students in respiratory therapy programs are typically graded on many non-cognitive attributes such as emotional and social skills, self-confidence and oral communication skills.

In the clinical setting, abilities such as interpersonal skills, intrapersonal skills, communication skills, and organization and time management skills are evaluated in a "real-world" clinical situation. As a result, grading in the clinical setting is highly subjective. Since grading techniques among clinical instructors vary, the reliability and validity of clinical grading practices are open to question. Additionally, one cannot rely on classroom achievement to predict skillful clinical performance. Therefore, the use of non-cognitive admission criteria such as interviews, letters of recommendation and personality tests may be better predictors of clinical performance. Limited information exists about non-cognitive selection criteria for respiratory therapy programs; therefore, studies that assess the ability of non-cognitive variables to predict clinical GPA are needed.

The results of this study also indicate that it may be possible to predict performance on the NBRC licensure examination. The findings that prerequisite GPA and science GPA were most strongly correlated with CRT examination scores is consistent with the literature.[1,6,16] Additionally, ACT math, science reasoning, composite scores, high school rank, and student perception of academic ability also showed moderate relationships with CRT examination scores. Since the CRT examination is a standardized exam-

ination, one might assume that students who performed well on ACT examinations will also perform well on the CRT examination.

Analysis of the data revealed four variables that were significantly correlated with WRRT scores: science GPA, ACT science reasoning score, prerequisite GPA, and student self-perception of academic ability. However, these relationships were moderate at best. Since science GPA has moderate correlations with RT GPA and advanced level examination scores, it seems likely that students who perform well in prerequisite science courses should perform well both in the respiratory therapy program and on the advanced level examination. It is also likely that students who do well in the program will perform well on the advanced level examination.

Although these findings are consistent with the literature,[1,5,6] approximately 70% of the variance in the advanced level examination score could be accounted for by other variables. Variables such as the length of time between graduation from the program and examination attempt and inadequate studying for the examination may have a greater influence on advanced level examination scores.

Limitations

A potential limitation of the present study is that only students who successfully completed the professional portion of the respiratory therapy program were included in the study. Additionally, although this study included all students admitted to the respiratory therapy program from 2003–2009, the results of this study can only be generalized to this population of students.

The findings of this study may also have limited use because of the small sample size (N = 52) attributable to the limited class size of the program that was studied. The time interval between program completion and examination completion may also have rendered coincidental relationships between admission criteria and examination scores.

Conclusions

It is important to note that academic criteria alone may not always predict successful completion of the program since they may not reflect the technical skills or affective attributes required to function in the health care setting. Both cognitive and non-cognitive attributes, including interpersonal and communication skills such as interview scores and reference letters, have been used as selection criteria in respiratory therapy programs. The literature supports the use of interview scores as admission criteria.[3,4] However, despite the recognition that clinical practice requires ability in both the cognitive and affective domain, admission committees continue to place great weight on academic performance as

measured GPA in the student selection process. Although the need for non-academic admission criteria is recognized, they are expensive, time consuming and much more difficult to measure than academic performance.

The results of this study suggest that science GPA and prerequisite GPA continue to be useful predictors of RT GPA and may also be valuable predictors of clinical GPA and success on national board examinations. However, including criteria such as high school rank and student perception of academic ability along with interview scores and reference letters may increase the predictive strength of these criteria. Further research is needed to elucidate these relationships in other respiratory therapy programs.

Additionally, since the respiratory therapy is a problem-solving profession requiring critical thinking skills and sciences such as anatomy, physics and chemistry are indicative of a student's problem-solving ability,[6] it may be advantageous to consider not only overall science GPA but also the GPA of individual science courses. This information may be beneficial in assessing the ability of an applicant to succeed in the professional phase of a baccalaureate respiratory therapy program from both an academic and clinical perspective.

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A Needs Assessment for the Delivery of Asthma Education to Parents of Young Children

Jacqueline Arroyo, MS, RRT

Ellen A. Becker, PhD, RRT-NPS, RPFT, AE-C, FAARC

Abstract

Background: Asthma education for parents and caregivers is key to achieving good asthma control in children. Parent motivation and other barriers affect attendance at asthma education programs. This study explored parental concerns about asthma as part of a needs assessment in order to better engage parents and increase participation at future asthma education programs. **Methods:** Parents and caregivers of children with asthma at an urban youth center completed a questionnaire to obtain demographic information followed by a semi-structured interview in focus group format. Caregivers answered questions related to their child's asthma and its management. The discussion was audio-recorded, transcribed, and coded into common themes. **Results:** Five major themes emerged from the focus group discussion: environmental triggers, asthma self-management, emotional response to emergency situation, and education delivery. Parents expressed fear and anxiety during emergency situations as well as confusion about the actions of medications and their proper administration. Most children experienced tobacco smoke exposure at home. **Conclusions:** Trigger exposures, fears, and knowledge deficits found in this study such as exposure to tobacco smoke, during an asthma-related emergency, inappropriate uses of asthma medication, and not properly utilizing an asthma action plan were similar to other studies cited in the literature. Designing asthma programs that address these common themes may help asthma educators engage caregivers in asthma education and result in better asthma control for their children.

Key Words: asthma education, delivery of asthma education, asthma self-management, asthma in children, needs assessment

Jacqueline Arroyo, MS, RRT
Respiratory Therapist
Department of Respiratory Care
University of Chicago Medicine
Comer Children's Hospital
Chicago, IL
j.arroyo.rrt@gmail.com

Ellen A. Becker, PhD, RRT-NPS, RPFT, AE-C, FAARC
Professor, Respiratory Care
Rush University Medical Center
College of Health Sciences
Department of Respiratory Care
Chicago, IL
Ellen_becker@rush.edu

Correspondence and Request for Reprints:
Jacqueline Arroyo, MS, RRT
Department of Respiratory Care
University of Chicago Medicine
Comer Children's Hospital
5721 S. Maryland
Room K273-A MC 0981
Chicago, IL 60637
j.arroyo.rrt@gmail.com

Introduction

Children under the age of five years represent the largest number of individuals with asthma.[1] Encouraging parental education is essential for asthma management for those who have children diagnosed with asthma. Many families with asthma live in underprivileged areas and do not have the resources to acquire medication, proper health care, and preventive education.[2]

Typically, several medications are prescribed to children who suffer from asthma. The number of medications taken depends upon the asthma severity, and the timing of medications may depend on the child's symptoms. Thus, parents may be confused about which medications to take and when to take them. Insecure, desperate, and frightened is how parents describe their feelings when their child is having an asthma attack. These feelings may result in making poor decisions. Some mothers are apprehensive about giving asthma medications, believing that medications could cause their child to become addicted, be hazardous to their health, or lose effectiveness with frequent use.[3]

Health care workers play a key role in helping parents and caregivers with asthma management. Discrepancies between the prescribed asthma management plan and actions of parents indicate the absence of a strong partnership and poor communication between the physician and parents. Parents feel that physicians doubt their proficiency, which creates a lack of respect in what should be an important partnership. Asthma education is a success when children with asthma and their parents or caregivers appreciate asthma education.[4]

In order for asthma education for families to be successful, parents need access to educational sessions at convenient times and venues. Prior attempts by the authors to educate parents and caregivers about asthma at a local youth center yielded low participation. The aim of this study was to understand parental concerns prior to holding an educational session and to determine how to best design and market an asthma education program that parents would want to attempt.

Methods

A semi-structured interview was conducted with a group of parents or caregivers of children with asthma. The interview contained a series of questions to discuss concerns, apprehensions, and thoughts that parents had about their child's asthma management. The interview also included questions regarding the timing and duration of an asthma education program to improve and promote parental participation.

Recruitment Methods
This study utilized a convenience sample of parents or caregivers who have children with asthma who attend a local youth center in an urban Midwestern city. Inclusion criteria were any parent or caregiver of a child who attended the local youth center who had been diagnosed with asthma or had asthma-like symptoms, child age between 1–18 years, and ability to communicate in English. Exclusion criteria were inability to communicate in English or not care for a child with asthma. No monetary incentives were provided in exchange for participation.

A flyer was created and left at the local youth center to create awareness of the focus group and recruit participants. The focus group was held the same night as one of the center's Head Start meetings. The director of the youth center and the director of the center's Head Start program personally recruited adults who cared for a child with asthma or asthma-related symptoms at the center and escorted them to the room where the focus group was held.

Semi-Structured Interview
A semi-structured interview was developed based upon a review of the literature related to asthma education for parents and caregivers.[1–4] The questions asked during the semi-structural interview were based upon several studies addressing parents' concerns about managing their child's chronic disorders such as asthma and autism.[3,5,6] Participants were asked questions in regards to side effects, medication administration, self-management, and signs and symptoms. Reactions to emergency situations, doctor visits, and asthma action plans were also topics of discussion among the participants. A copy of the interview questions appears in Appendix A.

Prior to participation in the focus group, the format for the semi-structured interview and that the interview would be audio-recorded was explained to the prospective participants. Each participant signed a consent form previously approved by an Institutional Review Board. Confidentiality was maintained throughout the entire process.

After completing the informed consent process, participants completed a brief questionnaire to obtain demographic information that requested gender, highest level of education, age of the child, medication taken, signs and symptoms of asthma, and type of insurance. During the semi-structured interview, participants had the chance to express their thoughts and share their concerns about the management of their child's asthma.

Analysis of Data
A typed transcript was generated from the focus group audio recording. The two authors independently evaluated the transcript to assign the participants' remarks into major themes. Differences in themes were discussed until agreement was reached. Frequency data for the demographic data was also computed.

Results

The focus group began with a total of six participants; however, one participant left because it was discovered that her husband had asthma and not her child. Of the remaining individuals, 80% (n = 4) were female and 20% were male (n = 1). All participants obtained a high school education or GED, with one individual having some college education. One participant in the group was an asthma educator who worked with other children as well as being a parent of a child with asthma. The age range of the care providers' children was 1–13 years. Medications taken by their children varied. Sixty percent (n = 3) used some type of inhaled corticosteroid, 80% (n = 4) used albuterol, and one parent reported not providing any medication. Two children took medications for allergies, such as fluticasone nasal spray and loratadine. Caregivers listed the first symptoms that their children experienced with asthma as difficulty breathing, whether it was "breathing fast" or "loss of breath." Other symptoms included wheezing, holds chest (chest tightness), and runny nose. Three out of five participants had Medicaid

Table 1
Participant Deomgraphic Information

Variables	Frequencies
Gender	
Female	4
Male	1
Education Obtained	
High School or GED	4
Some College	1
Age of the Child with Asthma	
15 years	2
5-10 Years	2
11-13 Years	1
Role as Caregiver	
Parent/Guardian	4
Nanny/Caregiver	1
Medication Taken	
Beta$_2$-agonist	4
Inhaled Corticosteroid	2
Allergy Medications	2
N/A	1
First Symptoms or Signs	
Breathing Difficulties	3
Wheezing	1
Tight Chest	1
Runny Nose	1
Type of Insurance	
Public Aid/Medicaid	3
All Insurances for Families	1
Blue Cross Blue Shield	1
Humana HMO	1
Harmony HMO	1
N/A	1

or public aid as a form of insurance. The asthma educator listed all the insurance plans for children that she cared for such as All Kids Insurance for Families and Blue Cross Blue Shield. One participant listed "not applicable" as a response to this question. The results are summarized in Table 1.

Five major themes emerged from the focus group discussion: environmental triggers, asthma self-management, emotional response to emergency situation, medication administration, and education delivery. Each theme is discussed in more detail below.

Environmental Triggers
One participant felt that the mold and dust in her living conditions made her child susceptible to asthma symptoms. In addition to hazardous living conditions, tobacco exposure was another major concern expressed by participants. More than half of the participants (60%) claimed that their child was exposed to tobacco smoke inside the home. To minimize or prevent their child from triggers, some stated that they asked family members or guests to smoke outside of their home. Another preventive measure discussed by a participant was use of a smoking jacket for those who desired to smoke. The smoking jacket prevents smoke from adhering to clothing that can potentially trigger a child's asthma. Table 2 summarizes specific participant responses.

Table 2
Environmental Triggers

Envionmental Trigger Topics	Participant Remarks
Living Conditions	"So I'm in a basement apartment, which could be also hazardous. Because there's probably mold and you know dust and uh a um the mess and stuff like that, so. I know that's that could be uh, so I tried a kinda you know wipe and dust as often as possible"
Smoking	
Smoking Indoors	"I think because we stayed in the household with my mom and she's a smoker." "Yea that's how my parents was. My parents was smoking and then they try to do it in another room."
Prevention	"Sometimes my family they smokes cigarettes and stuff but when it gets warm like this, I have a big back porch so I know a lot of them like smoke in the house, I make them go outside." "…I wear smoking jacket. So if I was out to smoke I wear a jacket. I don't really interact with *[child's name]* as much but I wear a jacket because there such a thing as third-hand smoke. So the third-hand smoke will come off of my clothing, but if I have my jacket on it will less likely be on my clothing it on the jacket."

Italicized text in bracket represents a question asked by the interviewer or edit to preserve confidentiality.

Table 3
Asthma Self-management

Asthma Self-management Topics	Participant Remarks
Albuterol Misuse	"The only thing I really know is the um albuterol. If I don't have that, no then I would be kind of lost in not know what would be the next step." "we would like to know what cause the episode so we can keep the child away from it so we're not constantly giving the child albuterol." "Okay so she has two medications than?… Yes. [*Okay, and the one and there's one that she takes every four hours?]…*Yes. [*Is that her albuterol?]…* Yes" "No you don't give him the Albuterol just because. The Albuterol is only a rescue inhaler, it's only if he has breathing problems."
Confidence	
Parent's confidence managing asthma	"Um I think I get nervous, scared, cause my son had an attack and I panic. I think I was panicking more than he was (laughing), so my first reaction was emergency room."
Concerns with knowledge of care givers	"…knowledge of the parent or whomever is the care giver of that person with asthma is."… how to react, so that's my big concern, knowing how to react to it." "Uh sometimes. Depends on whose house he with and who you with." [*comfortable with*]Well mainly just my, my immediate family."
Asthma Action Plan	
Content in Asthma Action Plan	"they alls read the same… yea I don't think it's more individualize, I would like for it to be more individualize per child because whereas like her child has asthma but his trigger is not as bad as her child's trigger."
Use of Asthma Action Plan	"Yea cause it is kinda confusing like you were saying they have the red the yellow and then the green"
Parental Recommendations for Managing Asthma	"I try to dust a lot, keep a lot of things wiped down, far as door knobs and her **a**nswering my phone. The knobs on the sink, the toilets, you know the little things that I she'll touch and got the most nastiest germs that can trigger her asthma. That's what I try to keep clean at home. And a lot of Lysol spray." "I mean I guess it's just I mean think like a wakeup call they need to know that the child has asthma it's not going anywhere and they need to know that this is a life threatening condition that it can potentially take your child away from here and I think if they looked at it that way that they will manage it better oppose to being so nonchalant about it because they don't look at it."

Italicized text in bracket represents a question asked by the interviewer.

Self-management
Overall, the participants addressed numerous asthma self-management issues in the discussion. There was a definite lack of confidence and knowledge among participants regarding how to properly manage their child's asthma. The asthma action plan was either not used, not understood, or was thought to be too generic. Many did not feel comfortable with leaving their child with someone who was not a family member. Albuterol was frequently misused. Some participants gave albuterol as a scheduled treatment instead of as needed. Confusion between the names, appearance, and the type of medication that were given to their child was also a concern expressed in the discussion. Specific quotes related to self-management appear in Table 3.

Emotional Responses to Emergency Situations
Fear and anxiety were the most common emotions participants felt during asthma emergencies. A sense of helplessness was also expressed among participants unable to make their child feel better. Frustration was also apparent. One participant recounted the need to return her child to the emergency department for a second time due to difficulty breathing. A summary of the emotional responses to asthma appear in Table 4.

Medication Administration
Possible side-effects of inhaled corticosteroids was a concern for some participants, while others were not apprehensive at all about the medications their child received for asthma

Table 4
Emotional Responses to Asthma

Emotional Response Topics	Participant Remarks
Concerns with Emergency Situations	"But um my concern would be like the um risk of their child dying from it, you know. Because your child's coughing and if you can't calm them down, and what can you do like in the event of an emergency?" "But the parents aren't taking it seriously, a lot of parents are not taking a- as serious as I think they should…- Cause they're not having any attacks, and then I don't know they can wake up and who, have an attack and it's, it's over, I mean, just that fast, it happens that fast." "When he, I don't know, I don't know the symptoms, so. I mean if he have an attack or something, I mean it's like I'm lost to it."
Hospitalization/ ED Visits	"Well, I'm a single mom. And, it kinda get lonely when you by yourself on the hospital and your baby got tubes an-and stuff sticking in her. I mean you wish you were there and your baby was sitting outside the bed. Like you to take the pain for her, but you can't." "I actually ended up going back to the hospital again that same night, so… Yes, for another long treatments."
Emotions with Symptoms or Attacks Occur	"Um I think I get nervous, scared, cause my son had an attack and I panic. I think I was panicking more than he was (laughing), so my first reaction was emergency room." "Nervous, scared" "Scared" "I be nervous"

symptoms. Proper use of the medication was another theme. These included when and how to properly administer medication. Throughout the interview, there was a notable misconception regarding when to use an inhaled corticosteroid and when to use a beta$_2$-agonist. Some participants did not use a spacer, while others used a spacer but found it to be expensive even though they had insurance. These misconceptions and responses toward how medication was administered are highlighted in Table 5.

Education Delivery
It was unanimous among the participants that they had no preference for who provides informational sessions about asthma. Participants wanted a person who will be engaging and knowledgeable to deliver asthma education. While some participants did not mind having informational sessions on Saturdays, the majority preferred weekdays after work or early evenings. Table 6 summarizes responses about issues related to education.

Discussion

The themes found in the focus group are consistent with findings elsewhere in the literature. Regarding environmental triggers, one study showed that African-American families face more environmental adversity, such as poor housing conditions.[7] One of the participants faced the daily challenge of living in poor housing. She lived in an older building with dust and mold that triggered her child's asthma. A few participants discussed environmental triggers common to everyone. Two participants claimed that they tried to keep their house clean by disinfecting and dusting to avoid their child's triggers. An additional environmental trigger was excessive crime. Crime creates increased stress, which can trigger asthma symptoms. The participants lived in a neighborhood associated with increased gang activity, drug use, robberies and violence.[8]

Environmental tobacco smoke (ETS) exposure was prevalent in the focus group participants, with half of the children being exposed to cigarette smoke in the home. A correlation between children with asthma and their exposure to ETS has been reported elsewhere. Kit et al. reported that a total of 53.2% of children with asthma were exposed to ETS, with 70.1% of those children coming from low-income status.[9] Similar findings were found in this study, with half of the participants' children exposed to in-house smoking. Participants claimed that family members would smoke in the house and, at times, were asked to go to another room or outside to prevent triggering their child's asthma symptoms. However, environmental tobacco smoke was still an issue since smoke remains in clothing and household fabrics even if smoking products were used outside or a different location in the home.

Research on children's self-administration of asthma

Table 5
Medication Administration

Medication Administration Topics	Participant Remarks
Spacer/Chamber	"I don't know, I- I guess he said outgrew that baby thing as he use to call it. Because like that's how I use to administrate the medicine to my daughter. Through the chamber."
	"…and it's not, I don't think it's because of the doctor, I don't think the doctor prescribed it okay, they really don't know to ask for it…" [*In regards to attaining a spacer for medication administration.*]
Parental Oversight Medication Administration	"We'll assist them. I mean the parents will let you know if they can self-medicate." "Yea we will just be there, will pull them out you know out, out the general population, pull them to the side let them self-medicate if they need me and basically."
	"And she's a big girl. Like, like literally she'll go, go take your blue medicine, she'll go. Twist and squeeze it, and squeeze it back in the in the mask, and put the mask on, turn the machine on."
Insurance Issues with Equipment	"And a chamber is kinda expensive thing if you have private insurance. The chamber is like $85, I wanna say"
	"I wonder why they don't prescribe the um… Nebulizer… I ask for it, but they denied me. I think they said because [*child's name*] is not um…severe"
Medication: Rescue vs. Controller	
Proper Use	"He do play sports and he got out of breath, he always keeps an inhaler on him. So he know how to treat himself. [*And does he use his inhaler before he gets out of breath? Or does he wait till he gets out of breath…*] I think he waits he gets out of breath, because he comes running those stairs, so it's after."
Identity Confusion	"So most o- of the Advair as well as the um Albuterol would be twice day too."
Medication and Side Effects	"With that um Advair and um a lot of medication that he's taking. I kinda fear that it's too much for him and, and, than I put in my head as if it's he needs this so give it to him. But then it's like for me being a parent with all the medication it's could be like too much to me." "Well I know I heard about the Advair. As far as the Advair being a steroid…"
	"Oh, (laugh) I would just be concerned about the long-term side effects of medicating a child overall. Like, a child as young as [*child's name*], he's four so, he's going to be on Advair for God knows how long." "And I just would be uh worried about the medication not working you know cause than he can become immune to it…"

Italicized text in bracket represents a question asked by the interviewer or edit to preserve confidentiality.

medications indicates that as the child becomes older, the parents take less responsibility for administering daily controller medication (DCM). At the age of seven, children adopted 20% of the responsibility for taking their daily controller medication. While at the age of 11, children adopted 50% of the responsibility of their daily medication; and at age 15, 75% of responsibility was reported, while full responsibility was assumed at 19 years of age. The same study also stated that parents who have obtained 16 or more years of education take on more DCM responsibility compared to those parents with 15 or less years of education. Parental adherence (assuring that prescribed doses were taken by their child) is also higher in white parents compared to nonwhite parents. Possible reasons for lower adherence in minority parents could be due to lower socioeconomic status, larger family sizes, and competing family priorities.[10] The number of participants in the present study was small, and there was not racial diversity in the group. Thus, a direct comparison between this study and the literature could not be made. However, children in the present study may need to self-administer their medications at a younger age because parents face daily obstacles such as single parent homes, one household income, numerous different child caregivers, unsafe neighborhoods, and poor living conditions. One parent in this study felt that the responsibility to administer albuterol was given to her child because he was old enough to understand when to take the medication. Another participant felt that her child was "a big girl"; and if she was able to turn on a large screen TV, she was able to take her asthma medication on her own.

Several parents described improper uses of albuterol, a finding consistent with other research. A study addressing

Table 6
Education Delivery

Education Delivery Topics	Participant Remarks
Preference on Who Can Deliver Informational Session	"I-I don't mind who gives the information. As long as their engage the parents. Right. If they can engage the parents to help them understand the importance of asthma, they'll be great, as long as they're engaging. That's the big thing." "the A to Z, all about it, not bits and parts of it or half of it, the whole thing."
Preference on What Day and Time to Deliver Informational Sessions	"Yea but far as the parents here they will come if it's after like 4:30, after 4:30, they'll show for asthma workshop, so they'll be great. After 4:30 because most people here work." "I'll give up a weekend morning… between like 10-2" Yea, like probably like after 4
Medical Provider Not Explaining Well or Taking the Time to Explain	"Because some parents just give you documents and they don't know because some doctors are in a hurry, it happens. So you may sometimes have to sit there and go over." [*In regards to doctors explaining the asthma action plan.*] "But usually, um, parents are pretty knowledgeable about what their child has once they found out about the asthma and they learn a bit more, because the doctor will explain to them how you know it's detrimental to their child's health and things like that. So if they need like additional assistance, I will go over the action plan because sometimes they may not know what it means."

Italicized text in bracket represents a question asked by the interviewer.

albuterol use in an acute asthma exacerbation found that albuterol was misused by undertreating, infrequently used, no medication, not using a spacer, over-treating, and over-reacting. Undertreating was the most common of the sub-categories of inappropriate albuterol use.[11] In contrast, two parents in this study gave their child scheduled albuterol treatments every four hours instead of as needed. In findings similar to the study cited above, one focus group participant claimed that a spacer was not used because her child did not like the spacer, and another parent did not have the medication at home.

Participants in our focus group did not appear to comprehend the asthma action plan well. The asthma action plan was described as either redundant or unclear. Problems associated with following the action management instructions have been documented in other settings. In a study describing feedback from school personnel in predominantly African-American low-income urban elementary schools, the authors found difficulties with understanding the action plan, lack of knowledge about asthma, and confusion with managing their students' asthma.[12] Principals of these schools were interviewed and expressed concerns about the lack of school nurses, how to handle an emergency, and lack of awareness of school-wide policies for asthma management. Teachers at these schools were unsure of what action to take if a student had an asthma exacerbation. It was reported that 39% of teachers did not accurately follow the correct procedures for asthma exacerbations. Inappropriate steps included bag breathing and trying to calm the child by instructing the child to sit still without medical attention. In the same study, half of the parents who were interviewed in this study claimed that they had a conversation with their medical provider regarding their child's asthma management at school.[12] Focus group participants in the present study had obvious miscommunication or misconceptions about the proper way to manage asthma. More effective education could improve the asthma management of those children. Proper education among school staff and parents would benefit both parties, and especially the child with asthma. A well-written asthma action plan customized for each child that is fully understood by parents could better control the child's asthma. Parents with proper asthma management education could explain their child's action plan to school personnel to improve the school's chance of taking proper actions. It seems that without proper parental education, school personnel may not be aware of the child's asthma action plan and, thus, not be able to respond appropriately to an asthma exacerbation.

Numerous parents had feelings of panic and fear when their children had an asthma exacerbation. The feeling of uncertainty was felt by 54% of parents during an asthma attack in one study.[13] Participants unanimously felt fear and nervousness when they had to take their child to the emergency department with symptoms of asthma. The majority of participants did not have or follow their asthma action plan. One participant claims it was confusing to follow the action plan given by her doctor.

Kieckhefer and Ratcliffe[13] also found that parents of children between the ages of five and 10 had concerns with medication and side effects that were much larger than those

who had children younger than five years of age. The study focused on why parents were apprehensive about the side effects that may occur with asthma medication. Parents did not express confusion. In the present study, it was the researchers who identified parental confusion and not a theme that parents self-identified. Participants were confused on when, how, and which medication to use for their child with asthma symptoms. There may also be a possible correlation between confusion of medicine and the absence of an asthma action plan. The lack of an asthma action plan could also lead to the fear and nervousness described by parents during asthmatic symptoms or exacerbations.

Further, Kieckhefer and Ratcliffe[13] concluded that parents would like more information about their child's asthma. A total of 37.5% felt they would like more knowledge from their health care provider about their child's asthma. The present study's focus group participants obtained educational information about their child's asthma but did not fully comprehend the content. The participant who was an asthma educator suggested that it would help to talk with the parents and review the information that physicians gave to parents to provide a better understanding about asthma and how to manage it. Another participant felt that "doctors do not spend enough time explaining important concepts to parents and making sure that the parents totally comprehend the information." Exploring other systems to deliver asthma education utilizing health care workers such as asthma educators, asthma clinics, respiratory therapists, and nurses, is needed.

Parental attendance at an asthma informational session is the first step in improving parental knowledge. A significant part of this study was asking participants about the timing of asthma education programs and whom they would like to present asthma education. The group unanimously responded that it did not care who delivered the information as long as the person was knowledgeable. One participant claimed that at times "…doctors are really dry, you still wouldn't understand the importance of asthma, so it doesn't matter, as long as they're engaging." More than half of the parents preferred after school hours, while the remaining participants preferred weekends.

The findings gathered from this study will aid planning future sessions to enhance participation and meet the parents' asthma education needs at the local youth center. However, the process used to conduct this needs assessment (a focus group) could be replicated in other settings. The focus group questions would need to be pilot-tested to assure that they were valid for the population being studied and specific results might differ.

This study had several limitations. It was conducted in a single location with a small number of participants. The majority of participants cared for children between the ages of 1–13 years. The needs of parents with older children, from different demographic backgrounds, or living in different geographic locations might yield differing results. The information obtained from this study's needs assessment provided a better understanding of what information parents want addressed. Further, key topics from the study can be highlighted in fliers advertising upcoming asthma education sessions to potentially enhance participation. Yet, these focus group outcomes alone will not determine whether attendance at future asthma education sessions improves nor, ultimately, whether the children will have better controlled asthma. Additional research implementing an asthma education program based upon the focus group findings is needed to clarify answers to these questions.

Conclusion

Focus group participants had many concerns about their child's asthma. The common themes from the semi-structured interview related to environmental triggers, self-management, and emotional responses to emergency situations, medication administration, and education. The focus group provided deeper insights within each theme that program planners can use to design more effective marketing and program content for parents who have a child who suffers from asthma. Further, parents identified the best time, days, and who should deliver asthma education sessions. Redesigning the former parent asthma education program by implementing the findings of this study improve parental participation. The effectiveness of designing a program that utilizes these findings and evaluating the outcomes is needed to ultimately test the utility of the focus group outcomes.

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APPENDIX A

Focus Group Interview Questions

What is most concerning to you about caring for a child with asthma symptoms?

Are you confident that you know the best decision to make when your child has asthma symptoms?

How do you feel when your child is having asthma symptoms?

Did your child ever require an emergency department visit or hospitalization? What was that experience like? What types of inconveniences did it cause for you?

What are your concerns about your child's asthma when they are not with you? (When you are at work, when they are in school, etc.)

What did you do the last time your child had asthma symptoms during their sleep?

Do you have a written asthma action plan?

Do you agree with the asthma action plan created for your child?

Does your caregiver (parent, grandparent, partner, etc.) know how to manage your child's asthma?

How do you care for your child's asthma symptoms?

Do you have any concerns or fears about medications that are prescribed by your medical provider?

How often do you need to give your child asthma medications? Which medications are given daily? Which are given only when your child has asthma symptoms?

Do you go to the doctor regularly for your child's asthma? (Attend follow-up doctor visits?)

Do you have an asthma action plan? Where do you keep it? Does the school nurse have a copy?

How do you administer your child's asthma medications? Do you watch your child administer his or her own medication?

If there are times that you do not have medication at home, what are the reasons that this occurs?

Prompts: Forgot to fill the prescription? Did not think my child would need the medication? I do not like to give my child too much medication. A relative or family friend is using the medication. What would make it easier to obtain your child's asthma medication?

What would be the helpful information you need to help you manage your child's asthma better?

Do you feel comfortable telling your health care provider or physician if you differ with the asthma plan that is created?

Do you understand how the health care providers explain your child's asthma?

From your experience, what do you think that other people who have children with asthma ought to know about caring for their children with asthma?

From your experience, what types of changes would you like to see health care providers make when they educate people who have children with asthma.

What time of day or day of the week should the educational session be held?

a.   How long should the session last?

b.   Where should the sessions be held?

Whom would you like to provide information about asthma? A community health worker? Respiratory therapist? Doctor? Others?

Are you comfortable communicating with your child's health care provider? For example, if you did not want to give your child a medication that was prescribed, would you tell your medical provider?

Interprofessional Collaboration Between Two Rural Institutions: A Simulated Teaching Laboratory Paradigm

Dennis Klima, PT, PhD, GCS, NCS

Katherine A. Hinderer, PhD, RN, CCRN

Kaynabess Freda, MS, RN

Dorothea Winter, PhD, RN

Robert Joyner, Jr., PhD, RRT, FAARC

Abstract

Promotion of successful multidisciplinary practice begins with the infusion of interprofessional education into the curricula of health care programs. This paper describes an educational paradigm where students from the disciplines of nursing, physical therapy, and respiratory therapy were brought together in a simulated clinical experience to promote interprofessional learning. Patient-case scenarios, with the addition of emergency situations to each case, promoted collaboration among students and further promoted understanding of the contribution of each discipline. The teaching laboratory simulation, along with aligned medical equipment and supplies, reflected contemporary health care practice settings. Interprofessional education is an important element in advancing teamwork among health professionals and use of simulated clinical activities can initiate increased understanding of collaborative patient care.

Key Words: interprofessional education, clinical simulation, nursing, physical therapy, respiratory therapy

Dennis Klima, PT, PhD, GCS, NCS
Assistant Professor of Physical Therapy
University of Maryland Eastern Shore
Princess Anne, MD

Katherine A. Hinderer, PhD, RN, CCRN
Assistant Professor of Nursing
Salisbury University
Salisbury, MD

Kaynabess Freda, MS, RN
Instructor of Nursing
Salisbury University
Salisbury, MD

Dorothea Winter, PhD, RN
Professor of Nursing
Salisbury University
Salisbury, MD

Robert L. Joyner Jr., PhD, RRT, FAARC
Associate Dean
Richard A. Henson
School of Science and Technology
Director, Respiratory Therapy Program
Salisbury University
Salisbury, MD

Correspondence and Request for Reprints:
Robert L. Joyner, Jr., PhD, RRT, FAARC
Associate Dean
Richard A. Henson
School of Science and Technology
Director, Respiratory Therapy Program
Salisbury University
1101 Camden Avenue
Salisbury, MD 21801

Interprofessional education (IPE), as defined by the World Health Organization (2010), occurs "when students from two or more professions learn with, from and about each other to enable effective collaboration and improve health outcomes."[1] Academic accrediting bodies recognize the importance of IPE and encourage increased collaborative education among health professionals. The inclusion of multiple health professions, specifically those who have not traditionally been involved in IPE, such as respiratory therapy and physical therapy, is paramount. Practicing professionals from multiple disciplines need to learn to work collaboratively to promote positive patient outcomes; moreover, optimal interprofessional learning can occur through interactive experiences. This may include discussions around case studies, shared-experience debriefing sessions, and team learning through case competitions and interactive learning. Historically, various instructional methods were used to promote teamwork: 1) high-fidelity simulation or the use of a physiologically modeled computerized patient simulator; 2) experiential team shadowing or following members of various specialties in their practice settings; and 3) virtual environments or the use of technology to simulate clinical settings and patient interventions in a computer-based environment.[2,3] The purpose of this paper is to describe a simulated clinical IPE experience that included students from two different institutions in the disciplines of nursing, physical therapy, pharmacy, and respiratory therapy.

Methods

Four cohorts of students, from two institutions, participated in a joint simulated laboratory instructional program using a post-test only design to enhance intercollegiate IPE. Participants included 85 nursing, respiratory therapy, pharmacy, and physical therapy students from two universities on Maryland's Eastern Shore. The educational program received Institutional Review Board approval from both participating institutions. A brief six-item post-test survey designed for this program assessed program effectiveness, organization, and opportunities for interdisciplinary knowledge sharing. Sample items from the survey included assessment of participant discipline and insight into others' health professional roles. Four items assessed program quality using a four-point Likert-style scale that ranged from 4 (Excellent) to 1 (Poor). Clinical problem solving was dichotomously assessed using an item from the Readiness for Interprofessional Learning Scale (RIPLS).[4]

Following an introductory group discussion of contemporary discipline-specific roles and responsibilities, 20 stations of four students participated in three patient-focused cases. Five pharmacy students acted as consultants to all groups. All disciplines were represented in each student group. Terminal objectives required students to: 1) describe the various roles and responsibilities of each health care provider; 2) perform select medical interventions specific to the discipline; and 3) describe how patient management could be optimized through interprofessional collaboration.

The design of this program afforded students the opportunity to contribute to the overall patient plan of care with interventions specific to each discipline. The program also allowed students to learn more about the other represented disciplines. The three case presentations included: patients with Parkinson's disease, cystic fibrosis, and total hip ar-

Table 1

Case Study Descriptions and Sample Interventions

Case Study	Physical Therapy	Respiratory Therapy	Nursing	Pharmacy
78-year-old patient with Parkinson's disease	Bed mobility, ambulation, and transfers	Breathing exercises for restrictive lung disease	Integumentary assessment, medication management	Sinemet®, with associated hypotension
20-year-old patient with cystic fibrosis	Mobility and stretching exercises	Auscultation, postural drainage, and percussion	Nutritional assessment, intravenous therapy and invasive catheter management	Pulmozyme and TOBI®, with associated occasional throat discomfort
65-year-old s/p total hip arthroplasty post-op day 3: posterior approach precautions	Bed mobility and transfers with precaution adherence	Post-operative breathing activities; supplemental oxygen therapy	Wound management; lab values analysis	Insulin, glucose correction scale and Coumadin®

Sinemet® (Merck, Whitehouse Station NJ)
TOBI® (Novartis Pharmaceuticals, Basel, Switzerland)
Pulmozyme® (Genentech, South San Francisco, CA)
Coumadin® (Bristol-Myers Squibb Company, New York City, NY)

throplasty. The cases represented common clinical diagnoses managed by all disciplines in most health care settings. Details of each case are listed in Table 1. Cases involved integration of discipline-specific and shared interventions, strategies for collective team building, and skill demonstration by each discipline. Interventions, congruent with the specific nature of each case, included: wheelchair management and transfers (physical therapy), intravenous therapy and invasive catheter management (nursing), supplemental oxygen therapy and postural drainage and chest percussion techniques (respiratory therapy), and medication management (pharmacy). Academic and clinical faculty supervised the individual groups during the instructional session to facilitate interprofessional dialogue and intervention integration. The laboratory environment created an atmosphere that mirrored a health care setting where professionals collectively interacted with their patients. The simulated patient cases also facilitated instruction in equipment management less commonly encountered by the other disciplines. For example, respiratory therapy students facilitated appropriate chest physical therapy and postural drainage of a simulated patient with cystic fibrosis. The physical therapy students provided the mobility and stretching exercises, the nursing students guided assessment techniques of breath sounds and nutritional assessment, and pharmacy students discussed appropriate antibiotic therapy.

Lab activities required students to react collectively to medical emergencies that might arise during management, including responding to syncopal episodes and postural hypotension, and performing cardiopulmonary resuscitation

(CPR). At the end of the session, participants completed the survey instrument to assess new insights into the roles of the other disciplines and overall program quality. Data were analyzed using SPSS version 21.0 for descriptive statistics.

Results

Eighty-five students participated in the simulation experience, including 24 respiratory therapy, 28 nursing, 28 physical therapy, and five pharmacy students. Analysis of the follow-up survey (n=83) demonstrated positive feedback from the laboratory session. Survey data are included in Table 2. Over 95% of participants rated the material relevance, interaction with other disciplines, and opportunity for discipline skill application as "Excellent" and "Good." In addition, most participants rated the session organization as "Excellent" or "Good." One hundred percent of participants noted that they gained insight into the roles of other health professionals; similarly, they expressed that shared learning with other health professionals would increase their ability to understand clinical problems.

Discussion

A variety of instructional methods have been utilized to promote teamwork among the various health disciplines and include activities with experiential team shadowing, the virtual environment, and high-fidelity human patient simulation.[2] Our approach was to utilize a case-based perspective where four disciplines joined together to both discuss

Table 2
Follow-Up Survey Results (n=83)

Program Quality	Excellent n(%)	Good n(%)	Fair n(%)	Poor n(%)
Relevance of Material	64(77%)	18(22%)	1(1%)	0(0%)
Organization of Session	28(34%)	43(52%)	12(14%)	0(0%)
Interaction with Other Disciplines	69(83%)	12(15%)	2(2%)	0(0%)
Opportunity to Apply Skills from Your Discipline	55(66%)	27(33%)	1 (1%)	0(0%)
Interprofessional Perspectives	Yes n(%)	No n(%)		
Did the program give you any new insights into the roles of other health professionals?	83(100%)	0(0%)		
Do you feel that shared learning with other health professionals will increase your ability to understand clinical problems?	83(100%)	0(0%)		

and perform common interventions related to three patient case studies. This approach afforded students, both graduate and undergraduate, an opportunity to discuss cases and get feedback from participants in various disciplines in a non-threatening atmosphere. A similar IPE approach was used by Breitbach and colleagues[5] to promote teamwork among health care professionals and enhance patient-centered care. Smith et al.[6] employed a comparable activity to facilitate communication between physical therapy and nutrition students by requiring one discipline to serve as consultant for the other regarding a specific patient scenario. Students in this study assumed a similar role. Students reported an improved role understanding of the other disciplines and noted that shared leaning would enhance clinical problem solving.

Interactions between the students included obtaining additional information, discussing interventions specific to a discipline and, at times, team interaction with the "patient." The inclusion of the patient and family in the team has been identified as an important aspect of collaborative care that is often omitted.[7] This is a component that we plan to expand in the future. A unique component of our structured case study approach required students to react to a series of emergency situations related to their case. While each discipline received prior requisite training in emergency management, the required practicing of CPR with other students added a unique dimension to the learning experience. The interaction with another discipline to manage syncopal episodes or performing CPR necessitated team interaction and communication. Our data findings suggest that shared learning experiences increased their ability to understand clinical problems. This is supported by Piquette, Reeves, and Leblanc who noted that health professional perspectives regarding others' expertise differed before and after an emergency event.[8] This suggests that it is important to provide students IPE opportunities that allow for reflection following crisis interventions.

The specific nature of the focused patient cases deserves discussion. These cases involved assessment skills and medical interventions applicable to all disciplines. The host institution provided instructional supplies and equipment to fully portray each clinical scenario such as wheelchairs, nasal cannulas, splints, braces, lines and tubes, and assistive devices. The laboratory environment created an atmosphere that mirrored a health care setting where professionals collectively interacted with their patients. The simulated patient cases also facilitated instruction in equipment management less commonly encountered by the other disciplines. This type of reinforcement may be especially beneficial with such devices as mechanical lifts, supplementary oxygen devices, and peripheral intravenous lines.

Conclusion

The benefits of IPE in the health care arena united four academic programs at two institutions to enhance IPE initiatives. The paradigm piloted by the two rural institutions could be augmented by other colleges to incorporate a variety of different health disciplines. Each case was led by a particular discipline; however, all students could readily contribute and offer management strategies from their clinical perspectives. This type of dialogue is both essential and an underpinning of effective team collaboration. Furthermore, the interaction between health profession programs at two neighboring institutions unified those disciplines comprising the health care team. These partnerships seem prudent given that individual academic institutions may have limited allied health programs resulting in narrower interprofessional interactions.

Declaration of Interest

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Can the CoARC Publication of Programmatic Outcomes Data Influence Student Enrollment at For-Profit vs. Not-For-Profit Respiratory Therapy Programs and Focus Curricular Modifications?

Karen L. Shaw, PhD, RRT, RPFT

Howard R.D. Gordon, EdD

Abstract

Background: In synchrony with a predicted employment crisis in the field of respiratory therapy, the Commission on Accreditation for Respiratory Care has published programmatic outcomes detailing individual program statistics. Utilizing these data along with combining pass rates for certification and registry exams, a ranking system was created to enhance data evaluation. Survey data were appraised for clarification of types of successful programs and strengths and weaknesses of curricular line items. **Methods**: A descriptive study utilizing an email survey method was developed to gather baseline data from RT program directors in the areas of program type and credentialing exam summary score reports. A convenience sample of programs was solicited from the top and bottom thirds of all programs with published programmatic outcomes. **Results**: Comparison of survey responses (46% return) between top and bottom thirds of the sample of RT programs indicated that not-for-profit programs were more frequently represented in the top third, whereas for-profit schools were equally represented in both sectors. When curricular line item scores were compared between high- and low-performing programs, strengths and weaknesses were revealed. **Discussion**: Outcomes data may assist the consumer with school selection by revealing a side-by-side comparison of program success rates. Additionally, assessment of credentialing exam summative reports between programs may be a useful vehicle for early recognition of programmatic weaknesses — identifying issues in curricula that may need to be addressed.

Key Words: Respiratory therapy, respiratory therapy education, credentialing success, programmatic outcomes, CoARC Annual Report of Current Status Outcomes, 20/20 Analysis, curricular assessment.

Karen L. Shaw, PhD, RRT, RPFT
Former Program Director
Cardiorespiratory Sciences
Engelstad School of Health Sciences
College of Southern Nevada
Las Vegas, NV

Howard R. D. Gordon, EdD, MPH
Professor of Career and Technical Education
Department of Teaching and Learning
University of Nevada
Las Vegas, NV

Correspondence and Request for Reprints:
Howard R. D. Gordon, EdD, MPH
Department of Teaching and Learning
University of Nevada
4505 S. Maryland Parkway, Box 3005
Las Vegas, NV 89154-3005

Introduction

The profession of respiratory therapy is projected to have a staffing deficit during the next decade.[1] According to the 2012 Occupational Outlook Handbook, it is estimated there will be 31,200 more respiratory therapy positions available in 2020 than there were in 2010.[2] Even though nationally, schools of respiratory therapy (RT) average 25 student enrollees annually, the average number of graduates is only 18 students or 72% of enrollees. Of these graduates, 93% successfully complete the certification exam. In the final calculation, only 16.7 out of 25 students initially enrolled in RT programs annually, or 67%, become eligible for entry-level employment.[3] The remaining students (33%) do not continue in the program or do not graduate and, therefore, do not attempt the entry-level exam. Students who enter a program and do not successfully complete the entry-level exam waste valuable financial resources and occupy space that may be better utilized by other students. Although there may be multiple explanations for poor performance on the National Board for Respiratory Care's (NBRC) Certified Respiratory Therapist (CRT) and Registered Respiratory Therapist (RRT) exams, the onus is on the schools to adequately prepare students to pass the barrier that lies between graduation and employment — attainment of the CRT and RRT credentials.

In 2012, the Commission on Accreditation for Respiratory Care (CoARC) released student-admission and student-success data to the public. Entitled "Programmatic Outcomes Data," the document contributes meaningful information to consumers and promotes confidence in higher education by making available comparable program information. The published programmatic outcomes reflect credentialing examination data, attrition, job placement, enrollee num-

Figure 1

Credentialing Success Survey (Relevant Questions)

1. Please provide some basic information about your facility. Choose one from each row.
   Is your program:
   a. Public   Private   Federal Government
   b. For-profit   Not-for-profit

In the next section, please follow the step-by-step instructions to report the average cumulative test scores over the designated reporting period in each of the 20 NBRC curricular content areas:

2. CRT results:
    a. Log in as you normally would to the NBRC EED school portal (www.NBRC.org....Educators....School Login)
    b. Go to "reports"
    c. Click "School Score Report"
    d. Exam type: CRT
    e. Enter dates to be captured: 7/10/2009–6/30/2011
    f. Click "View Report" (this may take a few minutes to load)
    g. Scroll down to detailed view of "**New Candidate Summary**"
    h. Copy numbers to the right of "Average Score" into the spaces provided below (2 decimal places)

Total Scaled Score	Total Raw Score	1A	1B	1C	1 TOT	2A	2B	2C	2 TOT	3A	3B	3C	3D	3E	3F	3G	3H	3I	3J	3K	3 TOT
Average Score																					

3. RRT results:
    a. Log in as you normally would to the NBRC EED school portal (www.NBRC.org....Educators....School Login)
    b. Go to "reports"
    c. Click "School Score Report"
    d. Exam type: RRT
    e. Enter dates to be captured: 7/10/2009–6/30/2011
    f. Click "View Report" (this may take a few minutes to load)
    g. Scroll down to detailed view of "**New Candidate Summary**"
    h. Copy numbers to the right of "Average Score" into the spaces provided below (2 decimal places)

Total Scaled Score	Total Raw Score	1A	1B	1C	1 TOT	2A	2B	2C	2 TOT	3A	3B	3C	3D	3E	3F	3G	3H	3I	3J	3K	3 TOT
Average Score																					

bers, and the number of graduates, averaged over the most recent three-year reporting period.[3] For savvy students, the publication of these outcomes assists with choosing a program with a record of graduation and credentialing success. From the program's vantage, glowing statistics potentially translate into collateral to attract low-risk students, financial gifts, award-winning faculty and medical direction, and desirable clinical affiliations (examples of program resources). Further, the transparency afforded by the publication of programmatic outcomes permits ranking (stratification) of RT programs for identification of best practices.

Figure 2
Major Domains (Curricular Line Items)
in the NBRC Summary Content Outline.

I Patient data evaluation and recommendations

  A Review data in the patient record

  B Collect and evaluate additional pertinent clinical information

  C Recommend procedures to obtain additional data

II Equipment manipulation, infection control, and quality control

  A Manipulate equipment by order or protocol

  B Ensure infection control

  C Perform quality control procedures for listed equipment

III Initiation and modification of therapeutic procedures

  A Maintain records and communicate information

  B Maintain a patent airway including the care of artificial airways

  C Remove bronchopulmonary secretions

  D Achieve adequate respiratory support

  E Evaluate and monitor patient's objective and subjective responses to respiratory care

  F Independently modify therapeutic procedures based on the patient's response

  G Recommend modifications in the respiratory care plan based on the patient's response

  H Determine the appropriateness of the prescribed respiratory care plan and recommend modifications when indicated by data

  I Initiate, conduct, or modify respiratory care techniques in an emergency setting

  J Act as an assistant to the physician performing special procedures

  K Initiate and conduct pulmonary rehabilitation and home care

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Adapted from Summary Content Outline for CRT and Written RRT Examinations[4]

Using a survey (Figure 1), information about program demographics and average school score reports was gathered from the programs included in this study. Demographics data were sorted to explicate trends regarding which type of program consistently demonstrated high credentialing examination pass rates. School score reports, available to program directors, were evaluated using corresponding headings and subheadings from the NBRC Detailed Content Outlines (labeled as "domains" in Figure 2). These domains are frequently used for cross-matching with curricula; therefore, high scores in individual domains align with areas of curricular strengths in high-performing programs.

In conjunction with the 2012 release of statistics relating to CRT and RRT credentialing success,[3] this study provides a timely assessment. The CoARC-released data were utilized to create a stratification of schools from high-credentialing success to low-credentialing success, based on CRT plus RRT pass rate percentages. Survey results from program directors included details of program characteristics as well as an aggregate summary of new candidate test scores in 17 content areas (*domains,* curricular line items, or alignment indicators). Detailed results were outlined by Shaw in 2012.[5] For this publication, two research questions were posed:

1. What *types* of programs are most frequently ranked in the top third of all programs?
2. What do average scores within domains (curricular line items) reveal about program strengths and weaknesses?

Methods

In response to the programmatic outcomes release, a descriptive study[5] was designed to assess programs identified as "successful." The ranking was based on the "Programmatic Outcomes Data" released in January 2012[3]; this publication was the product of annual program self-reporting averaged over the fiscal years 2009–2011. Although statistics from 440 programs were reported in the "Programmatic Outcomes Data," not all programs qualified for the current study; potential subjects were eliminated from the study population if they had not been accredited for the entire reporting period and did not accrue a three-year average of reported data. This qualification narrowed the probable sample from 440 to 399.

The "Programmatic Outcomes Data" spreadsheet was converted to Microsoft Excel format to facilitate data manipulation. The program list, with corresponding data, was reordered to create a ranking of programs related to credentialing success. Each program was assigned a score calculated by adding their posted CRT exam pass rate and the RRT exam pass rate (Figure 3). The maximum score attainable was 200 points, which was achieved by programs

Figure 3

Sample View of CoARC Outcomes Spreadsheet[3] (reprinted with permission)

with 100% pass rates on both exams. The program list was then rearranged from the highest to lowest assigned score.

As many programs received the same score, all programs receiving the same score also received the same ranking; out of 399 different programs, 101 scores were identified. The 101 scores were then divided into thirds (Figure 4): rankings 1–33 (n=161) were identified as top programs; rankings 34–66 (n=160) comprised the middle-level programs; rankings 67–101 (n=78) were identified as low-performers. For the study design, it was imperative to isolate the extremes of the sample population as modeled in the "20/20 Analysis Manual"[6] for appropriate interpretation of relationships. Therefore, the study sample was comprised of the top third and bottom third of the eligible programs (n=239). An independent agency, the Cannon Survey Center, was employed to facilitate survey dissemination and data collection, identify survey results from the programs in the top and bottom thirds, and guarantee that the researcher would not have the ability to link the returned survey results with specific programs.

Results

Survey results were submitted to the researcher from 239 program directors representing 161 high-performing programs and 78 low-performing programs. The results from

Figure 4

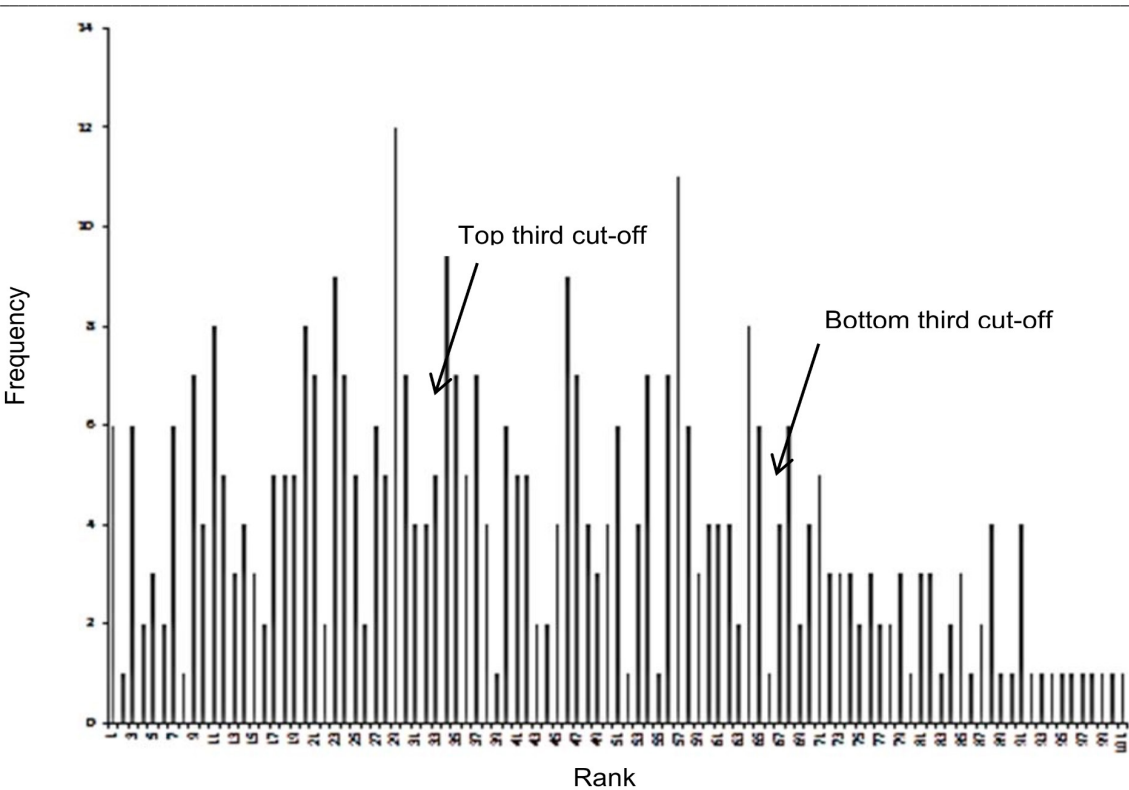*Distribution of Rankings 1–101 in the 399 Qualifying RT Programs*

Table 1
Gap in Score Intensities in NBRC Domain Areas on CRT & RRT Exams

Gap in Score Intensities in NBRC Domain Areas on CRT & RRT
Curriculum Alignment Totals from NBRC Domains

	Exam CRT	RRT
Patient data evaluation and recommendations (1 TOT)	15.15	11.05
Initiation and modification of therapeutic procedures (3 TOT)	14.8	6.65
Equipment manipulation, infection control, and quality control (2 TOT)	14.79	0.61

survey (Figure 1) question 1 were tabulated to quantitate program types. The results from survey questions 2 and 3 were utilized to compile scores reported in Tables 1 and 2.

Program Type: In the top third, although three programs did not respond, 82% of the programs were public, 13% private, and 1% government. While five programs did not respond to the question regarding for-profit or not-for-profit status, 13% of the responding programs claimed to be for-profit while 87% claimed not-for-profit status. In the bottom third of the population, 52% of the programs were public and 48% were private. Additionally, 38% of the

responding programs claimed to be for-profit while 62% claimed not-for-profit status.

When these results were viewed as the cumulative total of private plus public for-profit and not-for-profit programs, it became apparent that the for-profit sector was similarly represented in both the top and bottom thirds; additionally, the not-for-profit programs were more prevalent in the top third than in the bottom third.
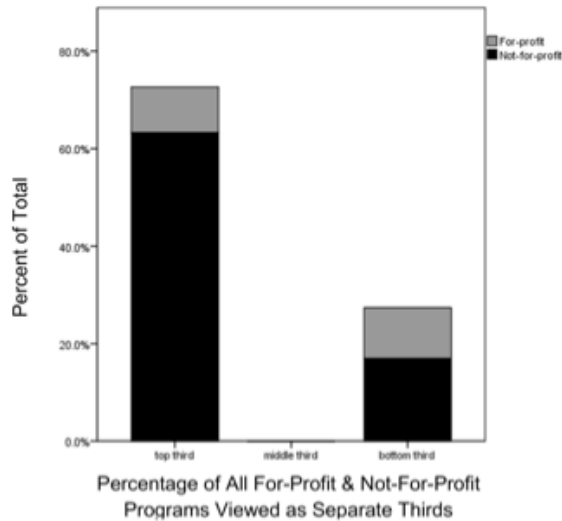
Scores: When CRT and RRT exam scores were evaluated within domains (Figure 2), differences were revealed between the average scores representing the top and bot-

Table 2
CRT and RRT Exam Scores Summarized by Curriculum Alignment Indicators

CRT and RRT Exam Score Summaries Reported by Curriculum Alignment Category (Top & Bottom Thirds)

Curriculum Alignment Indicator	CRT Score (Mean)			RRT Score (Mean)		
	Top Third	Bottom Third	% Difference	Top Third	Bottom Third	% Difference
	(n=47)	(n=12)		(n=47)	(n=12)	
1A	3.12	2.61	16.35	3.15	2.73	13.33
1B	13.77	11.49	16.56	11.03	10.09	8.52
1C	3.03	2.82	6.93	2.9	2.32	20.00
2A	16.79	14.29	14.89	7.92	8.12	-2.53
2B	2.19	1.87	14.61	1.02	0.83	18.63
2C	2.65	2.33	12.08	0.97	0.91	6.19
3A	3.79	3.24	14.51	3.22	3.08	4.35
3B	5.23	4.62	11.66	2.88	2.67	7.29
3C	2.68	2.26	15.67	2.03	2.06	-1.48
3D	5.66	4.65	17.84	3.85	3.21	16.62
3E	10.69	9.13	14.59	6.55	6.41	2.14
3F	13.83	11.7	15.40	7.35	6.73	8.44
3G	12.94	11.31	12.60	9.17	8.36	8.83
3H	3.2	2.6	18.75	3.49	3.18	8.88
3I	2.2	1.84	16.36	2.07	1.87	9.66
3J	1.61	1.42	11.80	1.6	1.57	1.88
3K	1.45	1.24	14.48	1.65	1.58	4.24

Figure 5

Distribution of Rankings 1–101 in the 399 Qualifying RT Programs

Percentage of All For-Profit & Not-For-Profit Programs Viewed as Separate Thirds

tom sectors. On the CRT exam, the bottom third of the programs averaged scores consistently lower than the top third, exposing weak performance in all content areas. On the RRT exam, there was little difference between sectors for curriculum indicators within Domains 2 and 3. The large difference in Domain 1 (patient data evaluation and recommendations) suggested greater urgency for this content area to be targeted for generalized curricular remediation (Table 1). For a narrower gauge of performance, curricular line items may be assessed individually (Table 2)

Discussion

Question 1: What types of programs are most frequently ranked in the top third of all programs?

The results implied that students attending a for-profit program had an equal chance of success or failure (Figure 5). Not-for-profit programs, either public or private, were three times more likely to be in the upper third of programs than in the bottom third, indicating a track record favoring credentialing success. Further investigation is required to determine why some programs are more successful than others. In the meantime, this information may assist consumers with informed program selection.

Question 2: What do average scores within domains (curricular line items) reveal about program strengths and weaknesses?

Comparing reported average scores from programs revealed that not all successful programs are consistently

above the cut score in every area just as not all unsuccessful programs miss the cut scores in all areas. Astute program directors regularly evaluate summative credentialing exam scores for areas of curricular weakness; deviation from cut scores (currently utilized method) may suggest need for minor revisions or major curricular overhauls. In programs plagued with multiple areas of poor performance, a plausible method exists for determining which area of curricular content will most expediently improve credentialing exam pass rates (Tables 1, 2). If data isolating the scores of the high-performing programs were accessible by individual programs, aggregate scores could be examined for areas of divergence. This information could be particularly useful to programs planning curricular remediation for improved outcomes. Comparison of an individual program's strengths to the strengths of high-performing programs has the ability to delineate where improvement efforts should be focused. The order in which change should be implemented may be discerned by assessing the domains with the greatest disparities. Specifically, the cumulative scores from domains one (1TOT), two (2TOT), and three (3TOT) may be appraised (Table 1). Alternatively, line items within domains may be identified for targeted curricular remediation (Table 2).

The results of this study were limited by a 46% return of surveys and the fact that all survey results were self-reported. Greater accuracy could be achieved for future examination of program types and cumulative test score analyses by receiving program data directly from CoARC and the NBRC. Nevertheless, this first release of side-by-side comparison of outcomes has the potential to generate new sentiments of advantage or disadvantage within various programs. The ability to view the performance of neighboring programs may add leverage to advertising campaigns or be a rude awakening to those feigning a reputation that is now realized to be unearned. This transparency could yield a shift in student enrollment in programs, financial gifting, faculty and medical director fidelity, and clinical site allegiances. Ideally, the public accessibility of this outcomes report will benefit the profession by leveling the consumer playing field.

Outcomes assessments are standard in career and technical education where field-specific credentialing examinations regulate the supply of candidates in the field. Even though each RT program director may view aggregate outcome score results, the presence of lateral sharing of successes among programs is rare unless solicited by survey for publication. Lateral sharing may inspire a collegial attitude of "learning from each other" or may precipitate competition for prestige through attainment of resources of students, finances, and clinical sites. The collegial sharing of this knowledge will inform the respiratory community of best practices and, by default, suggest pertinent areas requiring individual curricular reform. As formulas for suc-

cess are identified, individual programs may ascertain where improvement efforts are best focused — contributing to program reform and the successful ushering of more exam-ready graduates into the workforce.

Irrespective of intent, the public release of programmatic outcomes data provides a metric for consumers and providers to gauge program performance. Change is time consuming and uncomfortable; the data summarized in this study will allow each program to conserve their energies for program improvements most likely to contribute to improved program outcomes.

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