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THE LIVED EXPERIENCE OF PRECEPTORS IN RESPIRATORY CARE CLINICAL EDUCATION

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Abstract

Background: Respiratory Therapist (RT) preceptors provide expert clinical instruction and support for respiratory care students. These RTs are often faced with the conundrum of heavy workloads, short staffing, and mandatory overtime. Yet, in the midst of this demanding work environment, selected RTs are often being asked to act as preceptors for students. The purpose of this paper was to describe RTs' lived experiences of preceptorship and to develop an understanding of the meaning of being a preceptor. **Methods:** This qualitative study explored the attitudes of 45 participants in a respiratory care clinical education preceptor training program at a large urban children's hospital. During the training program, an open-ended critical-incident questionnaire was administered. **Results:** A phenomenological approach was applied to study the insights of the RT preceptors as they provided clinical training of RT students. The attitude trends revealed in the data were meaning, lived experience, and introspection. **Conclusions:** Data provided rich insights into the inner experience of veteran preceptors. Thus, we have gained valuable and detailed information with regard to the factors that may promote more successful preceptor-preceptee relationships.

Key Words: clinical preceptors, preceptorship, preceptor-student relationship, respiratory therapy education, meaning, introspection, lived experience, phenomenological analysis.

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The Lived Experience of Preceptors in Respiratory Care Clinical Education

Introduction

In recent years, there has been a growing interest in the utilization of unpaid preceptors to provide clinical instruction to Respiratory Therapy (RT) students. As educators, we often struggle to find the best strategies to facilitate our students' acquisition of the necessary knowledge, skills, and attitudes to prepare them for practice in today's complex health care environment. RT students need a variety of supervised clinical experiences with opportunities to perform patient care skills, to validate theory and knowledge, and to acquire abilities central to practice that can only be acquired through tangible clinical practice.² Furthermore, an unsatisfactory or irrelevant clinical experience can lead to student disillusionment about the chosen profession.³ We believe that the utilization of qualified preceptors is significant to exposing respiratory students to the role of the respiratory care practitioner so to prepare them for the 'real world' venue.

In working with clinical preceptors over the years, we have found that RT preceptors have frequently been assigned responsibilities for clinical education with little to no direction as to what is actually expected of them. RT preceptors are often challenged when providing clinical training at the bedside while performing assigned patient care. Heavy workloads, staffing issues, and mandatory overtime can become variables influencing the quality of bedside instruction. Indeed, there may be staff members assigned students who would prefer not to be responsible for clinical instruction or may not possess the skills to be effective teachers. However, therapists, employers, educators, and society are becoming progressively more attentive to the consequences of poorly prepared health care professionals. We should all agree that all types of specialized education must embrace the target of preparing students for competent and reliable practice.²

This paper looks at the literature regarding the underlying principle of preceptorship and describes a preceptor training program that was implemented at the University of Arkansas for Medical Sciences. Furthermore, this paper will give insight into the attitudes of RT preceptors about their lived experiences and of the preceptor-student relationship during respiratory care clinical education.

A Review of the Literature

A preceptorship is a one-on-one reality-based clinical experience in which an experienced health care professional is teamed with a learner.³ The literature clearly describes the benefits of such an arrangement to both the professional and the learner. Ohrling & Hallberg (2001) report that the use of this method of clinical education reduces the risk of nursing students feeling helpless and empowers them in their learning at the bedside.⁴ The literature supports that preceptoring has implications for promoting the role socialization of learners and the belief that the learner will be successfully integrated into the health care profession.⁴ Billay and Yonge (2004) identify attributes that preceptors should possess which include being a role model and a facilitator, having effective communication skills, and being knowledgeable about their field of expertise. They further posit that the preceptor needs to understand the principles of adult education.⁷

According to Newble and Cannon (2001), "It is a fact that clinical teaching is the most neglected area of all teaching despite being the one where more deficiencies have been found than in any other" (pg 72).⁸ Furthermore, they describe many medical clinical teaching en-

counters as 'haphazard, mediocre, and lacking in intellectual stimulation'.⁸ One hundred years after the Flexner Report which reformed medical education, preceptorships are being reestablished in medical education to make certain that medical students have adequate observation, supervision, and mentoring.⁹ There is also widespread acceptance of the use of preceptors in nursing education.¹⁰⁻¹³ Furthermore, the American Physical Therapy Association has developed a national clinical instructor educator credentialing program for clinicians who wish to provide clinical education to students.¹⁴

Implementation of a Preceptor Program

Because preceptorship is becoming a model of choice for clinical teaching in respiratory care education, a preceptor training program was developed for our baccalaureate degree cardio-respiratory care program at the University of Arkansas for Medical Sciences (UAMS). During the fall, 2002 semester, four sessions of the training program were offered to 45 Respiratory Therapists employed at Arkansas Children's Hospital. Participants earned four hours of continuing education credit for completion of the program.

The program, entitled "We're In This Together: Focusing on Your Success as Clinical Preceptors," included discussion on : (1) the role of the clinical preceptor; (2) student needs in the clinical environment; (3) providing effective feedback; and (4) future challenges in clinical education. Our objective was to enhance the participant's ability to provide a motivating environment to augment student learning in the clinical setting, promote opportunities for successful department integration, acquire techniques to facilitate relevant student clinical experience, and provide effective feedback to students during that experience. Prior to implementation of this preceptor program, RT students completed clinical experiences under the supervision of on-site university-based faculty.

In our program, the preceptor, who is employed by the hospital affiliate, volunteers to supervise and provide guidance to a designated respiratory therapy student who works with him or her during a 200 hour clinical internship. A faculty member from the university is available for counseling and support while students are under the direction of a preceptor. Learners enrolled in the internship are senior students in their final semester of a baccalaureate degree RT program.

During this internship, the preceptor encourages the student to progress by allowing him/her to assume the role of a Registered Respiratory Therapist (RRT). Thus, the preceptor continuously assesses the learner's abilities and evaluates his or her overall performance. It is important that preceptors provide frequent feedback to assist the learner in advancing to the appropriate level of practice. Likewise, learners should be made aware of less than standard performance in a timely manner. Equally important, program faculty must be notified in a timely manner about concerns related to poor student performance.²

Preceptors complete weekly written evaluations of the students' affective and psychomotor performance. They are also asked to identify student strengths, as well as areas that need improvement. Additionally, the preceptor alerts faculty to concerns requiring their involvement. When needed, early intercession ensures that serious problems may be averted and that students meet the professional standards of respiratory care practice.²

Methods

During the “We’re In This Together” workshop, 45 participating preceptors completed a 10-item open-ended critical-incident questionnaire (See Table 1). The questionnaire was modeled after an instrument used by Dunlevy & Wolf in their 1994 study which explored the clinical learning experiences of allied health students.¹ The purpose of this activity was to discover RTs’ lived experiences of preceptorship and to develop an understanding of the meaning of being a preceptor and of the preceptor-student relationship during respiratory care clinical educational experiences.

Participants included five Certified Respiratory Therapists (CRT) and 40 Registered Respiratory Therapists (RRT). The mean number of years of experience for the total group was 13.1 years. The average years worked by the CRT group was 12.4 while the RRT group was 13.2 years.

To examine the critical-incident questionnaire responses, a content analysis was conducted. The first step of the content analysis procedure included transcribing the answers to the questionnaire and subdividing the transcripts into small data units. Each data unit was subsequently analyzed and assigned a code. Each code is a single word that best summarizes themes, concepts, or ideas that formulate an attitude. For example, a preceptor stated, “shows no interest” as their answer to the question, “Please describe the incident(s) which were the most frustrating/disappointing — times when you felt discouraged as a preceptor.” This answer was coded “Unengaged.” In order to ensure rigor of the coding process two experts in qualitative methods were chosen as auditors. The two auditors reviewed the transcripts and developed a second, independent set of coding categories. After identifying the differences between the two sets of cod-

Table 1
Clinical Preceptor Experience Questionnaire

1. Please describe the incident(s) during the time you have precepted a student that were the most exciting/rewarding – the times when you felt that something significant happened to the student as a result of your instruction.
2. Please describe the incident(s) which were the most frustrating/disappointing – times when you felt discouraged as a preceptor.
3. List the characteristics and behaviors of student who were the most enjoyable to instruct.
4. List the characteristics and behaviors of those students who interfered with your personal productivity.
5. Describe a situation(s) that occurred during the time when you were precepting a student in which you felt that your role as a preceptor was valued.
6. Describe a situation(s) that occurred during the time when you were precepting a student in which you felt that your role was **NOT** valued.
7. If you were to give a new student advice on how to have an effective clinical rotation, what one thing would you tell him/her?
8. What is the most important thing you realized about yourself during your precepting experience(s)?
9. Describe the most fun ways for you to teach in the clinical setting.
10. What were the least desirable aspects of being a clinical preceptor in your experience?

ing, the primary investigator and the two auditors developed a consensus for a single code set.

The second step of the content analysis procedure was to develop a “code book”. A code book was used to define and track each code category. After all the code categories were defined, the primary investigator combined codes of a common theme into “attitude patterns”. As with code development, the primary researcher and the two auditors collaborated to develop a single set of attitude patterns. See Table 2 for a list of attitude patterns derived from coding data.

The final step in the content analysis procedure was to analyze attitude patterns for the attitude trends. The attitude patterns are combined into attitude trends, which are based on common themes. An attitude trend is a formal summary statement of the overall attitude trends based on the messages communicated within each attitude pattern. Use of this process helped to formulate, refine, and link concepts to create a clear description of the emerging attitude trends.

Delimitation

Because of the qualitative nature of this research design and the sample of RTs coming from only one urban children’s hospital, the conclusions drawn from the findings of this research may be generalized only to those therapists who participated in this study. This study is an exploration into the attitudes of a select group of preceptors on a single topic; it is not intended as a verification of fact.

Limitation

The open-ended survey questions were designed to indirectly explore RTs attitudes concerning the meaning of being a preceptor and of the preceptor-student relationship that develops during respiratory care clinical education. Open-ended questions were used to avoid getting the “politically-correct” attitudes from the group. The conclusions drawn from this research should be interpreted with the recognition that the attitudes depicted in this study may represent the ‘right thing’ for RTs as preceptors to say and may not represent the original thought of these therapists.

Findings

CRTs and RRTs had response rates of 100% on the questionnaire. Participants were allowed to make more than one response per question if they so desired. Data from the questionnaires were reduced into three attitude trends of *meaning*, *the lived experience*, and *introspection*.

Meaning

The meaning of the experience for preceptors is described by their responses below that explain in their own words their most rewarding and their most frustrating experiences.

Most Rewarding Experiences. When preceptors were asked to describe their most memorable or rewarding experiences while providing clinical instruction, 53% cited experiences involving seeing evidence of developing competency in the students. One such response was, “When the student, after you teach them to be thorough and check everything because

Table 2

	Codes (in bold) found in the Attitude Patterns
Most Rewarding Experiences:	Students demonstrate developing competency , proficiency and/or independence during breakthrough moments. As a result both students & preceptors feel rewarded . Preceptors are also rewarded when students demonstrate appreciation and/or gratitude .
Most Frustrating Experiences:	Preceptors are frustrated when students display a lack of interest and are unengaged . Students who are incompetent , unable to correct mistakes , overconfident , and “ know it all ” are also disappointing to preceptors. Preceptors are further discouraged when they feel they are too busy to be effective and students fail to communicate with them.
Desired Student Characteristics:	Attitude is everything! These characteristics include: excited, eager, open to learning, engaged, asking questions, showing initiative, outgoing friendly, humorous, confident knowledgeable, prepared and assertive .
Least Desirable Aspects:	Preceptoring slows me down when I already have a heavy workload and this makes me feel ineffective. It is also undesirable when students display poor attitudes, discipline or feedback issues , and remediation is necessary to correct poor skills or knowledge issues.
Feeling Valued:	Preceptors feel valued when students show gratitude or appreciation . They also feel valued when students communicate that he or she has learned from the preceptor and that he or she has developed a level of trust in the preceptor.
Feeling Not Valued:	Preceptors feel that they are not valued when they are unable to meet the learners needs, when students are not interested, and when they repeatedly make mistakes despite correction .
Fun Ways to Teach:	Preceptors find it fun to use the following techniques: Hands-on and in a comfortable atmosphere with enough time (a treatment load that accommodates teaching). They also enjoy the use of scenarios, quizzing and problem-solving as well as teaming
Self-Reflection:	I don't know everything; I have my own learning needs . I know a lot and I do have something to offer to students . I enjoy and am good at this. Teaching is hard work and it requires patience, practice, and time. My own attitude affects my effectiveness as a preceptor.
Preceptor Recommendations:	Be proactive – ask questions, be motivated and involved in what is going on. Don't be afraid, just jump in and “do it”. Be patient. Communicate your strengths and weaknesses.

a life is in their hands, catches or troubleshoots an incident that contributes positively to the patient.” Also, when “a student observed me doing a new and unfamiliar treatment and at the next scheduled treatment they were able to perform the task perfectly and were very competent and self-assured.” Lastly, “when a student who was uncomfortable with a procedure or treatment becomes more proficient at the task,” the RT feels a sense of reward.

Other preceptors reported (21%) that being present for “breakthroughs” or those moments when the “light bulb” comes on and the students sees new insight is most rewarding. As preceptors, these RTs enjoyed being present for those times when theory and practice seem to come together at the patient’s bedside such as when “you are trying to teach a student and they just aren’t getting it, and then they have that breakthrough.” Also, preceptors are excited when they hear students say, “Oh, now it makes sense;” Or “I see now.” It is also rewarding for preceptors to “help a student understand a concept they weren’t getting prior to a clinical experience.” Still other preceptors (18%) reported that they felt the most rewarded when there were mutual feelings of accomplishment between themselves and the student. The importance of the preceptor-student relationship is illustrated through statements such as, “When I do bond with a student and it causes us both to have good experiences.” “When I would have a new person with me and they completed the task at hand, and they would be so proud of themselves”. “It made me feel complete as being a preceptor.” Lastly, 8% of these RTs felt rewarded or excited when the student demonstrated appreciation for the job done by the preceptor during the clinical experience. “When they say thanks, I learned a lot.” “The student said they learned more from me than anyone else they had been with.” “When I have had a student tell me that they really enjoyed working in my unit and that they would like to work there again.” “When the day ended, he shook my hand and told me this was the best clinical day he had ever had.”

Most Frustrating Experiences. In describing those incidents that were the most frustrating or disappointing from the preceptor’s point of view, the majority of RT preceptors (59%) cited instances where students seemed to either be uninterested in or unmotivated by the learning experience. “When I work with someone that is not open to learning” it is frustrating. Some students are “just doing their time to get a grade and leave.” “Students who are not motivated and just doing clinicals because they have to.” “When students are only performing tasks and not paying attention to the patient who is obviously not tolerating the procedure well, and they don’t want to stop the procedure to take care of the patient.” “Students unprepared or unwilling to get in and do the work.”

Seventeen percent of the preceptors reported that they were frustrated by students who frequently made mistakes and just could not seem to ‘get it’. Common responses among the preceptors included: “Trying to get a student to understand something or show them something and they just can’t seem to grasp it.” There were students who were “unable to grasp techniques after numerous examples given.” “I have had students who consistently performed an error that we had been over time and time again”. It was particularly frustrating for some preceptors “when a routine task (e.g., sterile suctioning) is observed or performed many times and it is not done correctly and feeling like you have failed in teaching the procedure or are not being clean.”

Fifteen percent of preceptors also responded that the most disappointing clinical educational experiences involved having the learner who is a ‘know it all’ or is overconfident in

their own abilities. A preceptor shared their experience of “having a student not be willing to acknowledge that they do not know the answer to a question, and then make up some off the wall answer.” It is also disappointing to have a student who feels because they are in school, “they know the right way to do everything” and makes comments such as, “That’s not how we were taught at school”. “The most frustrating is a person who has an ‘I already know all of this attitude’. They are very hard to teach anything new or difficult.”

Two percent of the preceptors who had busy workloads felt ineffective and frustrated by the preceptor experience. “Sometimes when it is very busy, and short staffed, you can’t show them as much as you would like to. In the words of the preceptors: “When I was overwhelmed and felt like I had to work this person into my day.” “When I felt the time spent with the student was not adequate”, I felt ineffective and frustrated. Seven percent of therapists also stated that they were disappointed or frustrated when they were assigned to work with students who were not communicative. “When a student or new employee doesn’t have much to say and is very quiet.”

Lived Experience

This attitude trend is derived from preceptor responses that characterize desired student characteristics, things that make them feel valued or not valued, fun ways to teach, and the least desirable aspects of preceptoring.

Desired Student Characteristics: Student characteristics and behaviors that preceptors identified as being most enjoyable included demonstrating they were engaged by asking questions and showing initiative. According to preceptors, it is also more enjoyable to precept students who have a positive attitude, and who are motivated to learn. Other identified qualities included students who have good communication skills and those who are confident and knowledgeable.

Fifty percent (50%) of preceptors identified students who are lazy and frequently complain as a direct cause of interfering with their own personal productivity. About one-third of the participants also felt that the student who appears to be uninterested and bored with the clinical environment is counter-productive for them as well. Other student characteristics that interfered with the preceptors’ personal productivity included students who are not motivated and not open to learning, those who ‘know it all’, or who have inadequate knowledge base and skills attainment.

Feeling Valued: Preceptors (44%) reported feeling valued in their roles when the student shows gratitude and appreciation such as receiving “a compliment from my supervisors because of what a student has said about working with me”. Twenty percent of the preceptors liked seeing the end results, such as: “Seeing a student grow and perform tasks efficiently that you taught to them”; and “When the student restated a concept that we had been discussing in a very professional way.” Developing a level of trust in the preceptor-student relationship also creates self-validation for many preceptors (35%). This was evidenced by statements such as “it feels good knowing that a student prefers being with you if they can choose”. “If they always seek you out for an answer to a question, that means they can trust you.” The relationship is further evidenced when preceptors feel that “just being there at the bedside made them (students) comfortable.”

Feeling Not Valued: On the other hand, about one-half of preceptors sense that they are not valued when the student is uninterested or bored. “If the student shows no interest, I feel

I should not waste time trying to teach them.” Or, “when a student felt that the simple tasks were not important and looked down on me because I was teaching floor therapy.” Other reasons that RTs did not feel valued during the experience include: being unable to meet the needs of the learner (17%), a student repeating a mistake over and over after having been corrected (14%), and acting as a preceptor for a student that felt they already knew everything they needed to know (11%).

Fun Ways To Teach: Preceptors described the most fun ways to teach in the clinical setting as hands-on (48%), making it fun and comfortable to learn (20%), using scenarios and quizzing techniques (16%), having the time and treatment load that actually accommodates instruction of students (16%), and being able to team with the student (7%). One therapist remarked, “I would rather do hands-on teaching. I think they learn more when they can see it for themselves.” Another preferred, “letting the student watch me first, then let them do it.” Still another promotes, “All hands on deck.” Others described the method of “letting them do the treatment while instructing them at the same time” or “observing and assisting as needed with the student actually doing the care”. Preceptors (20%) often report making learning fun and comfortable by relating to learners “your own experiences or goof-ups,” telling the student “jokes” or a “funny story,” and by having a “good sense of humor”.

Least Desirable Aspects: The least desirable aspects of being a clinical preceptor according to the group of participants was being too busy to be effective (55%), having students with poor attitudes (26%), dealing with discipline or feedback issues (9%), and dealing with students with inadequate knowledge bases and/or poor skills (4%). These preceptors talked about “having a heavy workload and not being able to spend quality time with students.” Unfortunately, the preceptors also wrote about sometimes having to deal with “students who just want to do enough to get by” or with students who are not “able to pick things up no matter how much you try.” Furthermore, preceptors describe it as undesirable “having to discipline someone (e.g., taking long breaks or Internet usage)” or “when constructive criticism has to be given to the student or new employee.”

Introspection

Preceptors expressed an awareness of their newfound realizations through self-reflection and in their advice to students that could potentially ensure more meaningful internships.

Self-Reflection: Participants (64%) reveal through self-reflection on these questionnaires that they themselves do not “know everything” but that they “know a lot,” they still have “room to grow,” and that they have “something to offer learners.” Eighteen percent (18%) report that they actually “enjoy teaching” and that precepting is a “very rewarding experience.” Reflection also helped some preceptors (14%) come to a realization that “patience and time with a student is needed to teach them well.

Preceptor Recommendations: About two-thirds of these preceptors recommend that students should ask questions, be motivated and involved in what is going on in order to have an effective clinical learning experience. “You have to want to be here.” “Be open to everything going on around you.” “Act interested and be interactive.” “Be willing to get in there and do it.” Fifteen percent (15%) advise students to not be afraid or timid. “Jump in and offer to do as much as possible; don’t be scared to try new things.” “Jump in, but don’t be afraid, because I’m right behind you.” Other preceptors (13%) give an opinion that learn-

ers should be more observant and pay attention. “Keep your eyes and ears open.” “Pay attention – even the small things are important.” “You never know what you may come in contact with down the road.”

Discussion

From the questionnaire data, it was clear preceptors offered valuable insight into what they believe to be the ‘good, the bad, and less desirable’ about the lived experience of preceptorship. Preceptors revealed a need to discover solutions to the dilemma of finding the time to provide quality patient care in one’s daily workload and still meet the learning needs of the student. Because every patient deserves the best possible care, we are challenged to meet the training needs of preceptors while meeting the experiential learning needs of our students. Educators should analyze what in the RT preceptor’s daily assignment facilitates and/or hinders them in their roles as preceptors, as well as clinicians. Educators should also emphasize the rewards and value found in preceptoring.

Increasing our preceptors’ awareness of the processes of learning in the clinical environment is an important component of preparing them to be clinical instructors. While the ‘see one, do one, teach one’ method has historically been used in the clinical education of health care professionals, it is now clear that learners “must have the opportunity to compare their performance with a standard and to practice until an acceptable level of proficiency is attained” (p 5).² We believe that the use of the preceptor model during a senior internship has the potential to inspire their learning, influence their role in socialization, and reinforce their clinical competence.

Preceptors also revealed the characteristics and behaviors of students who were the most enjoyable to instruct and those characteristics least preferred in students. In addition, preceptors imparted recommendations that students should be inquisitive, show initiative and be eager participants if they want to be more effective learners in the clinical environment. Students should be given insight into these characteristics and behaviors that hold true across all clinical settings. Comparing the student’s responses to the Dunlevy & Wolf (1994) study and the preceptor’s responses in this study, both factions want similar things that basically uphold the morals of the ‘Golden Rule’ which simply means “treat others as you would like to be treated.”¹⁵

Conclusions

The preceptor-student relationship formed the basis of the process of teaching and learning in the preceptor’s point of view which incorporated meaning, lived experience, and introspection. Further, it is demonstrated that preceptorship rewards both the respiratory care student and the preceptor and that the primary motivation for clinical teaching is personal satisfaction. According to the preceptors in this study, preceptoring is a rewarding experience in which they have the opportunity to see students develop a sense of self, to synthesize knowledge and acquire employable skills. Both students and preceptors are benefited by the attainment of tools to build a more satisfying job and life.

Meaning does not necessarily lie in the experience. However, the preceptors’ experiences likely became more meaningful as they were grasped introspectively. These data provided rich insights into the inner experience of veteran preceptors. By focusing on the inner experi-

ence of experts in a field and on individuals as they interact with each other, the relationship of the preceptor-student is revealed. That relationship is affected by the knowledge, skills, and attitude level of the student, as well as barriers to teaching which include time, workload, and productivity issues.

Students enter their clinical internships with varying levels of preparedness. The preceptors in this study derived meaning from seeing evidence of developing competency and of students making breakthroughs in learning and in their application of information. These preceptors expressed frustration with the amount of time they must spend in reacting to student deficiencies (i.e. disinterest, mistakes, overconfidence, and poor communication skills). A portion of this problem likely stems from the student's clinical immaturity and procrastination. This clinical immaturity influences the preceptor's ability to manage their assignment proactively rather than reactively.

Perhaps the most important implication of the study is that increased workloads on preceptors may threaten the clinical education of RT students. Pressures for increased productivity make it less attractive to train the students when personal productivity is affected. To make certain that preceptors continue to volunteer, educational programs must monitor the increasing pressures on their preceptors and ensure that the support for clinical teaching is appropriate. In addition, programs must ensure that students are highly prepared in the affective, as well as cognitive and psychomotor domains prior to entry into the clinical phase of the program.

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SMOKING HABITS OF STUDENTS ENTERING COLLEGE

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Abstract

Purpose: This study describes the smoking habits of incoming freshmen at a private university. **Methods:** An 11-question survey was completed by 959 incoming freshmen during freshman orientation. **Results:** About half (49.4%) of the respondents reported ever smoking part or all of a cigarette, and 22.0% reported smoking part or all of a cigarette in the past 30 days. Of those current smokers, most (85.4%) smoked ≤ 5 cigarettes on the days they smoked, and about half (50.7%) smoked only 1-4 days during the past 30 days. Only 12.8% of current smokers were categorized as nicotine dependent (smoked within 60 minutes of waking up in the morning on the days they smoked). More than half (52.9%) of current smokers reported wanting to quit, and 34.4% tried to quit at least once during the past 12 months. Only 2.1% of never-smokers, but 19.0% of former smokers, were found to be susceptible to smoking uptake. **Conclusions:** There appears to be a window of opportunity for tobacco control efforts among incoming freshmen, whose smoking habits were relatively light, with a low prevalence of nicotine dependence and a high prevalence of desire to quit. Former smokers were appreciably more susceptible to smoking uptake than were never-smokers, and should be a target of prevention efforts. Tobacco control activities that reach college students early, before the onset of heavier smoking and nicotine dependence, have the potential to reap substantial benefits. Respiratory care educators will benefit from knowing smoking habits of their incoming students in order to encourage smoking cessation and prevention.

Key Words: Cigarette smoking, college students, levels of smoking, nicotine dependence, smoking cessation/prevention

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Smoking Habits of Students Entering College

Introduction

Tobacco use is the leading cause of preventable death in the United States.¹ Nationwide, 45.1 million adults (20.9%) currently smoked cigarettes in 2005, with the prevalence of cigarette use of those 18 to 24 years old even higher (24.4%).²

The prevalence of cigarette smoking among college students peaked in 1999 to 30.6% and declined to 23.8% in 2005, a prevalence that is still unacceptably high.³ Cigarette smoking rates among middle school and high school class cohorts tend to remain relatively stable through the life course and tend to account for much of the overall use observed in college.³ However, research shows that 11% of college smokers had their *first* cigarette in college and 28% began to smoke regularly at or after age 19 years, by which time they were already in college.⁴

More than 17 million undergraduate and graduate students are enrolled in post-secondary degree-granting institutions in the U.S., making university students the single largest group of young adults who, in principle, can be reached by anti-tobacco programs provided by a single class of institutions.⁵ Studies of the smoking habits of students entering college could help inform efforts at smoking prevention and cessation among college students. The purpose of the current study was to describe the incoming freshman population at a private university in terms of susceptibility to cigarette smoking, current and past cigarette use, nicotine dependency, and desire and efforts to quit.

Methods

The participants in this study were 959 incoming freshmen completing an 11-question self-administered survey during the June 2004 freshman orientation sessions at Quinnipiac University, a private university in New England. This represented 83.4% of the 1,150 incoming freshmen who attended June orientation and 71.8% of all incoming freshmen that year.

Never-smokers were defined as students who answered "No" to the question, "Have you ever smoked part or all of a cigarette?" Ever-smokers were defined as students who answered "Yes" to this question. Current smokers were defined as students who answered "Yes" to the question, "During the past 30 days, did you smoke part or all of a cigarette?" Former smokers were defined as ever-smokers who had not smoked in the past 30 days. These definitions have been used previously by others.⁴

Current smokers were asked about the number of days they smoked during the past 30 days, and about the number of cigarettes they smoked on the days they smoked. We defined lighter smokers as students who smoked five or fewer cigarettes per day on the days they smoked and smoked fewer than five days in the past 30 days. All other current smokers were considered to be heavier smokers.

As a measure of nicotine dependence, current smokers were asked, "During the past 30 days, on the days you smoked, how soon after you woke up in the morning did you usually smoke your first cigarette?"⁶ Nicotine dependence was defined as smoking within 60 minutes of waking up. Current smokers were also asked if they want to quit smoking now, and how many times they tried to quit smoking completely in the past 12 months.

Susceptibility to smoking uptake was assessed among never-smokers and former smokers with the questions “If one of your best friends were to offer you a cigarette, would you smoke it?” and “At any time during the next year, do you think you will smoke a cigarette?”⁷ Students who answered “Yes” to one or both of these questions were considered to be susceptible to taking up smoking.

Results were described using proportions, which were compared using the chi-square test.

Results

The survey was completed by 352 males and 607 females; this male: female ratio is characteristic of the student population of this university. More than 98% of the participants were age 17 or 18 years, which is typical of incoming college freshmen students.

Research Question 1: What proportion of students have tried cigarette smoking by the time they begin college? In the current study, 49.4% of the respondents reported having ever smoked part or all of a cigarette. The frequency of ever-smokers did not vary significantly by gender (47.9% of females, 52.0% of males; $p = 0.23$) or by age (46.7% of 17 year-olds, 50.8% of 18 year-olds; $p = 0.23$).

Research Question 2: What proportion of students are current smokers when they enter college? About one fifth (22.0%) of the respondents were identified by the survey as current smokers, as defined by having smoked part or all of a cigarette during the past 30 days. The frequency of current smokers did not vary significantly by gender (20.8% of females, 24.1% of males; $p = 0.22$) or age (19.4% of 17 year-olds, 23.4% of 18 year-olds; $p = 0.16$).

Research Question 3: What is the pattern of smoking (days per month and cigarettes per day) among current smokers in the incoming freshman class? When current smokers were asked about the number of cigarettes per day that they smoked, 85.4% reported smoking five or fewer cigarettes on the days they smoked during the past 30 days (Table 1). Furthermore, during the past 30 days almost two-thirds (63.2%) of current smokers smoked fewer than 10 days and about half (50.7%) smoked only one to four days (Table 2).

All of the current smokers who smoked on only one to four days in the past 30 days also smoked five or fewer cigarettes on those days (Table 3). These current smokers (about

Table 1

Number of cigarettes smoked per day during the past 30 days by current smokers on the days they smoked

Cigarettes/day	Number	Percent
1 or part of one	92	44.7
2 – 5	84	40.8
6 – 10	21	10.2
11 - 20	6	2.9
> 20	3	1.5

Note: 5 current smokers did not answer this question.

SMOKING HABITS OF STUDENTS ENTERING COLLEGE

Table 2

Number of days current smokers smoked part or all of a cigarette during the past 30 days

Days Smoked During Past 30 days	Number	Percent
1 – 4	106	50.7
5 – 9	26	12.4
10 – 19	29	13.9
20 – 29	25	12.0
All 30 days	23	11.0

Note: 2 current smokers did not answer this question.

half of the total) were defined as lighter smokers. The other half of the current smokers, who smoked on more than four of the past 30 days, were considered to be heavier smokers (Table 3).

Research Question 4: What is the prevalence of nicotine dependence among current smokers entering college? Current smokers were considered to be nicotine dependent if they smoked within 60 minutes of waking up in the morning on the days they smoked. Of the current smokers who answered the question about nicotine dependence (15 did not answer), only 12.8% were identified as nicotine dependent. Most current smokers (87.2% of those who answered the question) waited more than 60 minutes after waking up in the morning to smoke. Nicotine dependence was strongly associated with heavier smoking. While only 2.2% of lighter smokers were nicotine dependent, 21.6% of heavier smokers were nicotine dependent ($p < 0.0001$). All 15 non-respondents to the nicotine dependence question were lighter smokers, suggesting that they did not answer the question because they did not see its relevance.

Research Question 5: What proportion of current smokers entering college want to quit smoking? Of the current smokers who answered the question, “Do you want to quit smoking now?” (18 did not answer), more than half (52.9%) answered “Yes.” Desire to quit was

Table 3

Cigarette smoking among current smokers during the past 30 days by cigarettes smoked per day and number of days smoked

Cigarettes/day	Days Smoked in Past 30 Days			
	1 – 4 days		> 4 days	
	Number	Percent of All Current Smokers	Number	Percent of All Current Smokers
5 or fewer	103	50.2	72	35.1
> 5	0	0	30	14.6

Note: 6 current smokers did not answer this question.

strongly associated with lighter smoking. Two-thirds (67.0%) of lighter smokers desired to quit, compared to 40.0% of heavier smokers ($p = 0.0001$).

Of the current smokers who answered the question, "In the past 12 months, how many times did you try to quit smoking completely?" (16 did not answer), about one-third (34.4%) tried to quit at least once. Attempting to quit at least once during the past year was associated with heavier smoking, with 43.6% of heavier smokers, but only 23.9% of lighter smokers, attempting to quit at least once ($p = 0.004$).

Most of the nonrespondents to these two questions concerning desire and efforts to quit were lighter smokers, suggesting that they did not answer the questions because they did not see the relevance.

Research Question 6: What is the susceptibility to smoking uptake of never-smokers and former smokers who are entering college? Only 2.1% of never-smokers, but almost one-fifth (19.0%) of former smokers, were susceptible to smoking uptake.

Discussion

In the current study, 49.4% of year 2004 incoming freshmen had tried a cigarette by the time they were ready to begin college and 22.0% were identified as current smokers. These results were almost identical to the 2004 *Monitoring the Future* national survey results for twelfth graders who planned to complete four years of college, 49.0% of whom were ever-smokers and 21.6% of whom were current smokers.⁸

Cigarette smoking among incoming freshmen who were current smokers in the present study was relatively light, with 85.4% of current smokers reporting smoking five or fewer cigarettes per day on the days that they smoked and 50.7% of current smokers reporting smoking only one to four days in the past 30 days. Only 2.4% of the incoming freshmen engaged in daily smoking, compared with the national finding of 12.2% for all 2004 twelfth graders who planned to complete four years of college.⁸ The substantially lighter smoking among incoming freshmen to Quinnipiac University may reflect differences between 12th graders who plan to complete four years of college and 12th graders who actually enter a four-year undergraduate program, or it may reflect a particular characteristic of students entering Quinnipiac University.

Compared to heavier smokers, lighter smokers in college smoke a higher proportion of their cigarettes in the presence of certain environmental cues such as smoking when drinking alcohol and smoking more often during the evening hours.⁹ Many college students describe themselves as "social smokers" because their tobacco use is more of a social activity or a component of their social activities rather than a regularly practiced behavior characterized by nicotine dependence.¹⁰ Fifty-one percent of current college student smokers in a national cross-sectional survey ($n = 10,904$ students enrolled at 119 nationally representative U.S. colleges) reported that they smoked mainly with others or equally by themselves and with others, and were considered to be social smokers.¹⁰ In this study, social smoking was associated with lighter smoking and less nicotine dependence. Unfortunately, however, social smoking may represent a step towards heavier smoking and possible nicotine dependence.¹⁰

Students who smoke do not always fully comprehend the risks associated with any level of the smoking habit. In a longitudinal study of high school students who were college students four years later ($n = 1,479$), 25% of high school experimenters (defined as having

smoked at least 1 but fewer than 100 cigarettes ever, but none in the last 30 days) increased their smoking over the four years. The students who were more likely to progress from experimentation to a higher level of smoking believed experimentation with smoking was safe and reported that peers approved of smoking.¹¹ In another survey, college smokers ($n = 1,020$) were half as likely as nonsmokers to believe that there are health risks from smoking only on weekends or a couple of days a week.¹² Such lack of comprehension may encourage experimentation/social smoking which then may develop over time into a more serious smoking habit and nicotine addiction.

The current study found that most (87.2%) incoming students who smoked were not nicotine dependent. Furthermore, only 2.2% of lighter smokers were nicotine dependent. It is important to begin smoking cessation efforts early, when most current smokers are not nicotine dependent.

The majority (52.9%) of current smokers reported that they wanted to quit. Only 40.0% of heavier smokers reported a desire to quit compared to 67.0% of lighter smokers. Lighter smokers with definite intentions to quit in the future are most likely to quit.¹³ Smoking cessation efforts on campus should target these lighter smokers.

Tobacco control efforts on college campuses should also target former smokers (current nonsmokers who have smoked in the past). Whereas only 2.1% of never-smokers were found to be susceptible to smoking uptake, almost one-fifth (19.0%) of former smokers were susceptible. Thus, faced with the stresses of college and the popularity of social smoking, some students, who have tried cigarettes in the past, may start smoking again. Prohibiting the sale, advertising, and distribution of tobacco products on campus and prohibiting smoking in all campus buildings, including residence halls (or prohibiting smoking on campus entirely), may decrease the opportunity for this susceptible population to smoke.¹⁴ Colleges and universities can also work with local authorities to prevent access of underage students to local bars, where tobacco promotion and distribution of free samples often take place.¹⁵

In summary, there appears to be a window of opportunity for tobacco control efforts among incoming freshmen. Perhaps respiratory care educators should take a leading role in implementing tobacco control measures on their campuses. In the current study, more than one-fifth of them were currently smoking, but most were lighter smokers and were not nicotine dependent. Even among heavier smokers, only 21.6% were nicotine dependent. More than half of the current smokers desired to quit and about one-third had tried to quit within the last year. Former smokers were appreciably more susceptible to smoking uptake than were never-smokers, and should be a target of prevention efforts. Tobacco control activities that reach college students early, before the onset of heavier smoking and nicotine dependence, have the potential to reap substantial benefits.

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EDUCATIONAL TECHNOLOGY INTEGRATION ON A SHOESTRING BUDGET

Keith B. Hopper, PhD, RRT

Abstract

Background: Respiratory therapists are technology proficient but this has not translated readily into effective, efficient integration of educational technologies in Respiratory Care (RC) training. There are fundamental misapprehensions of principles of teaching and learning with technology, and myths of multimedia instruction abound. Technology integration is not a clinical or engineering problem, but a teaching challenge. **Methods:** RC educators should seek out technologies to permit students to learn *with*, rather than *from* technology. Judicious technology choices in teaching in RC should be student-centered, should capitalize on technology strengths, and should be cost effective. There is a satisfying range of educational technologies that match most or all of these criteria, and most are readily at hand. Some good technology choices simply improve instructor efficiency or facilitate scholarship. **Conclusions:** RC educators should demand rich online text support resources from publishers and should also develop high quality digital content products to be shared with the RC community.

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Educational Technology Integration on a Shoestring Budget

Introduction

Respiratory therapists (RTs) are technology proficient, often serving as technology innovators and champions in the clinical setting. The range and complexity of technologies mastered by RTs is astonishing, from computerized diagnostic equipment in the pulmonary function lab to sophisticated current generation mechanical ventilators. The field of Respiratory Care (RC) probably owes its existence, in part, to its willingness to innovate with technology. And when accomplished respiratory care practitioners assume teaching positions, this enthusiasm and confidence in technology applications, rightfully earned in the clinics, is applied to instructional needs.

Confronting the issue of technology integration in teaching, we tend to envision a solution involving choosing or developing first rate technologies, hopefully involving machinery of *Star Trek* caliber, and invoking them to efficiently solve our instructional needs. After all, we have successfully wheeled in generations of ever more capable mechanical ventilators, allowing us to routinely defeat odious clinical challenges, such as ARDS, that once stymied the best minds in the healing professions. Many of us vividly recall mechanical ventilation by pressure-cycled Bird and Bennett machines, the coolly efficient look and sound of the Bennett MA-1 ventilators, and the cleverness of early IMV circuits. We have every reason to expect that our ingenuity, innovativeness and tenacity will prevail in bringing technology to bear in RC training. But we do not prevail — a handful of technology enhanced learning success reports notwithstanding. Arthur C. Clarke advised us that, “Any sufficiently advanced technology is indistinguishable from magic.”¹ Respiratory therapists (RTs) in this sense have surely worked magic. How could it fail us in something as seemingly simple as teaching — of merely transferring knowledge from one human brain to another? But the research in RC echoes the general media comparison research of the past several decades^{2,3}; we are hard pressed to match learning outcomes of technology-based instruction with those of the traditional classroom. As Richard E. Clark^{4,5} and Thomas L. Russell⁶ have convincingly written, we know the end result before we do the media comparison research — the research will show a galling NSD (no significant difference) phenomenon.

As I have argued elsewhere, technology integration in teaching, in RC or any other field, is not an engineering or a clinical problem — it is a teaching problem.⁷ Human learning is a mysterious phenomenon. It is clear that we should not expect a one-size-fits all pedagogy or technology integration strategy. And we must all be ready to admit that educational technology products claiming to make learning easy, fast and fun have not fulfilled these promises.⁸

The fundamental issue seems to be a misapprehension of the most basic planks of learning — what does it mean to learn? When we have done our best to answer this question, we may then approach the secondary question of how best to teach, with or without technology. Having spent more than half my career in knowledge transfer mode, first in the classroom and then with technology mediated instruction, I came to admit the truth — it is a challenge. Passive absorption of facts and principles in isolation results in, at best, a temporary illusion of learning, which evaporates like ether — lasting long enough for our multiple-choice, objective exams to console our students and ourselves that our classroom time

has been usefully spent. Learning, as Jonassen eloquently points out, “. . . is a process of meaning making, not of knowledge reception.”⁹ And if we continue to see educational technology as a means of facilitating the same old classroom strategy of “dishing out the knowledge” we will continue to be disappointed in the results. The solution seems to be the subtle admonition to use technology to learn *with*, not *from*.

Media Myths

A major reason for our inability to achieve effective learning outcomes with technology is reliance on untested, and often false, assumptions about teaching and teaching with technology. Some of our expectations about teaching with technology are intuitively quite obvious but simply unfounded or demonstrably untrue.¹⁰ Clark¹¹ reviewed the research literature for widely assumed principles of multimedia learning and reached conclusions that will surprise and disappoint technology fans. Among these, that multimedia instruction:

1. Yields more learning than live instruction—there is no credible evidence that any medium (or combination of media) increases learning that is not explained by other factors. In most (possibly all) cases, perceived differences are due in fact to differences in instructional strategy, not choice of medium. In fact, the research indicates that multimedia easily strays into sensory and information overload, and this is an impediment to learning. However, the other side of this coin is that, although multimedia instruction is not inherently more effective than the traditional classroom, it can be replicated, distributed and leveraged to an impressive degree.¹² That is, your compelling lecture on hemodynamics this morning has evaporated, recorded only in the (often flawed) notes of your students. But a technology mediated instructional event of similar content quality may be faithfully, digitally recorded, archived, and distributed via a wide range of technology choices to an audience of 10,000, available at all times.
2. Is more motivating than other instructional means — evidence for this has been described as elusive. In fact, the research evidence is that the motivational aspects of multimedia instruction are often counter-productive. The attractive and seemingly motivational aspects of multimedia appear to diminish student work toward learning to the degree that they are satisfying to use. Some students appear to be attracted to technology mediated instruction because they expect it to be easier than classroom instruction.
3. Accommodates different learning styles — much media-based instruction aims to accomplish this (many students claim to be visual learners) but merely presents textual messages via a computer monitor. This is not authentic accommodation of a visual learning style. Moreover, the research indicates no benefit, or sometimes a negative result, when learners enjoy their learning style preference. Again, this appears to be related to the degree of work required of the student. Learning styles are preferences, not absolutes, and should not be accepted as legitimate excuses for failure to learn (or to teach). In other words, a student who professes a strong visual learning style preference can still learn effectively by other styles. Far more important than accommodating learning styles is intelligence, motivation toward learning goals, and prior knowledge.¹³ It may well be that the singularly important educational technology in-

vestment a program makes is using current generation multimedia products to recruit high caliber students.

Disappointing as the research findings may seem, there is good news in the literature. Most importantly, technology-based instruction is often considerably faster, with learning achieved in as much as 40% less time.¹⁴ This is presumably due to the learner's ability to control some aspects of instruction, choosing areas of weakness and skipping areas of redundancy, rather than having to listen to an entire linear classroom lecture before satisfying an informational or theoretical gap.

Given what the research reveals about teaching with technology, and given our own experiences, how should educational technologies be best used in respiratory care training? Should we use them at all? I propose that technology be integrated in instructional roles in ways that are pedagogically sound, consistent with the research, and cost effective. Specifically, I see three aspects to judicious technology integration, that it should:

1. Be student-centered.
2. Capitalize on the strengths of technology-mediated instruction, especially efficiency and scalability.
3. Be cost effective — providing maximal effect with minimal expense.

Student-Centered Technology

A subtle but critical distinction in judicious integration of technology in teaching and learning is that we should find ways to use the technology as a cognitive tool, where the student learns *with* rather than *from* the technology,^{10,15} as another way for instructors to attempt to linearly “dish out the stuff.” This necessarily involves requiring (permitting) direct student use of technology. For example, a traditional classroom approach to arterial blood gases (ABGs) is likely to involve lecturing by the instructor, possibly using highly developed PowerPoint slides with sound, animation, and even occasional detours to selected websites. The instructor may require ABG interpretation practice using drill and practice computer-assisted-instruction (CAI) software. Although technologically endowed, this is an instructor-centered approach that merely continues the knowledge transmission method that we know does not result in lasting, meaningful learning. This would be followed by content regurgitation by the students, without delay, and probably using mechanized testing methods.

But a learner-centered, technology infused approach would require students to collaboratively or individually create an Excel spreadsheet that models some aspect of the complex ABG content, ranging from something as simple as pH calculation to a tool to interpret ABGs. Ideally, clinical instructors would be prompted to simultaneously follow up classroom and CAI work with ABG interpretation at the bedside, which amounts to a far richer understanding than instruction in isolation and out of context. Similarly, students can research the topic and use PowerPoint and/or the Internet to present content portions to the class, to be critically scrutinized by their peers, and by the instructor. Rather than passive absorption of facts, technology may then be used to help students “...identify main points, search for cause and effect, find patterns and relationships, rank ideas, develop timelines, build taxonomies...draw comparisons and contrasts, examine costs versus benefits, or interlink ideas...”¹⁶

Technology Strengths

The research literature describing educational technology supports a potential advantage in technology mediated instruction, that often it may be scaled, reused, and repurposed. While a digital capture of your lecture content (text, audio, or audiovideo) may have no inherent instructional advantage over a classroom lecture, it can be delivered to large numbers of learners who are separated by distance and time, can be reused in a similar course, or repurposed for an entirely different application. Learners can pause, rewind, and skip content presentations to match their preferences and needs. Beyond the efficiency in this, there are major advantages:

1. Archived presentations may be highly polished, representing the instructor's best work.
2. Archived presentations may be updated and refined.
3. Topical presentations on content areas that are perennially troublesome for students may be archived, to be reviewed at any time either on CD or via video streaming over the Internet. Some engineering and medical programs compile streaming, topical archives on essential, stable content and make the presentations available as needed. For example, Boston University's Anesthesiology department deploys streaming instructional modules created by residents and peer reviewed in a problem-based learning strategy.¹⁷

Cost Effectiveness

Educational technologies have a track record of requiring enormous resources. Evaluation of cost effectiveness is rarely done, and seldom demonstrates a convincing return on investment. The primary reason for this is that technology integration in higher education has tended to be instructor-centered, rather than student-centered.¹⁸ Adding high octane, expensive technology to this limited instructional strategy is doomed.

A Shoestring Budget Technology Prescription

What will the program or classroom look like where technology has been judiciously integrated? Remarkably the same, but with seemingly subtle differences. We will likely see familiar technologies — computers and printers, network connections, Internet browsers, presentation applications (such as PowerPoint), databases, spreadsheets, graphics tools, online development tools (such as Dreamweaver and related programs). The difference is not the tools we purchase but who uses them, and for what end. A nonexhaustive survey of technologies and strategies for RC that match most or all of the three criteria described above follows.

1. Microsoft Word — fundamental word processing skill is essential to the aspiring RC manager or educator, and RC instructors are well advised to require students to prepare course papers using MS Word (which has few competitors at this time). We should be cautioned that word processing users tend to seriously overestimate their skill,¹⁹ and I invite RC educators to have a fresh look at the powerful features of MS Word that you may not be familiar with. A powerful but often overlooked functionality in MS Word is its "Save as Web Page" feature. Although not perfect, it does a remarkably good job creating sophisticated, simple web pages (including graphics and hyperlinks) quickly. Instructors can post, using MS Word, course support materials, policies and schedules, clinical information and job announcements.
2. Endnote or other automated citation managers that seamlessly "piggybacks" with Microsoft Word tools. Endnote allows the user to insert citations within a document,

then automatically format citations and bibliographies using one of more than 2,300 styles (APA, MLA, AMA, IEEE, etc.). Styles are readily customized for specific publications. Endnote manages a tedious aspect of formal writing so that authors may concentrate on content. PowerPoint — a recent discussion by RC program directors on the AARC education list serve revealed that RC teachers are highly aware that PowerPoint presentations provide no inherent instructional advantage but do offer a number of important housekeeping advantages, which translate into efficiency for both instructors and students. These include:

- Efficient content organization, an advantage for both instructor and student.
 - Detailed lecture handouts to streamline note taking.
 - High quality graphics — these can match graphics from course texts and eliminate the time-consuming, often unsatisfying artistic efforts of instructors.
 - Course archives that may be posted on a companion website for student use. These may include handouts to be printed by the student, or actual presentations published on the Internet via PowerPoint's efficient "Save as Web Page" option.
 - Presentation narration capability, so that course modules may be published on CD or compressed using a tool such as Impatica (described below), to be efficiently streamed from a course website. Note that narrated PowerPoint presentations are simply too large to effectively publish "as is" from a website.
3. PowerPoint (redux) — PowerPoint is a remarkably stable and easy-to-use platform for multimedia elements, and it can be used creatively with instructional strategies beyond mere knowledge transfer.²⁰ For example, an instructor might begin an upper division course using PowerPoint to deliver voice narration from an ICU survivor, followed by high impact photographs or even a brief movie. These can then serve as a spark and focal point for class discussion. Similarly, upper division students will learn a great deal about pathology and technology tools if they are assigned to work in small groups to produce brief PowerPoint modules for patient instruction — a remarkable opportunity in service learning as well.
 4. Develop an archive of in-house multimedia presentations on topics that are reused from semester to semester. These may be mainstream RC content modules (acid-base physiology, intubation, gas physics, etc.) or housekeeping modules (clinical polices, introductions to clinical facilities, introductions of faculty and clinical instructors, etc.). Technologies to accomplish this are included in Table 1.

Table 1

Impatica	www.impatica.com (\$200.00)	Compresses narrated PowerPoint presentations to be deployed from an ordinary web server. Very easy to use.
Microsoft Producer	http://www.microsoft.com/office/powerpoint/producer (free extension for PowerPoint)	Creates rich media streaming presentations based on PowerPoint. Provides high fidelity narration, music, excellent graphics, full motion video, and screen capture animations.

Streaming modules may also be developed for marketing purposes. To review a sample MS Producer module developed for a medical education need, visit the following URL:

http://www.bu.edu/av/courses/med/05sprgmedanesthesiology/Producer%20Lectures/Mutimedia/multimedia_files/Default.htm

5. Share instructor created digital archives. High quality instructional media products are time-consuming and tedious to develop. RC programs can share presentations developed in-house, or consider creating a nationally organized library.
6. Speakerphones and Internet connections — simple technologies readily at hand can be used to produce surprisingly satisfying professional presentations from a distance. For example, a subject matter expert on a new ventilator can prepare a simple PowerPoint presentation, publish it on a website (or the receiving program can publish it as a courtesy), then deliver a live lecture presentation to an entire class, referring to the online slides. Students can ask questions in real time. Imagine trading your smashing hemodynamics lecture for a top notch lecture on neonatal ventilation by a faculty colleague in another state. In my own graduate courses, I sometimes invite nationally known text authors to participate in live online class sessions and have often been pleasantly surprised at their willingness to do so.
7. Adobe Acrobat— an indispensable tool for rendering documents in an efficient, faithful format that may be universally viewed with a free plug-in download (www.adobe.com/products/acrobat/). Distributing original word processing files via website or email is off-putting to faculty, and rendering them as PDF files helps prevent unwanted use of proprietary material. Acrobat is especially useful to create interactive forms for program management tasks.
8. Online text resources — RC educators should collectively demand rich resources supporting mainstream texts. These are free and can be enormously helpful to instructors and students. Resources could include downloadable syllabi templates, instructional tips for instructors, high quality PowerPoint presentations with figures and illustrations taken directly from companion texts, online case studies, interactive online tutorials and exercises, self-assessment exercises, access to learning communities, and polished modules for online course tools such as WebCT and Blackboard.
9. Online topical databases — such as PubMed (www.pubmed.gov) are often underused by instructors in course preparation. There are similarly useful resources in some states, such as Georgia's Galileo system (www.galileo.usg.edu). Merely acquainting students with these resources, by requiring their use in course assignments, is an important step toward judicious technology integration.

This set of technology applications potentially facilitates improved learning outcomes as well as acquainting students with technology resources and skills that will serve them well in their careers. Many programs currently possess or have access to most of these, and the remaining items are comparatively inexpensive (vintage Medisims and MedSoft tutorials and simulations originally sold for about \$300.00, making today's technology investments a bargain).

Conclusion

Arthur C. Clarke is also credited with the following insight: “When a distinguished but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong.”¹ I sometimes reflect on an aspect of RC education that is apparent only in hindsight —that respiratory care is a uniquely satisfying and exciting field in which to teach. This is because to teach RC is to aspire to expertise in a wide range of theoretical and applied knowledge — it isn’t merely a *talking* field, but a *doing* field. Recall Dewey’s admonition, “To know is to do.” Add this variety of subjects and skills to technology prowess and the result is a sort of teaching laboratory paradise. What I know of applying technology in teaching and learning I learned as an educator. There is room to experiment, there are wonderful things to know and to discover, and we have every reason to expect that the next quantum leap in educational technology may be developed by RC educators

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UNDERSTANDING SUCCESSFUL CHARACTERISTICS OF ADULT LEARNERS

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Abstract

Background: The purpose of this paper is to provide the educator with an overview of characteristics and traits of distance learners. At present, colleges and universities are attempting to meet the increasing demands of today's student. One of the methods used to meet these demands is the delivery of education via distance learning. While this may be a convenient method of course delivery, not all learners will be successful in this setting. **Methods:** This review of literature will address demographic and affective characteristics of the distance learner and barriers the distance learner may encounter. The ability to identify these characteristics and barriers can provide the educator with valuable information to assist the distance learner in overcoming barriers to success.

Key Words: distance learning, education, online learning, learner traits

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Understanding Successful Characteristics of Adult Learners

Introduction

Distance learning has become a mainstay in health science education. During past decades, various forms of distance learning have become available to students, especially those enrolled at the college and university level.

The concept of distance learning can be traced back as far as 1873. It was at that time that Anna Ticknor established an at-home study for the purpose of encouraging the education of women in various arts, at a time when educated women were frowned upon.¹ This program, as well as many others that followed, used postal mail for correspondence. In 1883, the Chatauqua College of Liberal Arts became the first approved program to offer their degrees via correspondence. The American government sponsored radio learning from 1918-1946 by providing various educational institutions with broadcasting licenses. Capitalizing on the popularity of television, the government deemed it an acceptable method of learning in the 1950's. In the 1990's, the Internet became a popular choice for distance learning.¹ In 1998, the National Center for Educational Statistics stated that over half of the United States higher education universities and colleges offered distance learning opportunities utilizing several different types of media.²

Learners choose distance learning programs for a variety of reasons, including time flexibility, cost effectiveness, and flexibility of location.^{3,4,5} Another reason that distance learning is becoming more popular is that it is available to populations that have not traditionally had access to education, such as those who do not live in close proximity to an educational institution or those with severe physical disabilities. However, not every learner who attempts a distance education course will be successful, which in most cases means successful completion of the distance learning course. Barriers such as communication problems, isolation, poor time management skills and lack of motivation can prevent a learner from success. The purpose of providing distance learning with advanced technology such as interactive television and synchronous discussion arenas is to attempt to overcome the physical distance between learners as well as the communication barrier that occurs in an asynchronous environment due to the lack of immediate feedback and non-verbal communication. Despite advances in technology, barriers will remain for the non-traditional distance learner. It is prudent to identify these barriers and be able to determine which students will be successful with distance learning.

Demographic Characteristics

The age of the adult learner who chooses distance learning varies considerably. However, a number of resources report the typical distance learner is an older adult. Thus, it can be implied from these resources that the distance learner is older than the "typical" traditional learner.^{5,6,7} Thompson cites several studies in which the median age of the distance learner is 36 years and the age range is 25-45 years.⁶ Jian and Hamp-Lyons report the age ranges of distance learners as 20-40 years.⁷ Cross discusses why distance learning attracts an older adult. She states that an older adult is better established within the work force and financially secure. Their life experiences, both work and social, can make traditional learning experiences less satisfactory. These factors make an older adult more likely to choose a non-traditional

learning program rather than a traditional, on-campus learning program.⁸ However, in contrast to younger learners, some older adults may not be comfortable with the technology and may encounter problems, not with the course material, but with the technology that accompanies the course.⁹

Gender, Ethnicity and Employment

A number of studies have looked at gender and distance learning. Contradictory data regarding gender with distance learning makes narrowing this demographic variable down more difficult. While disagreements exist regarding the predominant gender in distance learning, the authors are viewing the concept from different angles. The difference in these studies lies in the type of distance learning program offered and the geographical location of the learners. A 1981 study reported by Simonson et al. states that more males are enrolled in distance learning programs than females. The author defends this statistic with the rationale that males are more likely to participate in distance learning opportunities due to job-related training.¹⁰ However, a 1998 report states that females comprise approximately 60% of all distance learners in North America. When referencing learners in Britain, Germany and Spain, the same study shows that males predominate in distance learning endeavors.⁶ These differences may be explained by way of cultural differences between populations. Gender roles vary across nations and account for many statistical differences within the nation's educational systems. In 1977, the State University of Nebraska reported that approximately 75% of their distance learners were female.⁸ Females are also more likely to choose distance learning due to their other life roles.² These roles, such as managing the home, being a full-time mother, wife, or caregiver, can place large time and energy constraints on the female. Distance learning provides an opportunity for the female in this position to continue life-long learning at a time and place that is convenient for her. While the research is contradictory, the question still remains: Is gender a predictor of success in distance education? Klessius et al. argues that gender does have a "limited effect" on the success of the distance learner.¹¹ Other studies suggest that females are more likely to succeed based on their increased motivational levels and more serious attitude towards successful completion of the course. Simonson et al. reports that factors such as employment status and whether or not the learner used support services provided by the institution accounted for the difference between genders.¹⁰

Most authors agree that it is difficult to assess the impact of ethnicity on the success of distance learners. While distance learners are made up of a wide variety of ethnicity, there is insufficient data to reach a conclusion whether ethnicity is a positive or negative influence on success. Klesius et al. reported that various studies noted that ethnicity was "found to have a limited effect on success of distance learning students" but it is unclear whether it is the ethnicity of the distance learner or a different cultural or socioeconomical factor that impacts success.¹¹

Distance learners tend to have multiple roles in today's society. Labeled "non-traditional students" for years, these learners typically work full-time while taking advantage of the distance learning flexibility to pursue their education. Lorenzetti reports that 80% of distance learners are employed and over two-thirds are married.⁹ Many other studies echo these findings, providing the conclusion that the majority of distance learners tend to be those with

family responsibilities and full time employment.^{5,12,13} With these data, it is apparent that this demographic chooses distance education for the flexibility on already strained time commitments.

Many employers are encouraging employees to continue their education. Employers are requiring more advanced training and are finding distance learning, especially online programs, to be cost effective and provide fewer conflicts with time and the employee's schedule. In a number of cases, the human resource departments are providing financial incentives for those who wish to return to an outside educational institution.

Affective Characteristics

A number of educational researchers have attempted to describe the "typical" distance learner and what characteristics make the learner successful. Personality traits have been discussed, and it is documented that persons who are passive, trusting and emotionally stable are more likely to succeed in distance learning programs.⁶ Also, those who are more introverted tend to be more comfortable with distance learning. Shy learners tend to participate less in a traditional classroom setting, but participate more via Internet and virtual classrooms due to the relative anonymity this medium provides.¹⁰ Most researchers agree that learners who chose to participate in distance learning are goal-oriented and highly motivated. These individuals typically enroll in the educational program to earn a diploma or certificate or to fulfill a requirement set forth by their occupation by either employers or licensure requirements. These learners are also able to direct their educational needs due to self-awareness. These learners desire more autonomy regarding educational needs and are self-sufficient, relying less on the instructor for guidance.⁶

Internal locus of control is defined by Thompson as "the belief that consequences stem from one's own behaviors and efforts."⁶ Conversely, persons with an external locus of control believe that fate or chance controls outcomes. Individuals with an internal locus of control are more likely to succeed in distance learning programs than those with an external locus of control. Those with external loci of control often require more feedback and communication with peers or the instructor to maintain the educational path.¹⁰ Successful completion of distance programs has been linked to learners who require less of a connection with peers and have an increased self-confidence regarding educational performance.⁶ Successful distance learners are inclined to be highly motivated and self-directed.⁵ Motivation tends to originate internally by way of goal-setting and desire for life-long learning.

The traditional barriers to on-campus learners can help motivate students to look at alternatives such as distance learning. Factors such as time constraints, on-campus tuition and costs, work schedules and family responsibilities tend to produce less of an effect on the distance learning experience than they would on the traditional course experience.⁶

Another variable influencing success in distance learning is intelligence. It was reported by Thompson that learners who choose distance learning opportunities are "more intelligent" than learners who chose entirely on-campus courses.⁶ It has also suggested that learners of average or higher cognitive ability will succeed at a higher rate than those of lesser cognitive ability.¹⁰ These findings do not necessarily indicate that distance learners are "smarter" than traditional learner, but may indicate that they take more responsibility regarding their education and are more open to new experiences and growth opportunities. Further research is

needed to make a valid conclusion.

Learning styles of distance learners have been explored to determine if this variable is a predictor of success. Authors have attempted to make a correlation between learning style and predictors of success but have not been successful. Mupinga et al. performed a study with 131 undergraduate students who were enrolled in Internet-based distance learning. Each student was administered a Myers-Briggs Cognitive Style Inventory personality test to determine learning style. The authors found that “no particular learning styles were found to be predominant among the online students” but did not report on the number of successful students within the online course. Their recommendation based upon their findings is that each distance learning course should cater to multiple learning styles.¹³ Printed media assist visual learners achieve success at a high rate. These learners require a visual stimulus to successfully process information provided in the course. Media in the form of video recordings, printed word and pictures will often fulfill this need.¹⁰ However, another study by Krentler and Willis-Flurry has failed to correlate these results.¹⁴ It has been observed that auditory learners can be challenged by distance learning. Providing access to video recorded media with accompanying audio can assist this type of learner. Simonson et al. notes that with proper hands-on activities relayed to the learner, even kinesthetic learners can be successful in distance education programs.¹⁰

Barriers to Successful Learning with Distance Education

Many barriers to distance learning exist. Furst-Bowe and Dittmann estimate that 70% of distance learners do not complete their courses.² One such barrier for course completion was the lack of institutional support services for online learners, such as “administrative services that were not made available electronically.”² Other barriers were of a personal nature. These barriers include lack of family support, lack of time, limited financial resources, poor time management skills and isolation. These factors negatively impact the ability of the online learner to balance home, work, and educational activities in a successful manner.²

Distance learning often requires substantial time to complete assigned course work. Despite having control over the learning schedule and environment, learners are often faced with time constraints. Domestic time or energy constraints, such as family care and work obligations, can place a strain on the amount of motivation a learner has for the learning opportunity, as well as the amount of concentration he or she is able to put forth.

Some learners may have a need to belong to a group or community thus making distance learning a less desirable option for learning. The lack of immediate response and face-to-face communication with peers and teachers can cause some usually motivated learners to procrastinate or access scheduled online activities less frequently. This, of course, limits the amount of participation in the course and negatively affects success.¹⁰

Anxiety and stress will have a negative impact on the success of the distance learner. Derick states that an unsupportive environment, such as a distance learning course without a clear goal, could trigger a negative response and transition the learner to inactivity within the course.¹⁵ Simonson et al. reported that a 1993 study showed that the learners who were unsuccessful in distance learning differed from the successful learners in test taking strategies, time management, and concentration levels. The researchers also claimed that the learners who had limited college experience displayed these traits of unsuccessful learners.¹⁰ Howell

supports this claim and furthers it by adding that past online experiences will increase retention of a learner in a distance learning program.¹³ It can be inferred from these claims that learners without prior college and/or online experience would be less successful than learners who have these experiences.

Learners with a less than satisfactory experience with traditional education may be reluctant to pursue distance learning. The lack of confidence evoked from past failures could overshadow the motivating factors of the learner and result in an unsuccessful experience.¹² A lack of preparedness for the online experience can also negatively affect the success of the learner.⁷ Many educational institutions provide an orientation to the online course experience to counteract this phenomenon.

Learners vs. Distance Traditional Learners

In terms of scholastic performance, distance learners do at least as well as those who learn in a traditional classroom setting. However, students often perceive education received through distance learning is of higher quality than that of traditional on-campus courses.¹⁵ According to Simonson et al., the major difference between the distance and traditional learner is the motivational level of the distance learner.¹⁰ A possible reason for this increased motivational level is that the learner has accepted more responsibility for the educational experience. Although the authors have provided rationale for this key difference, they further state that, when comparing the individual attributes of the two types of learners, they are “not generally different from each other.”¹⁰

Conclusions

Distance learning was designed to provide learners with more opportunity and flexibility for learning. Distance learning allows the learner to overcome traditional barriers to learning such as location, disabilities, time constraints, and familial obligations. However, not every learner will be successful in a distance learning environment.

Numerous studies have addressed those attributes which tend to allow a learner to be successful at distance learning. These include age, gender, socioeconomic status, and employment status. Studies have also attempted to predict success with distance learning by personality traits and cognitive ability. Correlations between learning styles and success in distance education have been shown to be inconclusive. However, one common theme reappears: the successful traits of a distance learner are similar to the successful traits of an adult learner in traditional educational settings. Therefore, the argument could be made that an adult learner who has been successful in a traditional classroom setting could be successful in a distance learning environment. The success of distance learning is dependent on communication between the learner, his or her peers and instructor. To encourage success within distance learning, it is necessary to evaluate each individual's needs on a case-by-case basis. While successful learners tend to display certain traits, any adult learner with the proper motivation and preparedness could be successful in a distance learning program.

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A STUDY OF PROGRAM EFFECTIVENESS: THE RELATIONSHIP BETWEEN PROGRAM RESOURCES AND PROGRAM PERFORMANCE ON THE WRITTEN REGISTRY FOR RESPIRATORY CARE EXAMINATION

Arzu Ari, PhD

Abstract

Background: With the increasing demand for program accountability in higher education, respiratory therapy program outcomes have become more important for quality assessment. **Objective:** This study examined the extent to which program resources predicted program performance on the Written Registry for Respiratory Therapy Examination (WRRTE). **Methods:** The unit analysis of this study was B.S. degree Respiratory Care Education (RCE) programs in the United States. After utilizing a mailed survey research method, a total of 36 out of 57 (63%) surveys were returned. Pearson correlations and multiple regression analysis were used for data analysis. **Results:** This study found a significant relationship between program resources and program performance on the WRRTE. Financial and personnel resources had a statistically significant positive relationship with program performance on the WRRTE. Multiple regression analysis identified that the ratio of financial resources to students was the single predictor of program success on the WRRTE and was responsible for 40 percent of the variance in program performance on the WRRTE. **Conclusions:** Programs with more financial and personnel resources consistently have better scores on the WRRTE. Therefore, RCE programs must assure their constituents that programs have the financial and personnel resources necessary to provide quality preparation for graduates.

Key words: program performance, the written registry for respiratory care examination, program resources, student success, program effectiveness, quality improvement, baccalaureate degree programs.

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A Study of Program Effectiveness: The Relationship between Program Resources and Program Performance on the Written Registry for Respiratory Care Examination

Introduction

As the demand for program effectiveness and accountability in higher education increases, respiratory therapy educators must assure their students that the programs in which they invest their time, energy, and money effectively prepare them for their career as a respiratory therapist. Most Respiratory Care Education (RCE) program directors believe that student success on the NBRC examination corresponds to program performance and should be used to evaluate program effectiveness.¹ Therefore, for the purpose of this study, the effectiveness of respiratory care education (RCE) programs is defined as the educational processes resulting in high percentage of students' success on the National Board for Respiratory Care (NBRC) examinations. In order to determine how well a program achieves its goal in producing knowledgeable respiratory therapists, RCE programs are assessed through program variables and program performance on the NBRC Examinations.²⁻⁶ Currently, program performance on the NBRC examinations varies among RCE programs. Some programs consistently have high graduate performance levels, while others experience consistently low pass rates on the NBRC examinations.^{2-4, 6}

Whether student performance on the WRRTE is considered an institutional effectiveness issue, a financial issue, or an enrollment management issue, it continues to be a challenge for many RCE programs. RCE programs expend a significant amount of resources to attract students, but there is a decline in enrollments and the respiratory therapy profession keeps suffering from a shortage as the demand for respiratory therapists increases. The US Bureau of Labor Statistics projected that employment of respiratory therapists will expand by 35% by 2012. This increase in RT positions is due to aging "baby boomers" and prevalence of chronic diseases.^{7,8} A further challenge to meet is the need for additional therapists while programs are experiencing a decline in qualified applicants. Nationally, RCE programs have reported declines in the number and quality of student applicants in the last 10 years, while there is an increase in demand for respiratory therapists. Therefore, it is important to understand how to effectively utilize program resources in order to improve program effectiveness on the WRRTE.

To explore the relationship between program resources and program performance on the WRRTE, this study focused on the role of financial, personnel, and clinical resources of programs on their student's performance on the WRRTE. In order to qualify this relationship, this study examined reasons underlying the variation in RCE program performance on the WRRTE and looked at specific program resources that might predict program effectiveness on the WRRTE. The basic assumption underlying the study was that RCE program resources would affect program effectiveness and in turn the quality of program graduates and program performance on the WRRTE.^{2, 3, 9, 10} Therefore, this study investigated the following research questions as they relate to the effectiveness of RCE programs:

1. What are the characteristics of Bachelor of Science (BS) degree RCE programs across institutions in terms of program resources and program outcome?
2. What is the relationship between respiratory therapy program resources and program

performance on the WRRTE?

3. To what extent do program resources predict graduate performance on the WRRTE?

Methods

Study Population

A growing number of programs offer the B.S. degree in respiratory care, which provides the knowledge and clinical expertise that prepares graduates for respiratory therapy positions at advanced levels in the areas of credentialing and education. RCE programs at the baccalaureate level have increased by 75% with 57 programs identified in 2002.¹¹ Because the American Association for Respiratory Care (AARC) advocates advanced level credentialing and expanded opportunities for B.S. degree RCE programs that provide qualified and knowledgeable respiratory therapists with heightened critical thinking abilities, the target population in this study was B.S. degree RCE programs.^{12, 13} Therefore, all B.S. degree programs in the United States accredited by the Commission on Accreditation of Allied Health Education Programs were surveyed.¹⁴ The directors of these programs were contacted to collect two consecutive years of retrospective data on program resources and WRRTE scores from January 2005 to April 2005. The mean scores of the variables were used for statistical analysis.

Instrument

The Respiratory Therapy Education Survey (RTES) was constructed to obtain data needed to conduct this study (See Appendix A). The format and items in the RTES were based on the survey instruments developed by other researchers who have previously studied the education of respiratory therapists.²⁻⁴ Five educators and two RCE program directors reviewed the RTES for clarity and relevance to the research questions prior to administration. After the review and redundant items were eliminated, the final instrument included 17 items related to program resources (financial, personnel and clinical resources) and outcome measure (WRRTE). The indicators for the resource component in this study consisted of the following variables: (a) the number of staff positions in the program, (b) the non-personnel operating budget; (c) the personnel budget; (d) the total program budget; (e) the number of clinical sites affiliated with the program, (f) the number of total faculty members (full-time and part-time); and (g) degrees.²⁻⁴ The operating budget included financial expenditures for travel, laboratory supplies, books, instructional aids, and electronic media, while the personnel budget consisted of the salaries of full-time and part-time faculty members, as well as support personnel working for the program. The total program budget was calculated by adding the operating and personnel budgets together.

Data Collection

A personalized pre-notice letter was sent to all program directors in order to build anticipation and improve response rate.¹⁵ The questionnaire package containing a cover letter, the questionnaire, and a return envelope was mailed out within a week of the pre-notice letter. A reminder was sent one week after the questionnaire was mailed, and a follow-up letter including the questionnaire package was mailed by first-class mail two weeks later. Then, a telephone call was made to those who had not responded, and if they agreed to participate in

the study, the questions were asked by phone. A total of 36 out of 57 (63%) programs responded after three follow-up mailings of the questionnaire packets and phone interviews with program directors.

Data Analysis

Correlation matrices were examined for variables determined as high correlations and having statistical significance. Then, multiple regression analysis was used to determine which of the predictor variables performed best in predicting RCE program performance on the WRRTE.

Results

Descriptive statistics were computed for the first question to identify the characteristics of B.S. degree RCE programs. Data revealed that universities sponsored 80.6% of RCE programs and four-year colleges made up the remaining sponsorships (19.4%). Program resources in this study were divided into three categories: (a) personnel resources, (b) financial resources, and (c) clinical resources. Regarding personnel resources, the mean faculty to student ratio was 1 to 4, and approximately 72% (n=35) of the RCE programs utilized part-time faculty. Also, most (81%, n=35) of the programs surveyed had full-time support personnel.

Data on financial resources in this study indicated that salaries of faculty and support personnel made up 66% of total program expenditures and the operating budget made up the rest of financial resources. There was wide variation among programs in terms of financial resources. For instance, the operating budget of RCE programs ranged from \$12,000 to \$539,114 while personnel budget ranged from \$89,000 to \$491,240. The mean scores for the total operating budget and for the total personnel budget of RCE programs were \$118,229 (SD=\$16,749; n=36) and \$246,462 (SD=\$117,462; n=36), respectively. Like financial resources, RCE programs had a wide range (1 to 31) in the number of clinical affiliations and the mean number of clinical sites affiliated with the RCE programs was 9.16 (SD=7.26; n=36). The mean WRRTE scores of RCE programs also ranged from 52 to 100. The mean WRRTE score of the 36 programs was 77.52 (SD=12.70; n=36).

To determine whether program financial, personnel, and clinical resources were significantly related to program performance on the WRRTE, the raw scores of graduates were correlated with program resources. The statistics indicate that financial resources were significantly positively related to program performance. For example, the correlation between the total operating budget and the mean WRRTE score was 0.429 ($p < 0.05$); operating budget was responsible for 18.4% of the variance in the mean WRRTE score. The total program budget, which includes both the operating budget and the personnel budget, was also related to the mean WRRTE score ($r = 0.459$, $p < 0.05$). Together, the operating budget and personnel budget explained a significant amount of variation (21%) in program performance on the WRRTE. Programs with higher operating and personnel budgets had higher WRRTE scores.

Not surprisingly, there was a significant positive relationship between the personnel budget and the number of full-time faculty members. In fact, 65% of the variance in the number of full-time faculty was explained by the personnel budget ($r = 0.809$, $p < 0.05$) and there was

also a significant positive relationship between the total operating budget and the number of faculty members with a doctoral degree ($r=0.579, p<0.05$). No significant relationship between clinical resources and program performance on the WRRTE was found ($r= 0.197, p=0.25$).

The ratios of financial resources to students, personnel resources to students, and clinical resources to students were calculated to identify predictors of program performance on the WRRTE. To obtain the ratio of financial resources to students, the total program budget was divided by the number of students enrolled in the program. For the ratio of personnel resources to students, the numbers of faculty and full-time support staff were added together to arrive at a total number for personnel, and this was then divided by the number of students enrolled. Similarly, the number of clinical affiliations of the program was divided by the number of students to compute the ratio of clinical resources to students.

Pearson product moment correlations were then computed between each program resource variable and program performance on the WRRTE. The ratio of financial resources to students was strongly positively correlated with the mean WRRTE score ($r=0.638, p<0.05$) and was responsible for 41% of the variance in program performance on the WRRTE. The ratio of personnel resources to students was also significantly positively correlated with the mean WRRTE score ($r=0.320, p<0.05$) and explained approximately 10% of the variance in program performance on the WRRTE. Finally, a significant positive correlation was found between the ratio of personnel resources to students and the ratio of financial resources to students ($r=0.698, p<0.001$). Approximately 48% of variance in the ratio of personnel resources to student was explained by the variance in the ratio of financial resources to students. In summary, RCE programs spending more money per student

Table 1
Pearson Product-Moment Correlation Coefficients Between Program Predictors of Program Performance on the WRRTE

Variables		Mean WRRTE	Financial Resources/ Student Ratio	Personnel Resources/ Student Ratio	Clinical Resources/ Student Ratio
Mean WRRTE	r	1			
	Sig.				
Financial Resources to Student Ratio	r	.638*	1		
	Sig.	.000			
Personnel Resources to Student Ratio	r	.320*	.698*	1	
	Sig.	.028	.000		
Clinical Resources to Student Ratio	r	-.135	-.273	.185	1
	Sig.	.217	.054	.140	

* Correlation is significant at the 0.01 level (2-tailed).

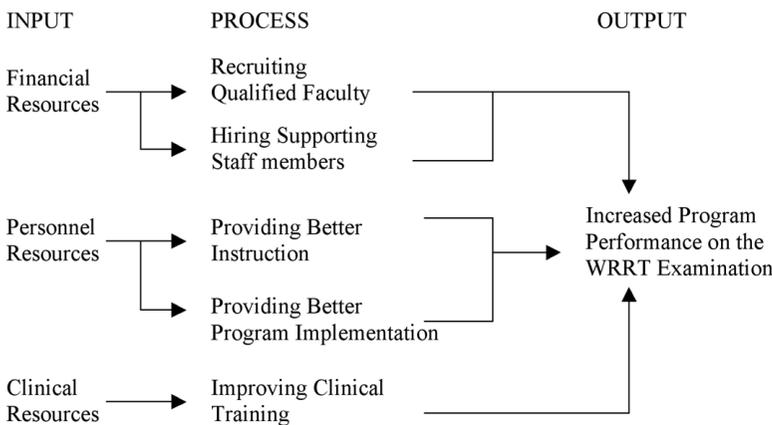
and having more personnel in the program had higher mean scores on the WRRTE.

Because the ratio of clinical resources to students was not significantly correlated with the WRRTE score, only the ratio of financial resources to students and personnel resources to students were used in the multiple regression analysis. The mean WRRTE was regressed on both the ratios of financial resources to students and personnel resources to students, resulting in an $R = 0.663$, $R^2 = 0.44$, and adjusted $R^2 = 0.387$ ($p < 0.05$). Only the ratio of financial resources to students significantly predicted program performance on the WRRTE, explaining 41% of the variance in a program's performance. The nonstandardized regression model generated to predict program performance on the WRRTE was statistically significant ($p < 0.05$) and multiple regression analysis revealed that the main predictor of program performance on the WRRTE was the mean financial resources per student. The coefficient of 0.001 for the ratio of financial resources to students means that every unit change on financial resources spent per student increased program performance on the WRRTE by 0.001 ($p < 0.05$). The results indicate a significant positive effect of financial resources on program performance on the WRRTE as well as a positive though non-significant effect of personnel resources on the average WRRTE score ($p < 0.05$).

Discussion

Measuring the relationship between input and output variables is a way of determining the effectiveness of RCE programs in transforming students into knowledgeable respiratory therapists who can pass the WRRTE. This study examined the extent to which program resources predicted the effectiveness of RCE programs in developing competent respiratory therapists for the health care workforce. Program resources in this study were divided into three categories: (a) financial resources, (b) personnel resources and (c) clinical resources (See Figure 1). As described by the other researchers, if RCE programs have adequate fi-

Figure 1
Input-Process-Output Model for the Program Effectiveness of RCE programs



nancial resources, they can hire high quality faculty with graduate degrees who will be able to develop effective curriculum and provide the necessary instruction to promote student learning.^{2-4, 10} Then, students will be able to exhibit the knowledge and clinical competence required for the respiratory care profession. When students develop the necessary knowledge, they will be able to pass the WRRTE.³ In this study, the ratio of financial resources to students was responsible for 41% of the variance in program performance on the WRRTE, indicating that the more money spent per student, the better the performance on the WRRTE. Therefore, this study explains the importance of program resources for the program effectiveness of RCE programs.

Regarding program resources, the results of this study indicated wide variation among RCE programs in both operating budget and personnel budget. Among the RCE programs surveyed, 72% had part-time faculty in the program. The mean number of full-time faculty was 3.08. Johnson found that the mean number of full-time faculty in RCE programs was 2.9, which is very close to the mean in this study.² The faculty to student ratio in this study was 1 to 4 and the majority (69%) of faculty members held graduate degrees. These findings are consistent with Johnson's finding that 67% of faculty in RCE programs held some type of graduate degree.³ Because BS degree RCE programs are sponsored by universities and four-year colleges in which graduate degrees are important for hiring and promotion, these results are not surprising.

Limitations

The primary limitation of this study is that it focused only on B.S. degree RCE programs, and so the findings cannot be generalized to neither A.S. or A.D. degree RCE programs nor other allied health care programs. Drawing a sample from nursing, physical therapy and other health care education programs would establish a more general picture of how program resources affect allied health education and make results easier to generalize. Further, this study used input-output evaluation, not process evaluation of RCE programs. Process evaluation is essentially the process of determining to what extent the educational objectives are actually being realized by a program's curriculum and instruction. Therefore, more research is needed to evaluate the process of curriculum preparation and teaching in RCE programs and the impact of the teaching on program performance on the NBRC examinations.

Conclusion

The findings of this study help us understand the role of program resources on program effectiveness in training respiratory therapy students and can be used as a guideline for the improvement of student performance on the WRRTE. Increasing financial resources spent per student and utilizing more personnel may help RCE programs increase their rate of success on the WRRTE. The final outcome will be students who have acquired the knowledge that enables them to pass the WRRTE and to contribute as members of respiratory care profession in the United States.

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Appendix A

THE RESPIRATORY THERAPY EDUCATION SURVEY (RTES)

Please accept my sincere thanks for taking the time to carefully complete this survey. Let me assure you that individual program confidentiality will be carefully maintained.

1. Please indicate the **type of institution** sponsoring your program
 _____ University _____ 4 Year College
 _____ Technical Institute _____ Community College
2. What is the total number of **respiratory therapy credit hours** required for your program? _____ hours
3. What is the total number of **clinical contact hours** required for your program?
 _____ hours
4. What is the total number of **laboratory hours** required for your program?
 _____ hours
5. Please indicate **the total number of faculty members** in your program based on their highest educational degree attained.
 Full Time _____ MD, PhD or Ed.D _____ MS, MPH, MA _____ BS, BA
 Part-Time _____ MD, PhD or Ed.D _____ MS, MPH, MA _____ BS, BA

	2002	2003
6. What is the total number of FTE staff positions in your program?		
7. What is the total number of full-time faculty positions in your program?		
8. What is the total number of part-time faculty positions in your program?		
9. What is the total number of clinical sites affiliated with your program?		
10. What is the total (gross) operating budget of your program per year?		
11. What is the total (gross) personnel budget of your program per year?		
12. What is the mean college grade point average (GPA) of your graduates when they were admitted to your program?		
13. What is the number of full-time students enrolled in your program?		
14. What is the mean WRRTE pass rate results of your graduates?		
15. What is the mean attrition rate of your graduates?		
16. What is the mean employment rate of your graduates?		

17. Your comments will be greatly appreciated either here or in a separate envelope.

THANK YOU VERY MUCH FOR YOUR PARTICIPATION IN THIS STUDY!

**PLEASE RETURN THE SURVEY BY
MARCH 17, 2005**

To:

ARZU ARI

Georgia State University
College of Health and Human Sciences
Department of Respiratory Therapy
P.O Box 4019
Atlanta, GA 30302-4019

CAN GPA AND STUDENT 'HARMFUL' (H) CHOICE FREQUENCY PREDICT SCORES ON THE NBRC'S SELF-ASSESSMENT WRITTEN REGISTRY EXAMINATION FOR ADVANCED RESPIRATORY THERAPISTS OR THE NBRC'S WRITTEN REGISTRY EXAMINATION FOR ADVANCED RESPIRATORY THERAPISTS?

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Abstract

We inquired if student success on the NBRC's Self-Assessment Written Registry Examination for Advanced Respiratory Therapists or the NBRC's Written Registry Examination for Advanced Respiratory Therapists (aka RRT Examination) could be predicted by student GPA or the number of harmful (H) choices selected by the student on a program generated self-assessment examination. In addition, the relationship between the student GPA and passing or failing the examinations was also examined. Student records and examination scores (n = 38) were evaluated for this study. There was a significant difference between the GPAs of those who passed or failed the program generated self-assessment examination. Evaluating the number of harmful (H) choices students choose and the item content on written examinations is an excellent analysis of student understanding of respiratory care essentials. However, the frequency of harmful choices did not predict success or failure on student scores for the NBRC's Self-Assessment Written Registry Examination for Advanced Respiratory or the NBRC's Written Registry Examination for Advanced Respiratory Therapists. Furthermore, we could not predict student success or failure with the program generated self-assessment or the NBRC's Written Registry Examination for Advanced Respiratory Therapists.

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Can GPA and student 'harmful' (H) choice frequency predict scores on the NBRC's Self-Assessment Written Registry Examination for Advanced Respiratory Therapists or the NRBC's Written Registry Examination for Advanced Respiratory Therapists?

Introduction

Respiratory Care education programs often use the National Board for Respiratory Care (NBRC) secured self-assessment examinations as a means to assess student knowledge and understanding of respiratory care. Programs have access to a secure self-assessment examination for both the entry-level and advanced practitioner examinations. In addition, programs may use, for the same purpose, a faculty generated or hybrid type self-assessment examinations often modeled after the NBRC examinations.

The East Tennessee State University Cardiopulmonary Science Program has been using these types of examinations since 1971 to assess student progress. Having a long history with using comprehensive assessment exams, the authors felt examination data could be used to predict student success on the NBRC credentialing examinations.

This research evaluated the relationship between examination scores, the number of harmful choices selected by students on these examinations, and the student's grade point average (GPA). More specifically the authors asked if student performance on a program generated self-assessment examination or GPA could predict success or failure on the NBRC's Self-Assessment Written Registry Examination for Advanced Respiratory Therapists, or the NBRC's actual Written Registry Examination for Advanced Respiratory Therapists.

Review of the Literature

For decades, educational research has addressed the fundamental question of what student characteristics are associated with successful learners. A number of respiratory care educators have tackled this question, and in the process revealed variables that may indicate student in-program success, and possibly, success on board exams after graduation from the program. It is widely accepted that all or some subset of these variables is indicative of the overall potential for of a student to succeed in a program and attain RRT success. However, identifying these variables by the education programs has proven elusive. We noted the use of the National Board for Respiratory Care (NBRC) secured self-assessment written examination for advanced respiratory therapists may be used by accredited respiratory care programs as an alternative indicator of program success if 80% of students 'pass' the examination with a score of 55% or higher.¹

We examined variables considered important in the student selection process that differed broadly in the respiratory care literature and in publications of other allied health education programs. The pre-program variables of academic achievement and/or GPA,² individual values and abilities,³ and characteristics deemed relevant to a specific educational program or health discipline⁴ were all examined.

Predicting which of the students selected will pass the self-assessment written examination for advanced respiratory therapists and the actual written examination for advanced respiratory therapists continues to be a question that all respiratory care program directors would like answered. VanScoder and co-workers reported that the self-assess-

ment written examination for advanced respiratory therapists approached good reliability as an evaluation of competency of advanced practice respiratory care students.⁵

In a statewide study that looked at criteria deemed important to both accrediting agencies and state licensure boards, Douce and associates looked at success on the NBRC written registry examination for advanced respiratory therapists as an indicator of educational program success while conducting a state-wide report on respiratory care education.⁶

Problem Statement

Can student success on the NBRC's Self-Assessment Written Registry Examination for Advanced Respiratory Therapists, or the NBRC's actual Written Registry Examination for Advanced Respiratory Therapists, be predicted by student GPA or the number of student harmful (H) choices in a program generated self-assessment examination? Further, our inquiry was guided by the following research questions:

Research Questions

The following research questions guided the analysis of the data:

1. Was there a correlation between the student's GPA and the number of harmful choices made on the program generated self-assessment examination?
2. Was there a significant difference in GPAs of the students who pass the program generated self-assessment examination and those who fail the NBRC Written Registry Examinations for Advanced Respiratory Therapists?
3. Was there a significant difference in the number of harmful choices recorded for students who pass the program generated self-assessment examination and those who fail the exam?
4. Was there a significant difference in between student success with the NBRC's Written Registry Examination for Advanced Respiratory Therapists and student success with the scores from the program generated self-assessment examination ?

Method

Students enrolled in the B.S. Program in Cardiopulmonary Science at Program at East Tennessee State University were oriented to the purpose of this research project and given the opportunity to decline to participate if necessary. Thirty-eight students agreed to participate in this study. Each student was given a program generated self-assessment examination. The content of the examination was compiled of 50 items taken from retired NBRC Written Registry (WRRT) Examinations for Advanced Respiratory Therapists.

The program generated self-assessment examination serves to prepare the students to take the NBRC credentialing examinations by exposing them to the content and type of questions used by the NBRC on their examinations.

Item analysis of student's responses on the program generated self-assessment examination was conducted. The number of harmful choices each student made on the examination was recorded.

During the student's last semester, they took the NBRC's Self-Assessment Written Registry Examination for Advanced Respiratory Therapists and scores were recorded. Table 1 sum-

Table 1

Definition of variables under consideration.

Variable	Definition
GPA	The student's cumulative Grade Point Average (GPA) at graduation.
Number of Harmful Choices	The number of harmful choices recorded for the student taking the mock program generated self-assessment examination.

marizes data used to address our research questions. Following graduation, all 38 students took the NBRC's Written Registry Examination for Advanced Respiratory Therapists and earned the Registered Respiratory Therapist (RRT) credential. Again, individual examination scores were obtained and recorded.

Of the 38 participants, 88% passed the self assessment written examination, and 12% failed the examination. Mean GPA was found to be 2.87 for all participants. The average number of harmful choices chosen was 6.76 harmful choices.

Results

Table 2 reports the individual student's scores, GPAs, and number of harmful choices chosen. Research question 1: examined the relationship between student GPA and the number of harmful choices made on the program generated self-assessment examination. The Pearson Product Moment Correlation Coefficient (r) and the Spearman Rho revealed no correlation between student GPA and the number of harmful choices made on the program generated self-assessment examination ($p > .05$). Research question 2: was designed to determine if students who passed the program generated self-assessment examination had GPAs that differed from those who failed. An independent group t-Test was performed. The results demonstrated a significant difference in GPAs of those who passed the program generated self-assessment examination and those who did not ($p < .05$). The mean GPA of those passing the program generated self-assessment examination was 2.97 and the mean GPA of those failing the exam was 2.64. Research question 3: was designed to determine if students who pass the program generated self-assessment examination and those who failed the exam differed in the number of harmful choices they made. The results of the analysis showed no significance between the two groups ($p > .05$). Research question 4: Was there a difference between student scores on the program generated self-assessment examination and the NBRC's Written Registry Examination for Advanced Respiratory Therapists? The results of the analysis showed no significance between the two groups ($p > .05$).

Discussion

The finding that students with higher GPAs were more likely to pass both the self assessment and actual written examination for advanced respiratory therapists is consistent with the findings of other studies. Otherwise use of the number of harmful choices chosen and scores on program generated assessment examinations could not predict success with standardized assessment or credentialing examinations.

CAN GPA AND STUDENT 'HARMFUL' (H) CHOICE FREQUENCY PREDICT SCORES

Table 2

Results of the program generated self-assessment examination, student GPA, and number of harmful choices selected by each student.

Student	SAE P/F	GPA	#H choices
1	P	3.04	7
2	P	2.51	4
3	F	2.35	9
4	F	2.6	10
5	P	2.47	11
6	P	3.0	6
7	P	2.6	10
8	P	3.5	3
9	P	2.46	4
10	P	2.7	3
11	P	2.3	7
12	P	3.0	6
13	P	2.9	3
14	P	3.5	5
15	F	2.66	4
16	P	2.45	9
17	F	2.27	1
18	P	2.70	6
19	P	3.20	6
20	F	3.20	5
21	F	2.65	13
22	P	3.61	5
23	P	3.64	12
24	F	2.55	8
25	F	2.88	6
26	P	3.63	7
27	F	2.39	6
28	F	2.72	8
29	P	2.55	5
30	P	3.66	10
31	P	2.76	8
32	F	2.60	9
22	P	3.13	6
34	F	2.85	9
35	P	2.85	4
36	P	3.2	8
37	P	3.1	5
38	P	2.85	9
n = 38	26P(68%P) / 12F (32%F)	meanGPA = 2.87	meanH = 6.76

Perhaps the most important finding from this study was why particular wrong answers on NBRC examinations were judged as harmful. This information has better informed our faculty and given rise to better discussion within our department, as well as improving our item writing on new examinations.

Limitations of the Study

Limitations of the study include the program's use of a self-generated self- assessment exam that was not validated and a small student sample. Data reflects only the findings within the program and may not be generalized to other degree programs or programs outside our geographical region.

Conclusion

The monitoring of harmful choices may shroud a twofold reward: a better understanding of why these choices are made by a student, and student awareness of why the choice was deemed harmful. Programs that monitor such variables may be able to use this information to improve teaching and test construction.

Expanding our knowledge of what makes a better practitioner will better inform the leadership of the respiratory care education program as they strive for better outcomes both in their graduates and in training more competent respiratory therapists.

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