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RESPIRATORY CARE STUDENT RECRUITMENT STRATEGIES: WHAT WORKS AND WHAT DOESN'T?

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Abstract

Background: Demand for respiratory therapists is increasing, but there has been a decline in enrollment in respiratory therapy education programs.
Objective: To determine effective strategies for recruiting applicants to our Respiratory Care Education Program.
Methods: Data from applicants (n=151) who applied to our BS degree program were reviewed to determine which of eight possible sources of information led them to apply. The chi square ($\chi 2$) statistical analysis was used with $p<0.05$ considered significant.
Results: Out of the 151 applicants questioned, 39.7 percent cited our direct mail recruitment as the way they learned about our program; 19.2 percent cited friends and family member recommendations; 15.9 percent cited information provided on the program's web site; and 13.2 percent cited college career fairs.
Conclusions: Our best source of applicants comes from recruiting efforts by direct mail, followed by recommendations from friends and family members, and information provided on our web site.

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Respiratory Care Student Recruitment Strategies: *What Works and What Doesn't?*

Introduction

Job opportunities for respiratory therapists are expected to be excellent over the next decade due to increasing numbers of patients suffering from cardiopulmonary diseases such as pneumonia, emphysema, chronic bronchitis, and asthma. The Bureau of Labor Statistics predicts a 35 percent increase in demand for respiratory therapists through 2012, making respiratory care one of the fastest growing professions.[1] According to 2001 CoARC data, however, in the past 10 years there has been a decline in enrollments in respiratory therapy educational programs.[2] This situation sets the stage for a potentially critical shortage of qualified respiratory therapists in the face of predicted increases in the demand for respiratory care services. Respiratory care educators are challenged with the task of identifying the most effective ways to bring high-quality applicants into our educational programs.

In a previous survey of four classes enrolled in our baccalaureate degree respiratory care educational program, students ranked 34 reasons why they chose respiratory care as a profession.[3] The two reasons cited most frequently were an interest in a health care career and a desire to help others. Additional reasons for choosing respiratory care as a career, rated as important or very important by students, included making a contribution to society, a desire to work in a specialty area such as neonatal or pediatric care, job opportunities in the field, availability of an educational program, the education requirements, and part-time work being available after graduation.[3] This information is important, but it does not tell us the best way to go about identifying applicants with these interests.

At our University, we employ a number of recruitment strategies designed to attract applicants to our program. These strategies include direct mail, participation in college and high school career fairs, placement of ads in college and university newspapers, and public service radio announcements. We also maintain a web site that is designed to provide the prospective student with information about respiratory therapy as a career choice and how to go about applying to the respiratory care program. These recruitment strategies are expensive, and in this time of diminishing resources, it is important to determine the most successful, and yet cost-effective, strategies for attracting new students. The purpose of this study was to determine the most effective strategies for recruiting applicants to our respiratory care baccalaureate degree education program.

Methods

Data were collected by reviewing existing records of applicants, students and graduates of the baccalaureate degree respiratory care program at our University. The applicant information form lists eight sources that can be checked to indicate how the applicant learned about the program (see Figure 1). The population studied included all applicants who came in for a required orientation interview beginning with 2001, the first year we began to collect this data, to the present (n=151). The chi square (χ^2) statistical test was used to determine if the frequency of observed responses differed significantly from that of expected responses. $P<0.05$ was considered significant.

Figure 1
Applicant information check box. Applicants are asked to indicate how they heard about the respiratory care program.

How did you hear about our program? (check as many as apply)

- ❒ Recruitment Mailing
- ❒ College Career/Transfer Fair
- ❒ High School Career Fair
- ❒ Web Site
- ❒ Newspaper Advertisement
- ❒ Radio Announcement
- ❒ Friend or Family Member
- ❒ Other (please write in): _____

Results

The percentage of responses for each source of program information is shown in Table 1. Of the 151 responses recorded, 39.7 percent of applicants cited the direct recruitment mailing as the way they learned about the program; 19.2 percent cited recommendations by friends and family members; 15.9 percent learned about the program through the web site; 13.2 percent found out about the program by attending college career fairs. High school career fairs and radio announcements accounted for less than 1 percent of the applicants, and newspaper advertisements was listed by only 3 percent of the participants. Another 7.9 percent of responses cited "other" as the source of information about our program. These individual responses are listed in Table 2.

Determination of χ^2 is dependent on the number of observed responses in a given category compared to the expected number of responses based on chance alone. The χ^2 value (144.1; 7 degrees of freedom) for all responses indicated that the number of observed responses was significantly different from that expected due to chance ($p<0.05$). The response category that contributed most to the χ^2 value was the direct recruitment

Table 1
Responses in each category

Category	Percentage (Number)
Recruitment Mailing	39.7% (60)
Friend or Family Member	19.2% (29)
RC Department Web Site	15.9% (24)
College Career Fairs	13.2% (20)
Newspaper	3.3% (5)
High School Career Fairs	0.7% (1)
Radio	0% (0)
Other	7.9% (12)

mailing (60 observed responses versus 19 expected). The number of responses for college career fairs (20) was about the same as the expected number of responses (19).

Discussion

In this day of electronic technology, one would expect the Internet to be the number one source of information about career options for today's college student. The most common source of information for applicants to our educational program, however, was the multiple direct mailings we do each year. At least three times per year, we mail packets containing brochures and letters to science majors and pre-health career students whose names appear on mailing lists obtained from all area colleges and universities. Our recruitment letter markets the profession, and is accompanied by an invitation to an open house for interested students. Our brochure also includes career information, as well as a description of the program and admissions requirements. A sample of the recruitment letter is found in Figure 2.

Printing brochures and letters and mailing packets are significant expenses for our department, and we do this mailing three, and occasionally four times each year. Recently, we began asking applicants to identify which of the multiple mailings convinced them to apply to our program, and almost invariably, the answer is the second or third mailing. According to our applicants, they typically discard the first one, but by the time the second or third letter and brochure arrive in the mail, they begin to regard our persistence as a sign that respiratory care is their best career choice. Unfortunately, direct mailing of high quality brochures can be cost-prohibitive for educational programs with limited resources. The complete recruitment packets cost about $1.00 each and include a cover letter, brochure, application, and other information about the profession and our program. We obtain mailing lists from three branches of our own University system and four community colleges. In addition to these students, we also frequently mail packets to applicants of other programs in our school who were not selected to be students in those programs.

Because of the high cost of direct mailing, it may be necessary to investigate alternate funding sources. One source of funding may be the hospitals that employ graduates of respiratory therapy programs. School budget limitations for recruitment can be brought to the attention of respiratory care department directors, many of whom serve on program advisory committees. It may be possible to solicit funds for student recruitment from hospitals and other health care agencies, if administrators recognize its value as an employee recruitment strategy.

According to our applicant form, the second most important source of information about the program was friends or family members. A survey of 253 respiratory care educational program directors found that the recruitment method most commonly listed was "word of mouth".[2] This is consistent with our current findings and reinforces the need to present the profession in a positive way. While "word of mouth" as a source of information about respiratory care as a profession is difficult to control, all practitioners should be aware of its importance in promoting our profession as a positive career option.

Use of the Internet to market educational programs is much less expensive than direct mail, but it will be effective only if potential applicants actually visit the web site. The

Figure 2
Marketing letter sent to prospective students currently enrolled in math, science, or health-related preparatory programs at area colleges and universities.

Dear Prospective Health Sciences Student:

I am delighted to tell you about The University of Texas Health Science Center at San Antonio's (UTHSCSA) **Bachelor of Science degree program in Respiratory Care**. Many students interested in a high technology health care career choose to further their education by pursuing a degree in respiratory care. We are proud to be among the top programs in the country, and our graduates enjoy 100 percent job placement upon completion of the two-year program. Here are some of the reasons so many have come to UTHSCSA to pursue a degree in respiratory care:

• Respiratory care is one of the fastest growing professions in the country. The need for respiratory therapists is expected to increase 42.6% through 2008.
• In fact, our graduates have consistently enjoyed 100% job placement.
• Graduates have consistently achieved a 100% pass rate on their national board examinations for licensure.
• Many of our graduates use their degree to pursue ongoing medical studies.
• The average salary for respiratory therapists in the United States. is more than $40,000, and new graduates are currently making as much as $22/hour.
• In this troubling economy, our graduates are virtually assured of work, at a great salary.

Respiratory care, also known as respiratory therapy, is the allied health profession that cares for patients with deficiencies and abnormalities of the cardiopulmonary system. As a respiratory therapist, you will see a diverse group of patients ranging from newborn and pediatric patients to adults and the elderly. You will bring help and relief to patients suffering from asthma, emphysema, chronic obstructive lung disease, pneumonia, cystic fibrosis, infant respiratory distress syndrome, and conditions brought on by shock, trauma or post-operative surgical complications. Respiratory therapists are also involved in many specialty areas in the hospital such as newborn labor and delivery, neonatal and pediatric intensive care units, pulmonary function laboratory, sleep laboratory, adult intensive care units, extracorporeal membrane oxygenation, and EKG testing. In addition to working in hospitals, respiratory therapists have job opportunities in home care, rehabilitation agencies, nursing homes, emergency transport teams, sleep centers, pulmonary function laboratories, outpatient clinics and physician offices.

The Respiratory Care Program at the UTHSCSA is two years in length at the junior and senior levels, and upon completion, awards the **Bachelor of Science degree with a major in Respiratory Care**. Enclosed is an application and brochure that describes the program and provides a listing of the prerequisite courses and admission requirements. A three-year track option is available for students who want to reduce their academic load and/or complete prerequisite courses. ***The application deadline for the Fall 2004 semester is May 15, 2004.***

If you decide to pursue studies in *respiratory care* (and I hope that you will), you can expect an exciting career that enables you to help people while earning a great salary and enjoying nearly certain job placement upon graduation. If you need additional information, please contact the Allied Health Admissions Office at (210) 567-2660 or the Department of Respiratory Care at (210) 567-8850. And be sure to visit our Web site at www.uthscsa.edu/respiratorycare.

Sincerely,

Chair, Department of Respiratory Care

Table 2
List of other responses

Health Science Center admissions office (2)
College career center (2)
College advisor
Pre-med club speaker
Community College field trip to Allied Health School
Respiratory Care department Open House
Personal experience
Self-interest
Air Force
State affiliate RC Society meeting

most likely reason that our Internet web site was cited as a source of information only 16 percent of the time may be that potential students are not familiar with the profession of respiratory care as a career choice. It is up to educators and practitioners to promote the profession of respiratory care so that word gets out that our educational programs provide students with an exciting and rewarding career choice.

Our earlier survey of respiratory care educational program directors indicated that the best methods for student recruitment were use of program information (brochures, information packets, college catalog and web page) combined with activities designed to personally involve prospective applicants.[2] These activities may include presentations to college classes, career days and hospital visits for prospective applicants, as well as specific mentoring programs and direct mail. In that survey, useful adjuncts for recruitment included financial aid and scholarship packages, as well as informing prospective applicants of job opportunities for students while they were going to school.[2] The program director survey findings are consistent with our current study of program applicants in that program materials provided by direct mail, the web site and college career fairs accounted for more than 68 percent of our applicants.

In the program director survey, the lowest rated recruitment activities were high school visits, meetings with high school career counselors, and faculty guest lectures to high school classes.[2] This is consistent with our finding that less than one percent of our students heard about respiratory care at a high school career fair or related event. The current study confirms that, at least for our students, the most important single source of information was direct mail, which included an informational letter, a program brochure, and an invitation to a program open house. As noted above, friends or family members, web site and college career fairs were also important sources of information.

Conclusions

Ongoing recruitment activities are necessary to ensure an adequate student applicant pool for schools, as well as adequate human resources for the profession. Due to the scarcity of financial resources, it is important that the best and most cost-effective

strategies for attracting new respiratory therapy students be employed. This study revealed that almost half of the applicants to our Respiratory Care program result from multiple direct mailings that we undertake each year. Recommendations by friends and family members, the program web site and college career fairs were also effective in attracting students. Marketing the profession using recruitment materials distributed by direct mail to prospective students, use of web sites and college fairs, and letting others know who respiratory therapists are and what they do, may be our best strategies for putting fresh, new faces at the bedsides of our future patients.

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HOW TO BLEND STUDENT SERVICE LEARNING AND RESEARCH: A CASE EXAMPLE FOR EDUCATORS EXPECTED TO ENGAGE IN SCHOLARLY ACTIVITIES – PROJECT ASTHMAPAL

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Abstract

Faculty at university-based respiratory therapy (RT) programs are expected to engage in scholarly activities to attain tenure and/or promotion. Teaching and service activities are to be performed as well. Given these demands, how can a faculty member adequately manage their time to devote to these three institutional expectations? This case example involves RT students assisting their instructors in characterizing an urban middle school population with asthma. The benefits of having RT students assist in this asthma project included incorporating appropriate and needed curriculum for [the students] them, supporting [the (delete)] evidence that many urban middle-school students are not receiving the education needed to improve asthma outcomes, and grantsmanship/ publishing opportunities for faculty members.

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Student Service Learning and Research

Introduction

Today, almost all colleges and universities say faculty should engage in teaching, research and service. However, when it comes to tenure and promotion, teaching and service are often forgotten. Boyer and others[1,2] tell us that service activities that relate directly to the intellectual work of the professor and are carried out through consultation, technical assistance, policy analysis, program evaluation and the like should be considered. Given the demands of increased credit hour production and other issues in today's managed education environment, how can a faculty member adequately manage their time to devote to the three institutional expectations? This case example involves RT students assisting their instructors in characterizing an urban middle school population with asthma. This form of service incorporates the actions of faculty engaging in scholarly research, but also integrates ideas, connects thought to action and hopefully inspires students.

Project Asthma Pal

The AsthmaPal approach was designed to pair a RT student (the AsthmaPal) enrolled in a baccalaureate program with a middle school child with asthma. The role of the RT student was to mentor and support the child in asthma management and general health promotion, which may lead to a higher degree of compliance with the National Heart Lung Blood Institute (NHLBI) guidelines. The long-term goal of the project was to determine the effectiveness of pairing a middle school child who suffers with asthma with an AsthmaPal in an effort to decrease the number of days missed from school, increasing Health Related Quality of Life (HQOL), and improving lung function before and after implementation of the project.

Service Learning

In the fall semester of an incoming baccalaureate junior RT class, the investigators conducted intensive asthma training to volunteer RT students. Students received one hour of instruction once a week for 13 weeks and one hour of clinical release time for each hour spent in the project. This was in addition to the regularly scheduled RT courses in which the students were enrolled. Instruction paralleled components found in the National Asthma Education Prevention Program (NAEPP), and included the following topics: pathophysiology of asthma; initial assessment and diagnosis of asthma, including development of a written action plan, periodic assessment and monitoring of asthma - e.g. signs & symptoms of asthma; peak flow monitoring; quality of life/functional status; compliance with drug therapy; patient-provider communication and patient satisfaction. Other topics also covered included medications used to treat asthma (controllers and relievers), exercise and asthma, stress management, short- and long-term management of asthma, and patient education techniques. RT students were then required to demonstrate adequate knowledge about asthma and patient education through the use of cognitive tests and skills assessment.

The following semester these same RT students provided asthma education to middle school children with asthma for eight consecutive weekly sessions. These sessions were held at the children's school during the lunch hour, using a "Lunch-and-Learn" format. The curriculum included the following topics: pathophysiology, the importance of the asthma care plan, recognizing signs and symptoms of an asthma attack, peak flow monitoring, medications to control and relieve asthma, exercise and asthma, and stress management.

The middle school in Project AsthmaPal represented a convenience sample, which emerged from an existing partnership between the University and the public school system. Approval for the study was provided by the university Institutional Review Board (IRB) and by the public school system's IRB. The principal of the middle school gave permission for the study to take place with the school nurse as a liaison to the researchers. The school nurse identified all sixth and seventh graders with asthma after a review of school health records submitted at the beginning of the school year. A total of 78 students were identified out of a 367-student pool. A letter from the principal was sent to the child and their parent(s)/caregivers explaining a two year asthma study and asking for voluntary participation. Eighth graders were excluded because in the second year of the study these students would no longer be at the middle school. After informed consent was obtained from parent(s)/caregivers, 31 (40 percent of eligible) children were enrolled in the study in the winter of 2002. All students were of African American descent with the exception of one child. Ages ranged from 11 to 14, with 21 females and 10 males.

RT students next assisted in characterizing this urban middle school population with asthma. Asthma severity and self-efficacy were studied. Asthma characteristics were based on self-report by the students participating in the study and on pulmonary function measures. Assistance was provided to those children who needed help in reading the questionnaires. A registered pulmonary function technologist performed the pulmonary function tests and a board certified pulmonologist reviewed the reports along with the asthma symptom history to grade the level of asthma severity in accordance with the Guidelines for the Diagnosis and Management of Asthma.[3] Control of environmental factors that contribute to asthma severity was also measured by questionnaire. Specific items surveyed included allergens, tobacco smoke in the home, indoor/outdoor pollutants and irritants in the home. No attempt to match these items to a student's individual asthma triggers occurred at this initial screening.

After the initial education sessions and screening at the middle school, eleven RT students were each assigned to a child in the AsthmaPal program to provide education and support related to asthma management, and role modeling related to general health practices. A control group of 10 children with asthma were not paired with an AsthmaPal while 10 children dropped out of the project or had withdrawn from school. The RT student met with their child weekly for four weeks to establish a relationship and to reinforce the child's knowledge of asthma management. This meeting took place at the middle school. The student then continued to contact the child at least once every two weeks for the next nine school months to reinforce the child's learning and to help the child problem-solve related to asthma management. This contact took place in person or by telephone.

Results

The RT students were helpful in the initial characterization of the children with asthma. Through prescreening symptom history the students found that 20 of 31 children (65.5 percent) had experienced daytime cough, wheezing, chest tightness, and/or shortness of breath during the past 2 weeks, while nighttime symptoms were experienced by 24 children (77 percent). The number of times these children were awakened during sleep ranged from one to five times, exercise induced bronchospasm was reported by 16 children (52 percent) and twelve children (39 percent) reported that they needed more quick-relief medicine than usual in the past two weeks. Pulmonary function testing results used for determining severity of asthma along with symptom history revealed 13 (42 percent) children with mild intermittent, 16 (52 percent) children with mild persistent and 2 (6 percent) children with moderate persistent asthma. Only 3 children reported use of long-term control medications and 10 children used quick relief medications when needed. The self-efficacy test mean was 21.1 (SD=3.42). This test is associated with increased adherence to treatment and self-care behaviors with scores ranging from 13 to 39.

Discussion

Several benefits were seen from blending student service learning and research in this case example. RT students involved with Project AsthmaPal were presented with the curriculum on asthma one full semester prior to other students being presented with the material. The RT students also became student teachers as they presented the material to the middle school children. Learning to be a teacher is shaped by interacting with students, discussing content, observing other teachers, reflecting on our practices, and negotiating rules and regulations of institutions.[4] This project reinforced learning by providing students with one of their first real-life experiences, which is recognized as good practice in adult education.[5] Students also expressed satisfaction in that they earned "clinical release pass time" for their voluntary efforts.

From the results of the characterization of the middle school students, the RT students were able to learn first-hand how children who suffer from asthma in an urban inner city might be better controlled as evidenced by symptom history and pulmonary function. RT students who also had a personal history of asthma were able to share their experiences regarding exposure to irritants and allergens, and the children seemed to be especially receptive to these personal accounts. The most important thing the RT students learned from this project was that middle school students with asthma often do not report taking the medicines they need if they are to control their asthma and improve asthma outcomes. Optimal asthma management requires that parents and/or caregivers, as well as children, be knowledgeable about their disease, and these RT students were able to contribute to the self-care management practices of these children by assisting them in complying with an effective treatment regime.

Children whose parent(s)/caregivers are of low socioeconomic status and minority ethnicity are at risk for significant asthma sequelae.[6-8] Our description and characterization of middle school children with asthma supports the premise that children of large disadvantaged urban areas are disproportionately affected. While the focus of the

article is not the effects of the AsthmaPal on the on-going care and treatment of the middle school children with asthma, at the end of the study there were no reported unscheduled physician visits or emergency department visits by the children who were paired with the RT students. Absenteeism from school was also lower in the treatment group when compared to the control group.

Blending service learning and research is not easy, but doable, given adequate resources in terms of time, materials and personnel. Faculty members must be creative and willing to collaborate across disciples to further their research goals. This case study provides an example of undergraduate RT students fulfilling an important role by modeling good health and reinforcing asthma management strategies. RT students who understand predictors and correlates of asthma can assist in designing interventions at home, school and in the community to improve their own education and the overall management of asthma. We believe that our results demonstrate that cooperative efforts between faculty, students, children, and parents in investigations that support research, teaching and service can be effective.

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DEVELOPMENT OF AN INSTRUMENT FOR THE ASSESSMENT OF STUDENTS' CRITICAL THINKING AND PROBLEM SOLVING ABILITY

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Abstract

PURPOSE: To develop and pilot-test an instrument to assess students' critical thinking and problem solving ability (CTPS). CTPS scores were compared to the Watson-Glaser Critical Thinking Appraisal (WGCT) and the information gathering (IG) and decision making (DM) total scores on four NBRC self-assessment clinical simulation problems.
METHOD: A 21-item instrument was assembled, reviewed by a panel of experts, revised and pilot tested for reliability. Scores on the items are summed to generate a total CTPS score. Twenty students were evaluated using the CTPS by two faculty members familiar with the students. The faculty were blinded to the students' WG, IG and DM scores. Interrater unable to locate this word reliability coefficients and Cronbach's alpha were calculated and Pearson product-moment correlations were performed to compare CTPS scores and WGCT, IG and DM.
RESULTS: Interrater reliability for the CTPS was r=0.66 (n=20; p=0.002). Cronbach's alpha was .95 and .99 for the two faculty raters, respectively. There were significant correlations between CTPS scores and WGCT (r=0.54; p=0.02), IG (r=0.51; p=0.03), and DM (r=0.47; p=0.04). There were also significant correlations between WGCT and IG (r=0.49; p 0.04) and DM (r=0.74; p=0.0003).
CONCLUSIONS: Our findings provide evidence supporting the reliability and validity of the CTPS instrument. Faculty ratings of CTPS correlated significantly with general critical thinking ability and the combined scores for IG and DM on the NBRC clinical simulation problems.

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Instrument for the Assessment of Student's Critical Thinking

Introduction

Respiratory care educational programs seek to develop students' critical thinking and problem solving abilities.[1-3] Unfortunately, it is not clear how to best teach critical thinking, and methods to assess critical thinking specific to respiratory care are not readily available.[4-6] General measures of critical thinking ability are available,[7] however, general critical thinking ability may not be particularly relevant to the specific skills needed by respiratory therapists in clinical practice.[5,6] A specific respiratory care critical thinking instrument has been developed,[5] however, this particular instrument is based upon practitioners self-assessment. While self-assessment of critical thinking ability may be useful for research purposes and for self-evaluation by current practitioners, such an assessment may have limited utility for evaluation of student performance.

Critical thinking skills needed by respiratory therapists have been identified.[1,4-6] The critical thinking skills thought to be needed by respiratory therapists include the ability to prioritize, anticipate, troubleshoot, communicate, make decisions, negotiate and reflect.[1,4-6] Problem solving models are often based on a simple step-wise model.[8-10]

1. Identify (recognize) problems
2. Collect information (patient/situational assessment)
3. Interpret data
    - analyze information
    - categorize/organize data
    - relate general concepts to specific situations
    - recognize conflicting data
    - gather additional information
    - draw conclusions
4. Formulate solutions
    - critically examine concepts and ideas
    - identify alternatives
    - choose/explain specific solutions
    - identify creative solutions
5. Solve problems/make decisions
6. Re-evaluate based on patient response/new information

The Watson-Glaser Critical Thinking Appraisal (WGCT) is designed to determine subject's ability to reason analytically and logically.[7] The WGCT uses five subtests:

1. Ability to make inferences
2. Recognize assumptions
3. Perform deduction
4. Interpret arguments
5. Evaluate arguments

Subtest scores are combined to generate an overall critical thinking score.[7]

The National Board for Respiratory Care (NBRC) uses clinical simulation examinations (CSE) as a part of the examination system to become a registered respiratory therapist (RRT).[11] Self-assessment examination (SAE) versions of the NBRC CSE's are available, both as latent image paper exams and as computer-based tests. NBRC CSE

SAEs are designed to represent the actual CSE used for the RRT credential. NBRC CSE's are widely thought to provide a measure of respiratory therapists critical thinking and problem solving abilities.[1,5,12] NBRC CSEs result in an information gathering (IG) and decision making (DM) score based on a series of clinical problems which the examinee must complete.[11] The NBRC CSE is reported to have demonstrated content validity, criterion-related validity, and reliability.[11,13-14]

The purpose of this study was to develop and pilot-test an instrument for use by respiratory care faculty to assess students' critical thinking and problem solving ability (CTPS).

METHOD

A 21-item instrument was developed based on critical thinking skills identified by Mishoe and the basic steps used in clinical problem solving described above.[1,4,8,9] The draft instrument was reviewed by a panel of experts for content validity. The panel consisted of registered respiratory therapists holding faculty appointments at two university-based respiratory care educational programs, two of whom have previously published in the area of critical thinking and problem solving.[1, 4, 8, 9, 15] Following a review, the instrument was revised based on panel recommendations. Next, the CTPS was used to evaluate 20 senior students enrolled in a baccalaureate degree respiratory therapy educational program. Each student was evaluated independently by two faculty members who had worked with the students in both the classroom and clinical settings during the students' junior and senior years. Students also completed the WGCT and four NBRC CS-SAE problems. Faculty completing the CTPS were blinded to students' WGCT and C-SAE scores.

The CTPS rater indicates the extent to which they agree or disagree with each of 21 statements about the student. Each item is then scored using a 7-point scale where 7 = agree very much and 1 = disagree very much. Items are used to assess students' ability to recognize problems, gather appropriate information, interpret data, apply principles and concepts to clinical decision making, analyze data, explain clinical decisions, and evaluate alternatives. Raters are also asked to complete items related to students' ability to understand concepts, apply problem solving skills, perform patient assessment, categorize information, gather additional data, and make appropriate conclusions. Scores are summed to result in a CTPS total score. Possible scores range from 21 (low) to 147 (high) points. The final version of the CTPS is found in Figure 1.

Interater reliability coefficients and Cronbach's coefficient alpha were calculated. Pearson-product moment correlation coefficients were calculated between CTPS scores and WGCT and between CTPS scores and C-SAE IG and DM total scores using a statistical software package (SPSS, Chicago, IL).

RESULTS

Interater reliability for the CTPS was r=0.66 (p=0.002). Cronbach's alpha was 0.95 (faculty rater one) and 0.99 (faculty rater two). Table 1 contains the results of Pearson-product moment correlation coefficients. There were significant correlations between the CTPS and the WGCT (r=0.54; p=0.02), C-SAE IG (r=0.51; p = 0.03) and C-SAE DM

scores (r=0.47; p=0.04). There were also significant correlations between the WGCT and C-SAE IG (r=0.49; p=0.04) and C-SAE DM (r=0.74; p=0.0003).

DISCUSSION

The internal consistency of the CTPS was very good, based on the calculated values for Cronbach's alpha. The instrument also demonstrated satisfactory interater reliability (r=0.66). It is interesting to note that in a separate administration at two baccalaureate degree respiratory care educational programs, the interater reliability for the CTPS was r=0.85 and r=0.86 for the two schools, respectively.[15]

The CTPS also has evidence of content-related validity, based on the review by the panel of experts. In terms of the CTPS reflecting student performance on other measures of critical thinking and problem solving ability, the CTPS accounted for 29 percent of variance in WGCT (r^2=0.29), 26 percent of the variance in C-SAE IG scores (r^2=0.26), and 22 percent of the variance in C-SAE DM scores (r^2=0.22). The significant correlations between the CTPS, WGCT and C-SAE provide evidence of the concurrent validity of the CTPS, in that CTPS scores were related to these other independent measures of students' critical thinking and problem solving abilities.

Teaching students to critically think and solve problems are goals of respiratory care educational programs. Unfortunately, there are few discipline specific measures of students' critical thinking abilities for use by health care educators. General critical thinking ability measures are non-specific to health care, and have been of limited use in measuring change following the education of health care professionals.[16-19] While there are a large number of clinical simulation examinations available in respiratory care, they are time consuming and expensive to administer, and tend to test students knowledge on one clinical problem or case at a time. There is also limited evidence regarding the effect of instruction and clinical practice on students' performance on these clinical simulations.[20] We hope that the CTPS will provide educators with a simple, easy-to-use tool to evaluate students, which can be completed by instructors during and after observing students in the clinical setting. The CTPS incorporates items to rate students' ability to identify problems, collect information, interpret data, analyze

Table 1
Pearson-product moment correlation coefficients for the CTPS, WGCT, and C-SAE IG and DM scores (n = 20).

	WGCT	IG	DM
CTPS	0.54*	0.51*	0.47*
WGCT	--	0.49*	0.74*

* $p < 0.05$

CTPS – Critical Thinking and Problem Solving Scores
WGCT – Watson Glaser Critical Thinking Appraisal
IG – Information Gathering Score on the NBRC Clinical Simulation Examination
DM – Decision Making Score on the NBRC Clinical Simulation Examination

Fig. 1. The final version of the Critical Thinking Problem Solving (CTPS) instrument for use in evaluating respiratory care students' critical thinking and problem solving abilities. The evaluator rates each statement using the scale provided. Total scores for each student for items 1-21 are then summed using the following scoring system:

Agree Very Much = 7
Agree Pretty Much = 6
Agree a Little = 5
Disagree a Little = 3
Disagree Pretty Much = 2
Disagree Very Much = 1

Note that there is no neutral score (i.e. neither agree nor disagree) so that the rater must choose whether they tend to agree or disagree with each statement. Possible total CTPS scores range from 21 (low) to 147 (high) points.

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Department of Respiratory Care
Critical Thinking and Problem Solving Ability Assessment

Directions: Please assess the following individual's critical thinking and problem solving abilities by carefully reading each of the listed statements. After reading each statement, check the one answer which best reflects how much you agree or disagree with the statement as it applies specifically to:

This individual:	Agree Very Much	Agree Pretty Much	Agree a Little	Disagree a Little	Disagree Pretty Much	Disagree Very Much
1. Recognizes clinical situations requiring action.	❍	❍	❍	❍	❍	❍
2. Gathers appropriate clinical information.	❍	❍	❍	❍	❍	❍
3. Interprets clinical data correctly.	❍	❍	❍	❍	❍	❍
4. Applies principles and concepts to clinical decision making.	❍	❍	❍	❍	❍	❍
5. Analyzes clinical data accurately.	❍	❍	❍	❍	❍	❍
6. Explains the rationale for clinical decisions.	❍	❍	❍	❍	❍	❍
7. Understands concepts related to the patients condition.	❍	❍	❍	❍	❍	❍
8. Evaluates treatment alternatives.	❍	❍	❍	❍	❍	❍
9. Is able to generalize and apply problem solving skills to new and different situations.	❍	❍	❍	❍	❍	❍
10. Has strong patient assessment skills.	❍	❍	❍	❍	❍	❍
11. Categorizes clinical information that it can be used effectively.	❍	❍	❍	❍	❍	❍
12. Clarifies misunderstandings and areas of ambiguity by gathering additional data.	❍	❍	❍	❍	❍	❍

Fig. 1 Continued. The final version of the Critical Thinking Problem Solving (CTPS) instrument for use in evaluating respiratory care students' critical thinking and problem solving abilities. The evaluator rates each statement using the scale provided. Total scores for each student for items 1-21 are then summed using the following scoring system:

This individual:	Agree Very Much	Agree Pretty Much	Agree a Little	Disagree a Little	Disagree Pretty Much	Disagree Very Much
13. Identifies alternate solutions to problems.	❍	❍	❍	❍	❍	❍
14. Draws appropriate conclusions from available data.	❍	❍	❍	❍	❍	❍
15. Explains the rationale for choosing specific solutions to a problem.	❍	❍	❍	❍	❍	❍
16. Corrects/modifies thinking based on new information.	❍	❍	❍	❍	❍	❍
17. Critically examines personal conceptsand ideas.	❍	❍	❍	❍	❍	❍
18. Has a creative approach to problemsolving.	❍	❍	❍	❍	❍	❍
19. Has excellent critical thinking. skills	❍	❍	❍	❍	❍	❍
20. Is good at solving problems.	❍	❍	❍	❍	❍	❍
21. Makes appropriate clinical decisions.	❍	❍	❍	❍	❍	❍

_____ _____

Student Date

_____ _____

Evaluator Date

information, and categorize and organize data. Items are also included to rate student's ability to relate general concepts to specific situations, recognize conflicting data, gather additional information, draw conclusions, formulate solutions, make decisions and solve problems.

Limitations of this pilot study include the small sample size and the fact that only two raters were used to calculate measures of reliability. Future research is needed with a larger sample to further validate our results. The study also did not use actual NBRC CSE results, but instead relied on four problems from an NBRC CSE-SAE, which may not reflect the actual NBRC examinations. Last, faculty ratings of student performance are subjective and may be influenced by the amount and nature of faculty-staff interacting, as well as student performance on other measures such as objective examinations.

CONCLUSION

The CTPS instrument demonstrated good internal consistency, based on the calculated values for Cronbach's alpha, as well as acceptable interater reliability. The CTPS also

demonstrated evidence of both content and concurrent validity. We believe that the CTPS may provide a good tool for respiratory care educators to evaluate students' critical thinking and problem solving abilities as they relate to the practice of respiratory care.

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THE RELATIONSHIP BETWEEN GENERAL CRITICAL THINKING ABILITY AND STUDENT PERFORMANCE

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Abstract

PURPOSE: We compared general critical thinking ability (CTA) to performance on a clinical simulation problem (CSP), course and clinical grades and performance on a NBRC self-assessment examination (CRT-SAE) given prior to graduation.
METHOD: Thirty-six first-year students from two area schools were tested using the Watson-Glaser Critical Thinking Appraisal. Grades were collected and an NBRC CRT-SAE administered. CTA was compared to CSP scores, respiratory care course grade point average (R-GPA), clinical course GPA (C-GPA), and CRT-SAE scores using the Pearson Product Moment correlation coefficient. A significant correlation ($p<0.05$) would indicate a relationship between CTA and these variables.
RESULTS: There were moderate, but significant positive correlations between CTA and R-GPA ($r=0.47$; $p=0.004$); C-GPA ($r=0.35$; $p=0.03$); CRT-SAE scores ($r=0.51$; $p=0.001$); and CSP information gathering (IG) ($r=0.54$; $p=0.001$). There was no relationship between CTA and CSP decision making (DM) ($r=0.11$; $p=0.54$). R-GPA and C-GPA correlated with the CRT-SAE ($r=0.65$; $p<0.001$ and $r=0.58$; $p<0.001$, respectively), but had no relationship to CSP scores ($p>0.05$). There also was no relationship between the CRT-SAE and CSP scores ($p>0.05$).
CONCLUSIONS: CTA correlated with student performance as assessed by GPA, CRT-SAE and performance on the IG portion of a CSP. There was no relationship between CTA and CSP DM. General critical thinking ability may be useful in predicting student performance in a respiratory care program.

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General Critical Thinking Ability

Introduction

Critical thinking and problem solving ability continues to be a focus for the allied health and nursing professions.[1-5] Practitioners must have the ability to recognize and solve problems, especially related to patient safety and appropriateness of care. Critical thinking is also of major concern for practitioners with respect to patient assessment and care plan development, and evaluation, monitoring and modification of patient care to optimize patient outcomes.[1,6]

Respiratory care educators recognize the importance of identifying students with good critical thinking and problem solving abilities, as well as encouraging the development of these skills in students as a part of students' planned educational experiences.[1,6-10] The purpose of the study was to compare student's general critical thinking ability (CTA) to performance on a written latent image clinical simulation problem (CSP), respiratory care course and clinical grades achieved over a 12-month period, and performance on a National Board for Respiratory Care (NBRC) certification self-assessment examination (CRT-SAE) given prior to graduation. Specific research questions addressed were:

1. Is there a relationship between respiratory care program grade point average (R-GPA), clinical course grade point average (C-GPA), and critical thinking ability (CTA), as assessed by the Watson-Glaser Critical Thinking Appraisal?
2. Is there a relationship between CTA and CRT-SAE scores?
3. Are there relationships between CTA and CSP information gathering (IG) and decision making (DM) scores?

METHOD

All currently enrolled students (n=36) from two area respiratory care programs were tested using the Watson-Glaser Critical Thinking Appraisal (WGCT) and a written latent image self-assessment clinical simulation problem (CSP) obtained from the NBRC. Respiratory care course (R-GPA) and clinical grades (C-GPA) were collected for a 12-month period and a NBRC certification examination SAE (CRT-SAE) was administered, prior to graduation. One of the schools was based at a university health science center offering the bachelor of science degree in respiratory care (n=12 students). The other program was based at a local community college (n=24 students) offering the associate degree.

The Watson-Glaser Critical Thinking Appraisal is designed to test subject's ability to reason analytically and logically.[11] The Watson-Glaser uses five subtests to assess the subject's ability to make inferences, recognize assumptions, perform deduction and interpret and evaluate arguments.[11] Scores from the subtests are combined to generate an overall critical-thinking score.[11]

Means and standard deviations (SD) were calculated for CTA, R-GPA, C-GPA, CRT-SAE and CSP scores for each of the two schools, as well as all students combined. Pearson-product moment correlation coefficients were then calculated to determine the degree of co-variation between CTA, R-GPA, C-GPA, CRT-SAE, and CSP IG and DM scores. A t-test of the correlation coefficients (r) was calculated to determine if there was a significant ($p<0.05$) relationship between CTA and any of the other variables.

RESULTS

Mean and standard deviation (SD) scores for CTA, R-GPA, C-GPA, CRT-SAE and CSP IG and DM scores are reported in Table 1. The mean (SD) CTA score for all students combined was 48.0 (11.1). The mean (SD) respiratory care course and clinical course GPAs were 3.24 (0.44) and 3.67 (0.32), respectively. The mean (SD) CRT-SAE score for all students combined (n = 36) was 111.7 (9.3). The mean (SD) IG and DM scores were 71.4 (15.6) and 53.6 (36.0).

Table 2 reports the Pearson-product moment correlation coefficients for paired sets of values. There were moderate, but significant positive correlations between CTA and R-GPA ($r=0.47$; $p=0.004$); C-GPA ($r=0.35$; $p=0.03$); CRT-SAE scores ($r=0.51$; $p=0.001$); and CSP IG scores ($r=0.54$; $p=0.001$). There was no relationship between CTA and CSP-DM ($r=0.11$; $p=0.54$). Respiratory care course and clinical GPAs also correlated with the CRT-SAE ($r=0.65$; $p<0.001$ and $r=0.58$; $p<0.001$ respectively), but had no relationship to CSP scores ($p=0.05$). There also was no relationship between the CRT-SAE and CSP scores ($p>0.05$).

DISCUSSION

We found significant relationships between general critical thinking ability, respiratory care program GPA, and clinical course GPA. Consequently, it is reasonable to assert that students with good critical thinking abilities will do well in respiratory care educational programs. There was also a significant relationship between general critical thinking ability and students' performance on the certification SAE, indicating that about 26 percent ($r=0.51$; $r^2=0.26$) of the variance in certification examination scores was attributable to general critical thinking ability. This is consistent with an earlier report by one of the authors that general critical thinking ability significantly correlated with actual NBRC certification examination performance,[12] and a study of baccalaureate degree nursing students in which the WGCT was useful in predicting student performance on the NCLEX.[13]

The earlier study also found a significant relationship between respiratory care program GPA and actual certification examination scores.[12] For our current study, respiratory care program GPA significantly correlated with certification SAE exam results.

Table 1

Mean and Standard Deviation Scores (SD) for Critical Thinking Ability, Respiratory Care Course GPA, Clinical Course GPA, Clinical Simulation Problem Scores and the certification SAE (CRT-SAE) Results.

Group	n	Critical Thinking Ability	Respiratory Care Course GPA	Respiratory Care Clinical Course GPA	CRT-SAE	Clinical Simulation Problem	
						IG	DM
School 1	24	45.9 (10.2)	3.06 (.38)	3.55 (.30)	109.3 (9.0)	70.9 (14.7)	55.4 (33.9)
School 2	12	52.1 (12.1)	3.62 (.27)	3.90 (.24)	116.3 (8.3)	72.3 (17.9)	50.0 (41.1)
Combined	36	48.0 (11.1)	3.24 (.44)	3.67 (.32)	111.7 (9.3)	71.4 (15.6)	53.6 (36.0)

G - Information Gathering Scores on a Written Clinical Simulation Problem
DM - Decision Making Scores on a Written Clinical Simulation Problem

The NBRC clinical simulation examinations (CSE) are widely thought to measure critical thinking and problem solving ability.[1,9,14-15] The clinical simulation examinations generate two scores related to critical thinking ability: information gathering and decision making.[14] The NBRC CSE for registered respiratory therapists is reported to have content- and criterion-related validity [14-16] and good reliability,[17] though the validity and reliability of the CSE have been questioned by some.[18]

In our study, we found a significant correlation between overall critical thinking ability and students information gathering (IG) scores on the CSP. This would support the supposition that at least for IG, there is a relationship between critical thinking ability and clinical problem solving. We could not demonstrate a relationship between R-GPA or C-GPA and CSP scores. There was also no relationship between CTA and CSP-DM scores. These findings are consistent with an earlier report by one of the authors in which there was no relationship between general critical thinking ability and scores on a clinical simulation examination or between entering GPA and scores on a clinical simulation examination.[12] However, in that study, there was a significant relationship between respiratory care program GPA and clinical simulation exam DM scores.[12]

Likely explanations for our inability to demonstrate a relationship between CTA and CSP-DM include the fact that only one sample CSP problem was used. The quality of clinical simulation problems may vary, and for the purpose of scoring overall IG and DM scores for the clinical simulation registry examinations, the NBRC combines the results of 10 different simulations, which should improve the exams reliability. The CSE examination development and review process used by the NBRC for the actual registry examinations may also be more rigorous than that used for the sample CSP used in this study.

It is also likely that the NBRC clinical simulation exams measure constructs that are different from the Watson-Glaser Critical Thinking Appraisal (WGCT). The WGCT

Table 2

Pearson Product Moment Correlations between Critical Thinking Scores, Respiratory Care GPA, Certification SAE (CRT-SAE) Scores, and Performance on a Written CSP (n = 36).

	Respiratory Care GPA	Clinical GPA	CRT-SAE	Clinical Simulation Problem	
				IG	DM
Critical Thinking Ability	.47 (p = .004)*	.35 (p = .03)*	.51 (p= .001)*	.54 (p = .001)*	.11 (p = .54)
Respiratory Care GPA	--	--	.65 (p < .001)*	.12 (p = .48)	-.05 (p = .79)
Clinical GPA	--	--	.58 (p < .001)*	.25 (p = .14)	.07 (p = .68)
Certification SAE	.65 (p < .001)*	.58 (p< .001)*	--	.14 (p = .41)	.06 (p = .74)

IG - Information Gathering
DM - Decision Making

* p<.05

measures general critical thinking ability and WGCT scores do not tend to change with additional professional education.[5,13,19-20] The CSE, however, is more closely related to highly contextual problem solving skills specific to the practice of respiratory care. In another study by one of the authors,[21] clinical simulation examination scores were shown to improve following the use of practice computer simulations, instruction over the content areas covered by the CSE and with instruction on the process of taking a CSE, to include knowledge of how the exams are scored and tips for maximizing exam scores. In that particular study, there were significant relationships between WGCT scores and clinical simulation post-test IG scores ($r=0.55$; $p=0.006$) and DM scores ($r=0.49$; $p.=0.015$).[21] Hill also found a significant relationship between WGCT scores and CSE DM scores in a fairly large study ($n=110$) of graduating respiratory therapy students. It is possible that general critical thinking ability is a relatively innate characteristic, not unlike I.Q. or scholastic aptitude. Problem solving and critical thinking in respiratory care, on the other hand, is highly specialized and requires a sophisticated knowledge base and the ability to apply that knowledge to identify, analyze, and solve clinical problems. Without this knowledge base, students could be expected to perform poorly on CSE's, regardless of general critical thinking ability. Following instruction and experience, however, students with higher general critical thinking skills may be better at solving respiratory care related problems than students with lesser general critical thinking abilities.

Limitations of the current study include the small sample size, the use of an available sample which may not represent the larger population of interest, the use of a single CSP which may not represent the actual CSE used by the NBRC to test candidates for the registry credential, and the use of a certification SAE instead of actual scores on the NBRC certification examination.

CONCLUSION

Critical thinking ability correlated significantly with student performance as assessed by GPA, CRT-SAE, and performance on the IG portion of a CSP. There was no relationship between CTA and CSP DM. We believe that general critical thinking ability may be useful in predicting student performance in a respiratory care educational program.

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DOES NEONATAL EDUCATION GET A FAILING GRADE?

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Abstract

An increasing number of respiratory therapists are exploring careers in pediatric facilities. An integral part of pediatric respiratory care is the Neonatal Resuscitation Program (NRP). To determine the preparedness of the respiratory therapy graduate, respiratory care educational program directors were surveyed regarding the types of programs, the utilization of neonatal resuscitation and the NRP guidelines, and the instructors' levels of certification. The majority of responding programs offered neonatal resuscitation in the pediatric curricula, but only a fraction used the NRP guidelines or offered NRP certificates. The most commonly cited reason for the lack of emphasis on neonatal resuscitation was curriculum time restrictions. Increasing instruction in this subject may be needed to insure that future respiratory care program graduates are prepared for the pediatric environment, as well as the national board examinations.

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Does Neonatal Education Get a Failing Grade?

Introduction

As oxygen technicians evolved into respiratory care professionals over the years, new and varied roles have emerged. As with geriatrics, pulmonary function testing and polysomnography, respiratory therapists have found themselves increasingly involved in the field of pediatrics. There are more than 100 dedicated pediatric tertiary care facilities in the United States.[1] Respiratory therapists treat increasingly large numbers of pediatric patients including newborns, and these patients have a wide range of pulmonary disorders. According to the National Center for Health Statistics, 4,093,000 babies were born in the United States alone in 2003.[2] Amazingly, 90 percent of these babies do not need assistance as they transition from prenatal to neonatal life.[3] The other 10 percent, however, are another story.

The Neonatal Resuscitation Program

The NRP was formed in the mid-1970's as a result of a National Institute of Health (NIH) funding project.[4] The Neonatal Resuscitation Education Program was one of these projects; it focused on educating the staff at Level I nurseries about the resuscitation of newborns. The program recognized that there were differing levels of training and responsibilities within each hospital and focused on a team approach to handle the delivery of training and preparation for neonatal resuscitation. This team approach has long been accepted as essential for successful and effective neonatal resuscitation. According to Dr. James Keenan, former NRP steering committee chairperson, everyone who participates in the resuscitation of newborns should be adequately and thoroughly trained.[5] The team members, whether physicians, neonatal nurse practitioners, registered nurses, or respiratory therapists, must be skilled and well versed in the fundamentals of NRP. The team approach has reduced newborn morbidity, and the presence of experienced and trained personnel promotes prompt identification of common problems associated with the need for resuscitation.[6] Since the NRP's inception, more than 1.5 million professionals worldwide have been trained in accordance with NRP standards.[7]

The NRP and the Respiratory Therapist

As respiratory therapists' roles change, a common question from respiratory therapy students is, "Do I really have to know this?" Educators answer such questions by reviewing the examination matrix published by the National Board for Respiratory Care (NBRC). The matrix is a list of topics and level of difficulty tested by each specific examination. Both the entry-level examination and the advanced-level examination matrices include NRP material.[8] The entry-level examination (Certified Respiratory Therapist) tests the recall and application of NRP requirements, and application of NRP while the advanced-level examination (Registered Respiratory Therapist) tests analysis abilities. Whether students choose to work in pediatric or adult environments, successful completion of at least one of these examinations is required in most states to achieve licensure.

Even if the respiratory therapist chooses an adult patient care environment in which to work, most hospitals include obstetrics among their services. Dr. Keenan emphasized that

for these hospitals, NRP is critical. Receiving a call to the maternity ward or even the emergency room for the resuscitation of a newborn is certainly a possibility during a routine respiratory care shift. Understanding NRP and experience in the techniques of resuscitation may positively impact newborn patients' outcomes and make respiratory therapists more comfortable in such situations.

In addition, many employers are searching for qualified respiratory therapists to fill staff positions. Employers may be more interested in those candidates who are trained in NRP, and managers in pediatric facilities prefer applicants with NRP certification. In addition, managers say they are more likely to hire new graduates if those candidates have had some exposure to the NRP.

Method

The purpose of this study was to determine the prevalence of neonatal resuscitation instruction within respiratory care education programs, to determine how many programs use the NRP guidelines and whether NRP certification was offered. In order to assess these issues, a survey was sent to all respiratory care programs listed on the American Association for Respiratory Care's (AARC) official web site, which listed 357 respiratory care programs in the United States.[9] E-mail was the preferred method of delivery. The program directors were asked to indicate the type of program (bachelor's degree, associate's degree or certificate of completion), program level (entry level or advanced level), and whether a neonatal/pediatric respiratory care course was offered and the text used in such a course. The program directors also were asked to provide the credential levels of the instructors for neonatal/pediatric courses: Neonatal/Pediatric Specialist, NRP certification and/or NRP instructor level. The use of laboratory time for resuscitation skills and the amount of clinical time devoted to neonatal and pediatric respiratory care were also assessed. The original survey is presented in Table 1.

Results

A letter of introduction and a survey were sent to each of the 357 program directors by either postal mail or e-mail. There were 146 responses (41 percent). The majority of the responses were in the form of e-mail. In addition to the 146 responses, three surveyed programs sent a notification that the respiratory care programs had been discontinued within the last year. The respondents represented 41 of 50 states, as well as Washington, D.C. Table 2 summarizes the responses of the program directors.

Of the 146 responses, 20 programs (13.7 percent) offered bachelor's degrees, 119 programs (81.5 percent) offered associate's degrees, six programs (4.1 percent) offered both associate and bachelor degrees and one program (0.7 percent) offered a certificate. The program that offered a certificate of completion required students to have a bachelor's degree prior to acceptance into the respiratory care program.

There were 128 (87.7 percent) advanced-level only (RRT), six (4.1 percent) entry-level only (CRT), and 12 (8.2 percent) programs which offered both entry and advanced levels. All of the bachelor's degree programs offered advanced level only.

All programs surveyed offered pediatric courses. The most frequently cited textbook (50 percent of respondents) was Kent Whitaker's *Comprehensive Perinatal and Pediatric*

Respiratory Care, 3rd edition (Delmar, 2001). In addition, 14.4 percent (21 of 146 programs) utilized the NRP text as a supplement to the pediatric courses.

When asked about the credentials of the neonatal-pediatric course instructor, 51.4 percent of the program directors responded that the instructor held the NBRC Neonatal-Pediatric Specialist (NPS) credential, for a total of 75 of the 146 programs. Seventy five percent of the instructors in bachelor's degree programs held the NPS credential versus 50 percent of instructors in associate's degree programs. Programs offering both entry and advanced levels had the highest percentage of NPS credentialed instructors (92 percent or 11 of the 12 programs in this category). Institutions offering advanced level programs reported that 63 of 128 (49 percent) of the neonatal-pediatric course instructors possessed NPS certification while entry-level programs reported only 1 of 6 (17 percent) instructors possessed NPS certification. With respect to the NRP, 56.8 percent (83 of 146) of program directors indicated that their instructors were NRP certified and 26.7 percent were NRP instructors. Table 1 shows the percentages of the pediatric instructors' credentials and certification.

When asked if neonatal resuscitation is included in the course curricula, 94.5 percent responded in the affirmative. Seven programs (4.8 percent) said it was not, and one respondent (0.7 percent) failed to answer the question. Laboratory time was allowed to

Table 1
Original Survey

1. Name of your Respiratory Therapy Program.
2. Location (city/state).
3. Degree provided by your program.
4. Placement level of your program (entry/advanced).
5. Does your curriculum provide a neonatal/pediatric respiratory care course?
6. What book is utilized in the neonatal/pediatric respiratory care course?
7. Does the instructor of the neonatal/pediatric respiratory care course hold the Neonatal-Pediatric Specialist credential from the National Board for Respiratory Care?
8. Is neonatal resuscitation included as part of the information covered in the neonatal/pediatric respiratory care course?
9. Is the instructor of the neonatal/pediatric respiratory care course certified by the Neonatal Resuscitation Program (NRP)?
10. Is the instructor of the neonatal/pediatric respiratory care course an instructor for the NRP?
11. If the answer to question 10 is yes, does that instructor provide NRP certification for the students who are enrolled in the neonatal/pediatric respiratory care course?
12. Does your program provide laboratory time for the students to practice the skills learned in the neonatal/pediatric respiratory care course?
13. What type of clinical rotation does your program employ for the practical application of the skills learned in the neonatal/pediatric respiratory care course?

Table 2
Summary of Survey Results

Response	Percentage of Respondents
Degree Provided	
Bachelor's Degree	13.7%
Associate Degree	81.5%
Bachelor's and Associate Degree	4.1%
Certificate of Completion	0.7%
Placement Level	
Advanced Level	87.7%
Entry Level	4.1%
Both Advanced and Entry Level	8.2%
Neonatal/Pediatric Course Offered	
Yes	100%
No	0%
Core textbook utilized in the neonatal/pediatric course	
Comprehensive Perinatal and Pediatric Respiratory Care, 3rd Ed. (Whitaker, 2001)	50.0%
Respiratory Care of the Newborn Child, 2nd Ed. (Aloan & Hill, 1997)	18.5%
Perinatal and Pediatric Respiratory Care, 2nd Ed. (Barnhart & Czervinske, 1995)	15.1%
Textbook for Neonatal Resuscitation, 4th Ed. (AHA/AAP, 2000)	14.4%
Other	2.0%
Is the instructor a Neonatal-Pediatric Specialist?	
Yes	51.4%
No	48.6%
Is Neonatal Resuscitation a part of the program curriculum?	
Yes	94.5%
No	4.8%
No Response	0.7%
Is the instructor NRP certified?	
Yes	56.8%
No	43.2%
Is the instructor an NRP instructor?	
Yes	26.7%
No	72.6%
No Response	0.7%
Does the program allow for neonatal/pediatric laboratory time?	
Yes	84.9%
No	14.4%
No Response	0.7%

let students practice the skills they learned in their neonatal/pediatric classes in 84.9 percent of the programs responding. An average of approximately 90 hours of neonatal/pediatric clinical time was allowed in the respondents' programs.

Discussion

This survey indicates that both entry and advanced-level programs provide their students with pediatric and neonatal instruction. It is interesting to note that not all programs provide instruction regarding neonatal resuscitation. A small number of programs provide the NRP certification to the students. One program offered NRP as an elective, one required NRP to be obtained by the students independently, and seven programs provided NRP for their students through their clinical affiliations. Some programs responded that they offered their students the Pediatric Advanced Life Support (PALS) course instead of NRP. While PALS contains a component of NRP, the course focus is not on the newborn. While the respondents realized the importance of NRP, the most frequently cited problem in offering NRP certification was time constraints. Pediatric course work is extensive and classroom, clinical and laboratory times are at a premium in most respiratory care programs. Often, only a small amount of time is available for pediatric skills.

The resources used by each program varied greatly, though the text by Whitaker was the textbook in most common use. Unfortunately, most texts contain only the 1994 NRP guidelines. The NRP updated its guidelines in 2000 and published its *Textbook of Neonatal Resuscitation*, 4th edition in October of that year. One change in the year 2000 was the resuscitation algorithm and a discrepancy in instruction will exist if the most recent NRP textbook is not used as a supplement.

The credentials of instructors of the pediatric courses varied. The Neonatal-Pediatric Specialist (NPS) is a credential offered by the NBRC. The examination for the NPS credential was created in the early 1990s and, to date, more than 7,000 respiratory therapists hold this specialty credential. The examination "objectively measures the essential knowledge, skills and abilities required of respiratory therapists in the neonatal/pediatric arena."[10] More than half of the programs surveyed had instructors who held the NPS credential and over half held the NRP certification. Three respondents commented that completing the NPS examination was their educational goal for the year. The number of pediatric instructors who were NRP instructors was comparatively low.

An important limitation of this study is the fact that with a 41 percent response rate, one can not generalize the findings of the study to the entire population of respiratory care educational programs. No effort was made to compare survey respondents and non-respondents to determine if they were similar.

Conclusion

While the field of pediatric respiratory care is not as large as that of adult respiratory care, it is a rapidly growing area. Many educators are now including neonatal resuscitation in the curriculum, but only slightly more than half of the pediatric instructors were certified in the NRP guidelines. The fact that the NRP is included on both the entry and advanced-level NBRC examinations indicates the importance of

neonatal resuscitation to the practice of respiratory care. Respiratory care curricula and educators should provide for neonatal resuscitation education delivered by instructors certified in the NRP guidelines. This will help provide students with the tools needed to pass both levels of their board examinations and also succeed in the workplace.

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MEASUREMENT OF CHANGES IN LEARNER ATTITUDES TOWARD INTERNET DELIVERED MULTIMEDIA

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Abstract

Background: Students realize the importance of using web-based resources, but attitudes toward online instruction may influence use and acceptance of this medium. Objective: To measure learner attitudes towards using Internet delivered multimedia before and after experiencing an Internet delivered instructional module.
Methods: Students (n=54) were given an instructional media attitudinal survey using a Likert scale to rate 21 statements about web-based instruction. Following a brief web-based instructional module, the survey was repeated. Mean pre and post intervention survey scores were compared using the paired t-test.
Results: Scores for comfort, convenience, effectiveness, eagerness, and fearfulness decreased significantly ($p<.05$) following the intervention.
Conclusion: Students' attitudes toward web-based instruction deteriorated following exposure to this learning medium, but their fearfulness also declined.

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Measurement of Changes in Learner Attitudes

Introduction

Internet–based instruction is a relatively new and rapidly developing educational technology that presents many opportunities and challenges to educators and students. Students have opportunities to find vast amounts of information and interact with their teachers and fellow students outside of the traditional classroom. Students today realize the importance of using web-based resources, including instruction. Students' attitudes toward online instruction are important in influencing the use and acceptance of this medium.

Web-based education has increased dramatically since the mid 1990s. Early computer-assisted instructional materials were primarily text-based, and the integration of text with graphics, video, animation, and sound came later. Advances in technology may allow instructors to communicate greater quantities of information to learners in a manner that improves learning while providing a more efficient use of time.[1] "In 1993 an estimated 12-million-plus Americans regularly used electronic mail. By October 1994, the number of e-mail users was estimated to be more than 27 million."[2]

These advances have supported a paradigm shift from the traditional teacher/learner interaction to learner-centered education, where the learner has access to the informational content in forms that are accessible at the learners' convenience. Internet delivered multimedia supports both synchronous and asynchronous interactions with students. However, this type of innovation does not guarantee participation and acceptance by the learner. Learner attitudes that are negative toward web-based instruction may deter use of this technology. Therefore, awareness of student attitudes toward online learning is critical when developing this type of instruction.[3] Student attitudes may influence the acceptance of this medium and the learning process. Therefore, learners' attitudes should be continuously monitored.[3]

Numerous scales are available to assess students' attitudes toward computer-based education, and many have been developed with the purpose of measuring anxiety and other attitudes toward computers. For example, the Computer Anxiety Index examines negative attitudes toward computers, caution with computers, and disinterest in computers.[4]

The Multimedia Opinion Survey, developed by Perry, who measured student preferences for presentation method. The results demonstrated that students preferred presentations that use multimedia over more traditional presentation methods.[5] The Attitudes Toward Multimedia Classrooms survey, developed by Guan et al. measured students' attitudes toward multimedia classrooms and towards learning in a multimedia classroom.[6] Garcia developed the Multimedia Attitude Survey (MAS) to focus on multimedia technology and multimedia based instruction.[3] The MAS provides educators with a tool to assess learner attitudes toward multimedia-based instruction.[3] This tool has practical applications, such as curriculum modification and assessment of learners' perceptions towards multimedia in order to promote positive outcomes.[3] While students' attitudes may affect learning, the effectiveness of multimedia may also vary with the learner's ability.[7]

"Streaming media technology enables a teacher or trainer to include real-time audio and video within instructional programs posted on web sites."[8] Streaming technology

became available about eight years ago.[9] At that time, files would have to be fully downloaded to the viewer's computer hard drive before viewing could begin. Today, files may take from minutes to hours to download, depending on the file size; however, streaming technology allows the learner to view and listen to presentations as they are downloaded in real time. With streaming technology, the content of the media file begins to flow almost immediately in a continuous stream from the remote server to the learners' computer. The media file may momentarily pause or break up due to heavy Internet traffic or a poor network connection. The content for the streaming technology may be a prerecorded or live presentation.[8]

Synchronous learning requires all learners to access a website to watch and listen to the material at the same time. Asynchronous learning allows the learner to view the prerecorded content material anywhere and anytime.[8]

There are numerous approaches to streaming content for teaching via the Internet. Audio is the simplest type of medium to stream because it requires the least amount of time and technical expertise to produce.[8] Many faculty use Power Point™ slides for lectures and record audio files for viewing static slides. This technique is referred to as illustrated audio and can be as effective as video.[8] Streaming video is another option that combines motion video with audio and is delivered over the Internet in real time from a live or recorded source.[8]

The purpose of this study was to measure learner attitudes toward Internet delivered multimedia, and to examine whether a difference in attitudes occurred after experiencing a brief Internet delivered instructional module.

METHOD

Fifty-four (54) undergraduate and graduate health science students, enrolled in either a statistics or biostatics course at a large state university, were given an instructional media attitudinal survey, and then participated in an Internet delivered media module on the topic of streaming media. Subjects' attitudes towards Internet delivered multimedia instruction were assessed using a pre-test. Subjects then experienced an online Internet multimedia presentation. Following the presentation, subjects were surveyed again (posttest) to determine changes in attitude and perception toward this type of instruction.

The draft instrument/questionnaire was developed following an extensive literature review. The instrument was reviewed by 12 allied health graduate students, three online education researchers and an expert in survey research. After several revisions the final instrument was approved by the researchers (see Appendix A for the post-test version). The instrument was tested for internal consistency using 47 undergraduate allied health students, for which the instrument yielded a Cronbach's alpha reliability coefficient of 0.90. A principle components factor analysis identified four composite variables: "total comfort and convenience score; total effectiveness score; eagerness score; and fearfulness score."

The "total comfort and convenience score" was calculated by summing scores for items 4 and 9 (combined score range 2 to 10) on the instrument. Items 1, 3, 5, 6, 10, 14, 16 and 17 were summed to derive the "total effectiveness score" (combined score range 8 to 40). "Eagerness" was assessed by item 2 (score range 1 to 5) and "fearfulness" by item 8 (score range 1 to 5).

The pretest consisted of three sections. The first section collected demographic information and asked the participants about their computer background. The second section assessed beliefs and values related to Internet delivered multimedia for learning. The third section used open-ended questions and requested participants to identify strengths, weaknesses and the importance of learning using Internet delivered multimedia.

Participants used a 5 point scale (5 = strongly agree, 4 = agree, 2= disagree, and 1 = strongly disagree) to assess attitudes toward Internet delivered multimedia courses with regard to effectiveness, eagerness, convenience, comfort and preference towards Internet delivered courses. The neutral or not applicable score option was removed to create a "forced choice" response.

Questionnaire administration was followed by a brief web-based instructional experience lasting about 15 minutes. The survey was then repeated, and scores were compared using the paired t-test for dependant samples. The instructional module used was an online Internet based multimedia presentation developed by the University of Wisconsin at Madison. The presentation was delivered using streaming audio with Power Point™ slides, also referred to as "illustrated audio." The presentation was located on a web-server and viewed using Realmedia Player Software™.[8] The presentation used streaming media to teach basic concepts about streaming technology for non-technical people. The following streaming media topics were selected for the presentation: Welcome and Introduction; Streaming: Why It's So Cool; and Types of Content for Streaming. The topics were viewed consecutively without interruption in a multimedia classroom.

RESULTS

Most participants were female (75.9 percent), white non-Hispanic students between the ages of 19 and 47, with a mean age of 22.9 years. Most (96 percent) reported feeling comfortable using the computer, 77 percent reported having 5 or more years of computer experience, and 21 percent reported having less than 5 years of experience. Pre- and post-attitudinal scores are shown in Table 1. Total comfort and convenience (p=0.00014), total effectiveness (p=0.0464), eagerness (p=0.0457) and fearful (p=0.0001) scores decreased significantly after the intervention.

Table 1

Mean Pretest and Posttest t-test for the Total Comfort and Convenience, Total Effectiveness, Eagerness and Fearful Scores (SD).

Variable	Pre Test	Post Test	p value
Total Comfort & Convenience Score	8.3 (1.5)	7.0 (1.3)	0.00014
Total Effectiveness Score	26.2 (4.8)	24.6 (4.4)	0.0464
Eagerness	3.6 (1.2)	3.2 (1.3)	0.0457
Fearful	3.6 (1.2)	2.5 (1.3)	0.0001

Total comfort and convenience score range is from 4 (low) to 10 (high)
Total effectiveness score range is from 8 (low) to 40 (high)
Eagerness and fearfulness score ranges are from 1 (low) to 5 (high)

DISCUSSION

The participants in this study were health sciences undergraduate and graduate students enrolled in one of two statistic courses, Statistics for Health Care Professionals or Biostatistics. There were three groups of students: Group 1 included 22 male and female undergraduate students from various ethnic backgrounds; Group 2 included 30 female undergraduate students from various ethnic backgrounds; Group 3 included 18 male and female graduate students from various ethnic backgrounds. The total subject demographic information was 74.6 percent female and 25.4 percent male, between 19 to 48 years of age, although the majority of the students were between 19 and 26 years of age. Students were from various ethnic backgrounds and their demographics closely resembled the university's overall student demographics. The ethnic origin of the total group was 1.6 percent American Indian or Alaskan Native, 4.8 percent African American non-Hispanic, 12.9 percent Hispanic, 1.6 percent Asian or Pacific Islander, and 79 percent Caucasian non-Hispanic.

Students' total comfort and convenience, total effectiveness and eagerness scores declined, indicating the use of Internet based instruction resulted in less enthusiasm for using this medium for instruction. Students' fear of using Internet based instruction also declined significantly.

The use of audio-streamed Power Point™ slides in this study was not well received by the learners. This type of teaching platform was not perceived as convenient, comfortable or effective for the learner. Once the presentation began, the format was not interactive and did not actively engage the learner. However, after experiencing this type of instruction, the student's fear of learning using this platform decreased.

Findings in this study can not be generalized. The quality of instructional media, instructors and instruction vary tremendously. Quality online instructional development requires money and time, and the amount of money and time spent on development does not equal the amount of time spent on delivery.[9,10] In some cases, instructors may not be able to effectively manage more than 10-20 students in an online course.[10] "Hasty, sloppy distance learning courses are not necessarily effective. And competent teachers achieve positive results using almost any vehicle or medium."[10] The key to successful learning is not necessarily in the media, but in the instructional strategy.[9]

Parts of the respiratory care curriculum are suited for online technology integration. For example, online teaching makes it possible to bring subject matter experts from any location directly to the students.[9] Suggestions for the respiratory care curriculum may include web-based presentations and case studies.[9] Unit lectures that are created in a PowerPoint presentation can become accessible on a web site for viewing and reviewing.[9] Internet delivered multimedia may allow students to provide a case presentation to classmates, faculty, and physicians affiliated with the school and those who are at a distance.[9] Web-based course management tools may allow students to retrieve course materials, including syllabi and handouts, directly from the Internet. Computer administered quizzes and exams may be given, and immediate feedback provided, though test security may be an issue. However, web-based instruction is not a panacea. While it seems clear that web-based courses can be as effective as traditional courses, we believe that their use should be reserved for situations where they have clear advantages. These

include providing educational experiences to non-traditional students who could not otherwise attend school due to job, home or other obligations, and providing access to students who geographically are unable to travel to the traditional college campus. Web-enhanced courses, which combine traditional classroom learning activities with web-based resources and learning activities, are very likely here to stay, and instructors will need to integrate this technology into their teaching repertoire.

CONCLUSION

Students' scores for comfort and convenience, effectiveness and eagerness to use Internet-based instruction all declined, indicating that actual use of Internet based instruction resulted in a lower rating of that medium for instruction. Students' fear of Internet based instruction also declined significantly. Our results demonstrate that web-based educational instruction is not always well received by students. Care must be taken to ensure that the quality of instruction using web-based instruction is on-par with that of traditional instruction by devoting sufficient resources to insure good instructional design.

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APPENDIX A
POSTTEST INSTRUMENT

Research #_____ This number is for research purposes only. It will be used to keep track of information. Please use the first four (4) digits of your phone number.

Directions. This study encompasses three parts: participant background, participant beliefs and values, and participant opinions This survey wants to find out your feelings and views about Internet delivered media instruction. Your responses to the statements will be kept strictly confidential. Please take your time and answer the questions by choosing the letter that best represents your opinion or feelings towards each of the statements below, and fill in the appropriate circle on the SWT answer sheet provided with a #2 pencil. (For example, I choose A, fill in the circle A.)

Please write the research number on the SWT answer sheet in the COURSE ID space. The term, "Internet delivered media" is defined as Internet delivered media integrates two or more kinds of media including text, graphic, motion video, still video, voice recognition, animation and sound. (Beckman, 1991)

Part I: My Beliefs and Values
If you strongly agree with the statement select A. If you agree with the statement select B. If you disagree select C. If you strongly disagree select D.

	(A)	(B)	(C)	(D)
1. I believe an Internet delivered media is an effective format for learning.	SA	A	SD	D
2. I am eager to learn through an Internet delivered media.	SA	A	SD	D
3. I believe Internet delivered media instruction enhances the learning process.	SA	A	SD	D
4. I like to learn at times convenient to me.	SA	A	SD	D
5. I believe the Internet delivered media classes are confusing.	SA	A	SD	D
6. I believe Internet delivered media instruction is as effective as lecture instruction.	SA	A	SD	D
7. I enjoy learning through Internet delivered media video.	SA	A	SD	D
8. I am fearful about learning through Internet delivered media.	SA	A	SD	D
9. I prefer Internet delivered media courses, even if there is a short down load time.	SA	A	SD	D
10. I believe it is difficult to learn using an Internet delivered media.	SA	A	SD	D
11. I prefer to take classes that utilize Internet delivered media.	SA	A	SD	D
12. I believe Internet based interaction with my professor is important.	SA	A	SD	D

13. I believe the Internet delivered media classes are more interesting.	SA	A	SD	D
14. I believe Internet delivered media is not an effective method for learning.	SA	A	SD	D
15. I value person-to-person contact.	SA	A	SD	D
16. I value person-to-person contact.	SA	A	SD	D
17. I believe Internet delivered media helps me grasp difficult topics.	SA	A	SD	D
18. I prefer to have an instructor present the course materials.	SA	A	SD	D
19. I believe active student participation is important for learning.	SA	A	SD	D
20. I am excited to learn using Internet delivered media.	SA	A	SD	D
21. I will tell others about courses that use Internet delivered media.	SA	A	SD	D

Part II: My Opinion

22. I believe Internet delivered media is important because…..

23. I believe Internet delivered media is not important because…

24. The strengths of Internet delivered media are:

25. The weaknesses of Internet delivered media are:

26. My years in age _____ (Example: 24) (Exact age is needed for statistical purposes only. Please write your answer on the SWT answer sheet in the TEST FORM space)

Your answers are very valuable for the success of this study. Thank you for agreeing to participate.

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