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Factors that Predict Performance in a Respiratory Care Program

Leonard D. Wittnebel, MSIS, RRT
Douglas L. Murphy, PhD
David L. Vines, MHS, RRT, FAARC

Abstract

BACKGROUND: Our respiratory care baccalaureate program experienced a 47% attrition rate over a five-year period from 2001-2005. The purpose of this study was to examine the relationship between program completion and a set of predictors: proportion of prerequisites completed at a four-year college or university (4P), total proportion of prerequisites completed (TP), prerequisite grade point average (PGPA) and student's age (AGE). **METHODS:** An ex post facto review of records for students admitted - from 2001-2005 was conducted to collect needed information. The sample did not include advanced standing students, students with missing data, and students at a distant education site. All data pertaining to PGPA was obtained from a pre-existing departmental database, and the 4P and TP values were calculated on a 0-1.0 scale based on student transcripts. In addition, descriptive characteristics including age, sex, and ethnicity were collected. Logistic regression analyses were conducted to identify predictors and ascertain their relationship with graduation status. **RESULTS:** Four predictors were entered in stepwise fashion into the logistic regression: (1) PGPA, (2) TP, (3) 4P, and (4) age. This four-predictor model was significant, but neither 4P nor AGE contributed unique explanation of variance. The model was reduced to a two-predictor model (PGPA and TP), which was significant (χ^2(3, N = 102) = 41.97, p < .000), with R^2 = .44. Contrary to expectations, TP was the better predictor of graduation status (R^2 = .40); PGPA added a small but significant increment in explained variance. The model correctly classified graduation status for 83.3% of the sample. However, prediction for those not graduating was not better than chance (53.3%). **CONCLUSIONS**: Based on results, total proportion of prerequisites completed may prove more useful than PGPA when predicting graduation probability for potential admits. Prediction models incorporating age and type of prior institution attended (2-yr vs. 4-yr) was not useful in making admission decisions in our student population. Further research is needed to determine factors contributing to the remaining variance of the sample's graduation success and failure. *Key words: admission variables, GPA, respiratory therapy, student success, attrition, retention.*

Leonard D. Wittnebel, MSIS, RRT
Assistant Professor
Department of Respiratory Care
School of Health Professions
University of Texas Health Science Center at San Antonio
San Antonio, TX USA

Douglas L. Murphy, PhD
Associate Dean
School of Health Professions
University of Texas Health Science Center at San Antonio
San Antonio, TX USA

David L. Vines, MHS, RRT, FAARC
Program Director and Associate Professor
Department of Respiratory Care
College of Health Sciences
Rush University
Chicago, IL USA

Correspondence and Request for Reprints:
Mr. Leonard Wittnebel
Department of Respiratory Care Mail Code 6248, School of Health Professions,
University of Texas Health Science Center,
7703 Floyd Curl Drive, San Antonio, TX 78229.
wittnebel@uthscsa.edu

Factors that Predict Performance in a Respiratory Care Program

Introduction

The Committee for the Accreditation of Respiratory Care Educational Programs (CoARC) maintains an attrition threshold of 30%, by which it holds all accredited programs accountable. If any accredited program's attrition rate exceeds this 30% threshold, CoARC initiates an accreditation dialogue in the form of a Progress Report that is a formal citation of Standard IV.B.1, from the Committee for Allied Health Educational Program guidelines. This standard deals with outcomes assessments such as attrition/retention, graduate satisfaction, national credentialing examination performance, and job placement. The program in question responds with plans for improvements in the identified problem areas. CoARC then reviews the program's response and future outcomes results to determine if there is any improvement, and if the results fall under the thresholds. If the deficient program still fails to meet the thresholds, the program's accreditation status could be adversely affected by moving from a continuing accreditation status to a probationary or possibly non-accredited status, depending on the number, magnitude, and duration of outcomes measures not meeting the minimum thresholds.

The Respiratory Care Bachelor's degree program at the University of Texas Health Science Center at San Antonio (UTHSCSA) experienced an average attrition rate of 47% during a five-year period spanning from 2001-2005. CoARC requires the UTHSCSA Respiratory Care program to submit an annual report depicting attrition rates and other outcomes measures, with a quality improvement plan to address the issue of attrition. Questions arose regarding the role of the then current admissions process in selecting candidates who would succeed in the program. In response to these questions, the minimum prerequisite GPA was recently changed from 2.0 to 2.5, in an effort to matriculate higher academic caliber students.

Attrition can be defined quite simply in scholastic terms as the loss of subjects during the course of study. Institutions of higher education have examined attrition, and conversely retention, since the inception of postsecondary education. Colleges and universities across the nation are being held to a higher degree of accountability, thereby solidifying their interest in admissions and retention studies as a gauge of institutional effectiveness.[1] Attrition rates have averaged roughly 45% over the last hundred years, and graduation rates have been in a steady rate of decline since 1983.[2, 3] This pattern does not bode well for the college students of tomorrow, and does little for the schools in terms of exemplifying their successes.

Countless research has been conducted regarding both two- and four-year schools, examining a wide range of possible explanations for why so many students fail to or are unable to complete their educations. Some researchers have focused the scope of their examinations on characteristics of specific student populations, such as transfer or non-traditional students.[4, 5] Others have hoped to decipher the specific combination of overall student variables, such as race or social standing, which can be used as predictors of success in higher education. Additional researchers have chosen to shine the spotlights of their inquiry on the schools themselves, evaluating the role that institutional characteristics such as faculty involvement and on-campus housing availability play in retention. Regardless the direction of the various research studies, the search for a solution to the attrition process has been conducted with a sense of urgency, especially within the four-year institutions.

Transfer shock is the term applied to the decline in GPA experienced after transfer from a two- to a four-year school, and is significantly associated with increased attrition, either as a result of poor grades leading to academic dismissal, or voluntary withdrawal.[4] Research conducted in this area has reached different conclusions as to the cause and degree of transfer shock experienced, but most examiners agree on its existence. Glass & Harrington, in their examination of 1000 transfer students from North Carolina Community College determined that transfer students did in fact experience a 0.37 point decrease in mean GPA at the end of the first semester at the four-year institution, while comparable native students only experienced a 0.02 point mean GPA decline.[5] However, they also found that the incidence of transfer shock was primarily experienced by students with a transfer GPA of 2.5 or less, and that figures indicate that both transfer and native students that persist to the junior year have a high probability of graduating. This is supported by evidence that community college transfer students have been found to have equal or better performance than native students at the end of the sophomore year, and at the time of graduation.[5] This study focused on overall mean and transfer GPA, but other research has shown that transfer shock varies with discipline, with the greater magnitude being reflected in business and science majors.[6]

Regardless of the presence or absence of transfer shock, social surveys regularly note large differences in degree completion between students beginning their education at a community college and those that start at the four-year colleges, commonly referred to as the baccalaureate gap. Dougherty found that even when controlling for student characteristics, those entering community colleges are 11% to 19% less likely to receive a bachelor's degree than their four-year native counterparts.[4] This was confirmed by Velez when he determined that four-year native students had a 19% higher probability of finishing their degree.[7] This gap can be partially attributed to institutional deficiencies such as infrastructure weakness, as well as additional factors such as transfer credit hour loss, inadequate transfer advice/counseling, and the diminished social and institutional integration frequently experienced at a junior college.[4] Despite this gap in degree attainment, retention rates for both transfer and native students show a decline.[5]

Some researchers have identified the importance of foundation courses, supplemental instruction, and college orientation programs in retaining students, especially those identified as "high-risk". Many students arrive at institutions of higher education with foundational gaps in their educations.[8] Students wishing to pursue a degree in healthcare related disciplines such as Respiratory Therapy or Nursing, often have a poor background in science and mathematics, severely limiting their ability to succeed in the science prerequisite courses needed to complete a professional degree. Beeber & Bierman designed a survey to gauge the effectiveness of a Biology foundations entry level course, designed to prepare students for the more rigorous section courses. They found that 80% of the students surveyed felt that the foundations preparatory course provided them with a background sufficient to succeed in the required full section science courses, but lacked quantitative data to substantiate actual improvements in course grades.[8]

Other examinations have identified deficiencies with foundational courses, and focused solely on the need for supplemental instruction. The major problem noted with foundations courses, as identified by Blanc, DeBuhr, & Martin is:

> The most common means of assessment is the students performance on detail oriented exams, which by their design, encourage rote memory. It is therefore possible for students to achieve higher marks in courses and fail to understand the principle concepts that must be assimilated if they are to retain and utilize the memorized material.[9, p82]

These researchers examined the relationship between academic achievement in high-risk students and supplemental instruction programs. They found that the high-risk students utilizing the supplemental instruction programs experienced significant gains in course grades compared to those students not using the programs ($p<0.05$). Additionally, students taking advantage of the extra instruction exhibited higher retention rates than the students not using the program.[9] Other programs designed to familiarize students with the world of higher education and prepare them academic rigors involved in their pursuits have proven beneficial, as students frequently lack the study habits and knowledge to maneuver through the educational systems that guide many institutions.[1] In the words of the often cited Tinto, "effective programs are those that integrate individuals into the mainstream of the academic and social life of the institution in which they are housed".[2, p692]

With all the varying research and different findings regarding retention, attrition, and predictors of student success, the one universal measure of student ability and academic achievement is the grade point average (*GPA*). It has been shown in at least one study that students with an "A" average had a 34% higher probability of completing their degrees than a "C" student.[7] The GPA is utilized in a variety of ways by institutes of higher education, from measures of aptitude used in admissions decisions to markers of academic progress. GPA has been broken down into several subcategories, depicting high school achievement, core curriculum fulfillment, prerequisite course average, major-specific achievement, and overall academic success. With the widespread use of GPA as a measuring tool, questions have arisen regarding its validity and usefulness.[10, 11]

Researchers have identified discrepancies in the overall GPA measure, and have conducted studies to determine the effect. Differences in grading standards are evident between the faculty, departmental, and institutional levels and these differences contribute to measurement error, diminishing the GPA's reliability. Common perceptions would lead one to believe that an "A" at Harvard is hardly comparable to an "A" at Springfield Community College. Other contributing factors identified included measured differences in performance level and course content over time, and the fact that a student's overall GPA is composed of not only required, but a large number of self-selected courses.[10]

Explanations for the institutional differences in grading standards contributing to the measurement error of GPA have been explained in several ways. The first explanation is the *halo effect*, in which instructor standards are influenced by prior knowledge of an individual's abilities, or lack thereof. Another possible reason for the error is the *adaption level phenomenon*, in which individual performance is judged against the backdrop of the performance of the rest of the class.[10] Dougherty found that community college instructors typically subscribe to the adaption level grading standard more often than university instructors. *Grade inflation*, in which GPAs increase over a period of time without a corresponding increase in academic ability, also contribute to the diminished reliability of GPA as a predictor of success. This is created by students taking minimal course loads to main-

tain higher GPAs than they would otherwise be capable of while taking a full course load.[4] The proliferation of merit based scholarships and minimum university GPA requirements only encourage this behavior.[3]

The reliability and validity of admission tools used in the selection of students for general health profession has also been addressed. Health program admission committees face a unique problem, as Salvatori states:

> Since the admission process is typically very competitive with more applicants than available spaces, it is incumbent upon the committee to select candidates from the total applicant pool who are most likely to succeed, not only as students in the program but also as clinicians in the future. [13, p159]

Healthcare programs have different assessment measures from profession to profession, but most use some form of both cognitive and non-cognitive measures in the selection process. Salvatori conducted a comprehensive review of the measures used in healthcare education programs. The researcher noted that GPA in some form, such as overall GPA or science GPA is typically used in most assessments, and as the literature suggests, it serves to predict academic achievement in various programs.[13] Salvatori makes no mention of the difference in the GPA requirements of various programs, only that the GPA serves as a predictor of success in the didactic components of the programs. In terms of other common measures of success in healthcare education programs, such as clinical performance and licensing examinations, the results of the study branch in different directions. Clinical performance and GPA have correlated in primarily low levels in previous studies, and vary from program to program. In regards to licensing examinations, Salvatori found that pre-admission grades serve to predict performance on board examination, and that the strength of the relationship "may be greater than suggested at first glance".[13] The strength of this relationship was confirmed by Ari, Goodfellow, & Gardenhire in their study examining respiratory care program admission variables including science GPA, non-science GPA, cumulative GPA, and their relationship with mean CRT board exam scores. They found that all three variables demonstrated a significant positive relationship with mean CRT scores ($p<0.01$). This relationship also proved true with similar significance values with the written portion of the RRT examination ($p<0.01$).[14] Overall, Salvatori determined that GPA is in fact the single best predictor of academic success, but that it alone did not account for all of the variance in actual performance. The researcher suggests that the remaining variance could be attributed to non-cognitive traits such as motivation, integrity, work experience, and empathy.[13]

Two plus two Respiratory Care programs created three-year track options in the face of declining enrollments. This option allowed students to enter the program before all of their prerequisites were complete. Students were allowed to finish required prerequisites and take a reduced course load in the program. The effect of this three-year track option on program completion has not been previously reported.

Purpose

The purpose of this study was to determine if there is a significant positive relationship between preadmission academic variables including prerequisite GPA, student age, proportion of prerequisite courses obtained at four-year institutions, total proportion of prerequisite courses completed prior to admission and completion of the Respiratory Care Program at UTHSCSA

during the years from 2001-2005. These issues were examined in order to offer insight for possible future refinement of the admissions process, and to guide future research examinations.

Methods

After obtaining Institutional Review Board approval, an ex post facto review of existing data was conducted by reviewing files for all admits during the years 2001-2005. Information was collected regarding the student's age (AGE), prerequisite GPA (PGPA), proportion of total prerequisites obtained at 4-year universities (4P), and total proportion of prerequisites (TP). PGPA was obtained pre-calculated on the standard 0-4.0 scale and 4P and TP were calculated on a 0-1.0 scale based on information contained in student transcripts. Students already holding the CRT or RRT credential admitted to the advanced standing track, students admitted to a distance education site in Laredo, students still currently enrolled, and students found to have missing data in their files were excluded from the sample. Once the information regarding the variables of interest was collected, it was imported into SPSS statistical analysis software where it underwent a stepwise logistic regression.

Results

The total population of students admitted during the years in question numbered 193 individuals. After excluding students admitted under the advanced standing track (n=12), those students with whose files were found to have missing data (n=37), students admitted to the Laredo extension campus (n=34), and those students who were still currently enrolled (n=8), the remaining population was designated the final research group (n=102). These students as a whole presented with a mean PGPA of 3.07 (= 0.40) with a range from 2.35-4.00. Of these individuals, 95% had a PGPA of 2.50 or higher and 74.8% had a PGPA of 2.8 or higher. The mean student age was 24.4 years (=4.94), with a range from 19-49 years. The mean 4P value was 0.47 (= 0.39), and the mean TP value was determined to be 0.94 (= 0.12) with a range of 0.36-1.00.

In analyzing this data, the initial model (Table 1) utilized was a four variable model based on the variables of interest for this study. This 4 predictor model indicated that age and 4P did not contribute to the explanation of variance in graduation status, however both TP (p<0.01) and PGPA (p<0.05) proved significant. Based on these results, these two significant variables were reduced to a 2 predictor model to ascertain their own contribution to the

Table 1

Four Predictor Model Stepwise Logistic Regression

Variables	B	S.E.	Wald.	df	Sig.
TP	33.184	9.863	11.319	1	0.001
PGPA	1.937	0.791	5.989	1	0.014
AGE	-0.140	0.070	0.042	1	0.837
4P	0.539	0.783	0.474	1	0.491

$X^2 = 42.01$, df = 4, p < .000   * Nagelkerke

Table 2

Two Predictor Model Stepwise Logistic Regression, Version 1

Variables	B	S.E.	Wald.	df	Sig.	R^2*
PGPA	1.944	0.794	5.992	1	0.014	0.072
TP	33.924	9.745	12.119	1	0.000	0.475

X^2 = 41.38, df = 2, p < .000   * Nagelkerke

Table 3

Two Predictor Model Stepwise Logistic Regression, Version 2

Variables	B	S.E.	Wald.	df	Sig.	R^2*
TP	33.924	9.745	12.119	1	0.000	0.406
PGPA	1.944	0.794	5.992	1	0.014	0.475

X^2 = 41.38, df = 2, p < .000   * Nagelkerke

Table 4

Results Classification

Actual Graduation Status	Predicted Graduation Status	
	NO	YES
NO	16	14
YES	3	69

Efficiency (Correct Classification) - 83.3%;
Sensitivity - 95.8%; Specificity - 53.3%
 PVP - 83.1%; PVN - 84.2%

overall variance. The first 2 predictor model (*Table 2)* entered PGPA first and "stepped in" TP. This 2 variable model accounted for 48% of the variance in graduation status. PGPA was entered first primarily due to its prominence in the literature, however to determine the unique contribution of TP, we entered TP first (Table 3) and found that it alone accounted for 41% of the variance in graduation status; PGPA accounted for an additional 7% of the variance. The two predictor model resulted in correct classification (*Table 4*) of 83% of the cases. However, the specificity shows that the model is incorrectly predicting the number of students who are likely to NOT graduate (53%) - no better than chance.

Discussion

   The issue at hand in the present study is the challenge undertaken by respiratory care educators and admission boards to admit students with the best chance of successfully com-

pleting program requirements and going on to become competent, advanced level respiratory care practitioners. Refining the admissions process to meet the challenge is the responsibility of all top-tier educational programs, and healthcare programs in particular are charged with producing graduates capable of meeting the needs of a rapidly aging and soon to be dependent population of patients.

With so many studies demonstrating significant differences in degree attainment between two-year transfer and native four-year school students, there are precious few studies where the entire cohort is made up entirely of transfer students.[4-7] As a result, the true nature of prior college type experience in predicting baccalaureate degree attainment is murky at best, and as a result their persists a common perception that students from four-years schools are more likely to graduate than their community college counterparts.[4-7] In addition, while some studies have been conducted to confirm the validity of prerequisite courses in preparing students for later specialty courses, others have identified deficiencies in the preparatory role prerequisites are intended to play.[8-9] While these studies may prove useful in examining general higher education, no identifiable research has been conducted to determine if there exists a relationship between prerequisite courses and completion of an undergraduate respiratory care program. This study was an attempt to bridge the gap and confirm previously identified predictors of success in relation to respiratory care programs and identify new predictors that can be used to select successful program admits.

Overall, the information revealed in the statistical analysis led the respiratory care program in question to re-think the admissions process. Since the analysis revealed that a high percentage (95%) of admissions already demonstrated a PGPA > 2.5, this leads one to speculate that reasons other than prerequisite course ineptitude were responsible for program attrition. This PGPA value becomes even more noteworthy when you weigh it against the fact that the mean TP value was 0.94. Essentially what this amounts to is questioning the validity of the PGPA as the primary academic yardstick when <100% of prerequisite courses are complete, as these missing courses would serve to either bolster or hamper the overall PGPA. The fact that in this analysis TP served as a better predictor of success than PGPA leads one to further speculate that a student with a PGPA of 2.5 and 100% completed prerequisites may in fact be of equal caliber or a better admit than a student with a PGPA of 3.0 and only 80% completed prerequisites. Further research should be conducted with a more homogenous sample to confirm these findings, as the researchers recognize that the potential for confounding variables is high in this retrospective analysis. Since this model fails to predict who is likely not to graduate, other potential variables including external commitment, institutional and social integration, and changes in program structure, as well as others identified in the introduction may be to blame for students lost to attrition.[2,3,10,12,13]

The results of this study may prove beneficial to respiratory care educators in several ways. Because there is a significant relationship between not only PGPA and graduation but also TP and graduation, programs may benefit by altering their stance on early admission policy or delayed educational track programs, as well as raising their minimum PGPA requirements to matriculate higher academic caliber students. While 2+2 programs in particular have cohorts comprised entirely of transfer students from varying types of institutions, this is likely not as important as the status of the student's foundational course background. Delayed educational track or three-year track programs may prove more beneficial as remedi-

ary options for struggling students or as flexible education tracks for non-traditional students with higher levels of external commitments, as opposed to the option for students needing to concurrently complete prerequisite courses.

Limitations

The difficulties in achieving sample homogeneity inherent in a retrospective analysis prevented a more equitable sample group and forced the researchers to work under several assumptions, which also serve as limitations to the study: 1.There is a directly proportional relationship between student age and level of external commitment, 2. There were no differences between students admitted to either the two- or three-year education track and 3.Eliminating individuals with missing variables from the data set would not significantly alter the outcome. As a result of these limitations, the results of this study are limited to the specific program in question. A longitudinal analysis of future program admits is needed to confirm these results.

Summary

Student achievement in the form of successful program completion is essential for the needs of the student, the program, patient populations and the healthcare workforce. This outcome is based initially on the selection of qualified applicants during the admissions process. Respiratory Care educational programs must have an adaptive, comprehensive method of isolating the best candidates and retention strategies for seeing them through to program completion and their entrance into the healthcare workforce.

References

1. Monroe, A. Non-traditional transfer student attrition. Community College Enterprise. 2006; 12(2):33-47.
2. Tinto, V. Limits of theory and practice in student attrition. The Journal of Higher Education, 1982; 53(6): 687-700.
3. Grove, W., & Wasserman, T. The life-cycle pattern of collegiate GPA: Longitudinal cohort analysis and grade inflation. Journal of Economic Education 2004; 35(2): 162-174.
4. Dougherty, K. Community colleges and baccalaureate attainment. The Journal of Higher Education 1992; 63(2): 188-214.
5. Glass Jr, J. & Harrington, A. Academic performance of community college transfer students and native students at a large state university. Community College Journal of Research and Practice 2002; 26(5): 415-430.
6. Cejda, B. An examination of transfer shock in academic disciplines. Community College Journal of Research and Practice 1997; 21(3): 279-291.
7. Velez, W Finishing College: The effects of college type. Sociology of Education 1985; 58(3): 191-200.
8. Beeber, C. & Bierman, C. Building successes out of at-risk students: The role of a biology foundations course. American Biology Teacher 2007; 69(4): 48-53.
9. Blanc, R., DeBuhr, L., & Martin, D. Breaking the attrition cycle. Journal of Higher Education 1983; 54(1): 80-90.
10. Young, J. Grade adjustment methods. Review of Educational Research 1993; 63(2): 151-165.
11. Bacon, D. & Bean, B. GPA in research studies: An invaluable but neglected opportunity. Journal of Marketing Education 2006; 28(1): 35-42.
12. Stricker, L. Adjusting college grade point average criteria for variations in grading standards: A comparison of methods. Journal of Applied Psychology 1994; 79(2): 178-183.
13. Salvatori, P. Reliability and validity of admissions tools used to select students for the health professions. Advances in Health Sciences Education 2001; 6: 159-175.
14. Ari, A, Goodfellow, L, & Gardenhire, D. Admission criteria as predictors of student performance on the national board for respiratory care examinations. Respiratory Care Education Annual 2008; 17: 1-6.
15. Report of Current Status for an Education Program for the Respiratory Therapist-Advanced. University of Texas Health Science Center at San Antonio. 2005.

The Need for Preceptor Training According to Respiratory Therapy Managers

Kathy Jones-Boggs Rye, EdD, RRT
Erna L. Boone, MEd, RRT

Abstract

Background: There is a growing acceptance of the use of volunteer clinical preceptors to provide clinical instruction to respiratory therapy (RT) students. However, RT preceptors have frequently been asked to serve as preceptors without the benefit of adequate training. This study seeks to identify the training needs of clinical preceptor as perceived by their departmental managers. **Methods:** RT department managers were asked via electronic mail to complete a Web-based survey. **Results:** Participants included 24 managers from across the Unites States at a variety of institutions including public, private, academic, and pediatric. According to managers, 33 percent of current preceptors received no training prior to supervising students. Seventy-nine percent of the participants believed there was a need for a standardized preceptor training program. **Conclusions:** Results of the survey indicated RT managers' perceived needs for standardized training and their level of support for staff that participate in training. Barriers to preceptor training and the preferred delivery methods for the training were also identified. To address these issues, more attention should be given to the development and implementation of a standardized preceptor training program.

Key Words: Preceptors, Respiratory Therapy Education; Preceptor Training, Clinical Education

Kathy Jones-Boggs Rye, EdD, RRT,
Associate Professor
University of Arkansas for Medical Sciences
College of Health Related Professions
Little Rock, AR

Erna L. Boone, MEd, RRT,
Associate Professor
University of Arkansas for Medical Sciences
College of Health Related Professions
Little Rock, AR

Correspondence and Request for Reprints:
Kathy Jones-Boggs Rye, EdD, RRT
University of Arkansas for Medical Sciences
College of Health Related Professions
Department of Respiratory & Surgical Technologies
4301 W. Markham St., Slot 737
Little Rock, AR 72205-7199

Phone: 501 526-4495
Fax: 501 526-4491
E-mail: ryekathyj@uams.edu

The Need for Preceptor Training According to Respiratory Therapy Managers

Introduction

There is a growing shortage of qualified respiratory therapists (RTs) in the United States (US).[1,2,3] The 2005 AARC Human Resource Survey reported that there are roughly 132,000 RTs in the US with vacancy rates of almost nine percent.[2] Furthermore, varying enrollments of students in RT programs and that the average therapist plans to remain in the profession for another 14.6 years are indications that the shortages are not likely to be resolved in the near future.[2,3] Acute care hospitals currently have a vacancy rate of more than 11,000 FTEs while there are only about 4,500 new graduate therapists per year.[2] Shortages are predicted to increase through 2030.[1] Therefore, it will be necessary for RT department managers to "focus a significant amount of time and attention on the 'care and feeding' of their existing professional therapy staff while attempting to recruit and assimilate new therapists into clinical competence" (pg 42).[4]

RT students need ample supervised clinical experiences with opportunities to perform patient care skills, to validate theory and knowledge, and acquire abilities that can only be acquired through clinical practice.[5] Furthermore, an irrelevant clinical experience or orientation or both can lead to student disillusionment about their chosen profession.[6] We believe that the utilization of qualified preceptors is pivotal in preparing respiratory students to be competent respiratory therapists.

To adequately address the learning needs of RT students, more attention needs to be given to the development and implementation of a standardized preceptor training program. The availability of trained preceptors is an important component in the professional development of new RT graduates and preceptor training is a long-range strategy for recruitment and retention that will serve to strengthen the practice of respiratory therapy. The purpose of this study was to determine the RT department managers' perception(s) of the need for a national preceptor training program for respiratory therapists (RTs). Thus, RT department managers across the country were surveyed using an instrument that was designed to assess respondent attitudes about preceptor training. The study addressed the following research questions: 1) Is there a need for a national preceptor training program for RTs? 2) What content should be included? 3) What are the barriers? 4) What are the preferred delivery methods?

Methods

In 2008, randomly selected Program Directors (PDs) from accredited respiratory care educational programs listed on the Committee on Accreditation for Respiratory Care (Co ARC) website were surveyed.[7] These PDs were asked to voluntarily provide the researchers with the names and email addresses of three to four RT department managers that were affiliated with their programs. The survey instrument (see Appendix) was adapted from Rye and Boone's previous study of PDs. Finally, a draft of the revised instrument was reviewed by a panel of three registered respiratory therapists for content and face validity. Following their review, the instrument was again revised based on panel recommendations. The Institutional Review Board of the University of Arkansas for Medical Sciences also approved the project.

An invitation to participate in the study was electronically mailed to 161 managers in RT departments. Ten of the managers recommended by PDs were not able to be reached

because the invitation to participate was undeliverable to the email address provided. Instructions were provided in the email about how to access the appropriate website and a password was assigned. Participants were advised that they were free to refrain from answering particular questions or to withdraw from the study at any time. The web-based survey was delivered to participants using the Perception software. Identifying factors were not requested or used. Managers were informed that demographic data would be used for descriptive reporting purposes and for training program development purposes. The population for the study consisted of 151 managers.

Findings

Approximately 16% (24 of 151) of managers returned the surveys. There were no participants in the study from 28 of the 50 states (see Figure 1). Fifteen of those states have between one (1) and three (3) RT programs currently in existence and one state, Alaska, has no program. Two-thirds (16/24) of the respondents were from not-for-profit institutions. Seven of those institutions were identified as academic, five were public, five were private, and one was a governmental, federally funded institution. An additional four participants indicated that their institutions were classified as predominantly pediatric providers. Managers further described their institution's location as: urban (75%), suburban (20.8%), or small town (4.1%).

Fifty percent of managers reported that preceptors are chosen in their institution based on willingness to volunteer (n=5), level of education (n=4), or number of years with the organization (n=3). The remaining managers (n=12) identified other reasons for their selection of preceptors which included the employee's: ability to work effectively with students or guests, their communication skills, clinical competence, and enthusiasm for the assignment.

The majority (66.6%) of managers indicated that each preceptor is assigned to work with no more than two students at a time. In fact, 25% (6/24) of the managers reported a one-to-one student- to-preceptor ratio. However, some indicated that preceptors must work

Figure 1. Location of Respondents by State.
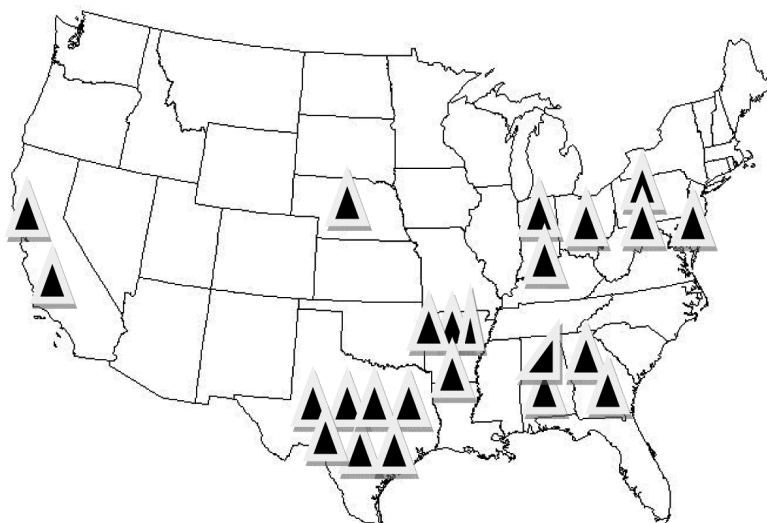
with three (25% of respondents) or four (8.3% of respondents) students at a time in the clinical setting. According to respondents, almost 80% (19/24) of preceptors were full-time staff members. Only 16.7% (4/24) of the respondents reported that the clinical instruction of RT students was provided by paid clinical faculty of the educational program. Only one manager reported that a combination of both regular staff members and paid clinical instructors provide clinical instruction in their institution.

While 62.5% (15/24) of these managers reported that clinical instructors or preceptors receive some type of training prior to receiving students, over one-third of the participants indicated that no training was provided. The training that was provided was described as "on-the job training" by 33% of the respondents. According to these managers, over one-half (56.3%) of the preceptor training was being provided by the institution (4/16) or by the department (5/16) itself, while only 43.7% (7/16) of the training was being provided by the educational programs affiliated with the institution. The length of preceptor training varied from two to sixteen hours with a mean of 6 hours (S.D. 3.91).

Almost 80% (19/24) of participants responded that they believe a need does exist for a standardized preceptor training program for RTs who are providing clinical instruction for students. While 75% (18/24) of managers rated the importance of such a program positively (> 6 on a Scale of 1 to 10), it was interesting to note that 33% (8/24) of respondents rated the importance as most important by choosing a rating of 10. As a group, the respondents estimated on average about 13 staff members would require preceptor training each year.

The most important preceptor training needs identified by managers included: providing effective evaluation and feedback of clinical performance, developing resources to provide preceptor training, developing communication skills, roles and responsibilities of the effective preceptor, and principles of adult learning. Resources in this item were defined as having the time, money, and staffing to provide effective interactions between preceptors and learners. Other training needs rated at a lesser degree of importance included: curriculum development, understanding institutional or regulatory requirements, maintaining clinical competency, promoting critical thinking skills, providing remediation to struggling learners, and professionalism.

Almost 80% (19/24) of the participants reported that they had experienced barrier(s) to providing preceptor training to staff. A total of 46 responses were collected. The top three barriers perceived by RT managers to providing preceptor training were a lack of resources (n=17), staffing versus workload issues (n=12), and getting RTs to commit to the training (n=8). Resources included the constructs of both dollars and time. Other barriers that were identified included a lack of an appropriate curriculum (n=4), a lack of qualified preceptors (n=2), and a perceived lack of educational program involvement (n=1).

Participants were asked to rate the effectiveness of a variety of delivery methods to achieve their training needs on a scale of 1 to 10 with 1 being not very effective and 10 being very effective. The survey revealed the mean rating of the various delivery methods (Figure 2). Furthermore, managers ranked the same face-to face formats of workshops or the classroom as more desirable methods to provide the training that would achieve the needs of clinical preceptors in their institutions. Respondents ranked the formats with 1 as most desirable and 6 as least desirable or the type of training that preceptors would be less likely to attend because of their personal learning preferences.

Figure 2. Median Ratings of Effectiveness of Delivery Methods: 10 as Very Effective to 1 as Not Very Effective.
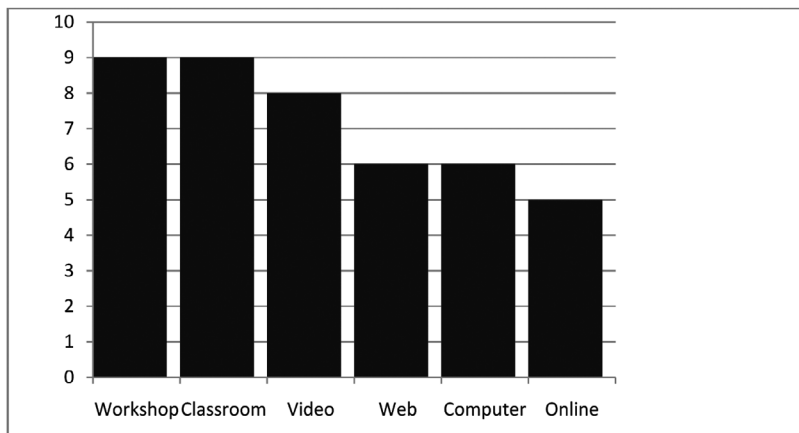
Two-thirds (16/24) of respondents indicated that they believe RTs in their areas would seek preceptor training. Ninety-two percent (92%) of managers conveyed that they would support preceptor training in various degrees to include granting of continuing education requirements (n=16), paid time off to attend a workshop (n=15), payment of registration fees (n=15), or the use of institutional technology to complete a course (n=10). Sixty-three percent (15/24) of managers indicated that a one day (8 hours) training program would be optimal. Four other managers would support a two day (16 hours) program and three other managers would support a one-half day (four hours) program. Two managers gave no response. Almost one-half (11/24) of managers indicated that a reasonable fee for a preceptor training program would cost between $10 and $20 per credit hour. However, one respondent felt that the training should be provided as a service of the educational program and another felt that it was a service responsibility of the employer since much of it is institution specific.

Discussion

Qualified preceptors play an important role as "coach, effective listener, evaluator, creative tutor, at times confessor; a prototypical guide and primarily a talent evaluator and developer" for students enrolled in a clinical rotation.[4] Furthermore, the preceptor is a role model who exemplifies desired and acceptable professional behaviors. Billay and Yonge (2004) identified attributes that preceptors should possess including: being a facilitator, having good communication skills, and being knowledgeable about their field of expertise.[8] Indeed, respondents in this study demonstrated that they do recognize the importance of selecting therapists with the appropriate knowledge, skills, and attitudes to precept in their own departments. It is further posited that the preceptor needs to understand the principles of adult education.[4,8] Similarly, managers in this study rated adult learning theory as a training need in their departments. With the preceptor being an integral part of student training, the importance of a standardized program for preceptors cannot be over emphasized.

The literature clearly describes the benefits of teaming experienced health care professionals with learners to both the professionals and the learners themselves.[4,9-11] Hospitals that have a preceptor

program have reported a greater degree of integration of new hires with existing personnel, improved quality of patient care, increased job satisfaction among both new hires and existing employees, reduced orientation time for new employees, as well as the development of new leaders from experienced employees.[4] Indeed, the Ohrling & Hallberg (2001) study reveals that the use of preceptors reduces the risk of nursing students feeling helpless and empowers them in their learning at the bedside.[9] The literature also demonstrates that a preceptor promotes socialization of students and helps them with integrating into the health care profession.[4,9-11]

Preceptor training is an important component in the professional development of new RT graduates and a long-range strategy for strengthening the practice of respiratory therapy. The Inaugural Clinical Preceptor Training Program, sponsored by the AARC was offered to an unexpectedly large group of enthusiastic, experienced and knowledgeable RTs just prior to the AARC Summer Forum 2008. The 156 RTs who attended the program consisted of department managers, current staff preceptors or clinical instructors, those desiring to become clinical preceptors or instructors, and respiratory care educational program faculty. As a result of this first program being so well received, the AARC Education Section's Ad Hoc Committee for Preceptor Training now realizes the potential that this type of program holds for development of individual therapists as clinical preceptors.[12]

Certifying instructors to teach the current face-to-face program, solidifying commitment and support for the program from all stakeholders, and developing a comprehensive plan for the distribution and evaluation of the program will be essential steps for the success and further advancement of the present initiative. Once the program is fully developed and the curriculum validated, it could be offered through partnerships between any health care institution and educational program.[7] The Ad Hoc Committee's Work Group has committed to investigating the feasibility of an electronic format of preceptor training since many participants in the initial training program had requested this mode of delivery.

Several RT department managers that responded to this survey expressed concern about finding qualified preceptors who are willing to serve as mentors in assisting students or orientees in becoming future professionals. We believe these managers are hungry to have "enthusiastic employees participate as preceptors in a comprehensive training program that will help improve clinical quality and retention rates for newly hired respiratory therapists."[4] According to Schmitt, "It is time that our profession unites and assumes responsibility for the development of successful clinicians" who have the appropriate skills to precept.[13] Currently many RTs practicing full time and providing clinical instruction to students at the same time have few resources available for developing the much needed preceptor qualifications.

While the 16% return rate of the survey without repeated mailings is a limitation of this study's results, we believe that the study findings are an important addition to the body of knowledge currently available on this topic. Further analysis of whether the responders to this survey differed from the non-responders in type of institution, location, and other demographics would be beneficial. Further investigation is definitely needed.

Conclusion

An investigation of preceptor practices in RT departments across the country showed that the understanding, curriculum and implementation of the concept varied considerably between in-

stitutions. Accordingly, there were evident gaps in the type and length of preceptor training currently being offered. Barriers to preceptor training were experienced by nearly 80% of respondents with the primary barrier being the lack of resources (time and money) to conduct such a program.

To address the learning needs of RT students, more attention needs to be given to the development and implementation of a preceptor training program that is standardized and easily accessible so as not to deplete the already scarce departmental resources. Indeed, there is likely value to working directly with the RT department managers as well as educational programs to invest in making the clinical preceptor training curriculum readily available to RTs. An outstanding clinical preceptor program has the potential to address the looming staffing shortages through increased recruitment and retention while improving the quality of patient care and integrating new employees into the RT department. Furthermore, a preceptor program that provides the opportunity for the educational programs and clinical departments to collaborate would improve the quality of the partnership as well as the quality of healthcare provided to patients.

References
1. Ewart GW, Marcus L, Gaba M, Bradner RH, Medina JL & Chandler EB. The critical care medicine crisis: A a call for federal action: A white paper from the critical care professional societies. Chest 2004;125:1518-1521
2. Dubbs B. By the numbers: Results from the AARC's 2005 human resources study. AARC Times 2006; April: 37-43.
3. Mathews P, Drumheller L & Carlow, JJ. Respiratory care manpower issues. Crit Care Med 2006; 34(3): 32-45.
4. Wheeler D. Preceptor programs for respiratory therapy: When in doubt try kindness and compassion. Focus J 2007; Nov/Dec: 42-43.
5. Freiburger OA. A tribute to clinical preceptors: Developing a preceptor program for nursing students. J Nurses Staff Dev 2001; 17 (6):320-27.
6. Peirce AG. Preceptorial students' view of their clinical experience. J Nurs Educ 1991; 30 (6):244-50.
7. Rye KJ & Boone EL. Respiratory care clinical education: A needs assessment for preceptor training. Resp Care 2009; 54(7):868-877.
8. Billay DB & Yonge O. Contributing to the theory development of preceptorship. Nurs Educ Today 2004; 24:566-74.
9. Ohrling K & Hallberg IR. The meaning of preceptorship: Nurses' lived experience of being a preceptor. J Adv Nurs 2001; 33(4): 530-40.
10. Hayes EF. Factors that facilitate or hinder mentoring in the nurse practitioner preceptor / student relationship. Clin Excell Nurse Pract 2001; 5 (2):111-18.
11. Bain L. Preceptorship: A review of the literature. J Adv Nurs 1996; 24: 104-07.
12. Sorbello J. Communications via electronic mail, August 18 & December 11, 2008.
13. Schmitt T. Preceptor training programs: It's time for standardization. Advance for RCPs 2007; 20(9):8

APPENDIX
Respiratory Therapy Preceptor Training Needs Assessment

Part 1: Demographics

1. Type of institution (choose all that apply):
   _____ Private
   _____ Public
   _____ Not for Profit
   _____ Academic
   _____ Governmental / Federally Funded
   _____ Pediatric

2. Local of institution (state): _____

3. Location of institution:
   _____ Urban
   _____ Suburban
   _____ Small town
   _____ Rural

4. How do you choose people to be clinical preceptors?
   _____ Number of years at institution
   _____ Level of education
   _____ Sign-up sheet/volunteer
   _____ Other (Be specific): _____

5. What is the maximum number of students receiving clinical instruction per instructor/preceptor (*i.*e. maximum student: instructor ratio in any clinical setting)?

Part 2: Preceptor Training Needs

1. Who directly supervises the clinical instruction of respiratory therapy students in your institution (Choose all that apply.)
   a. Paid Regular Staff Members
      1) Full Time
      2) Part-time
   b. Paid Clinical Instructors
      1) Full Time
      2) Part-time
   c. Volunteer Clinical Preceptors
   d. Please explain if a combination of the above is used.
   e. Other; please explain:

2.   Do clinical instructors/preceptors receive any type of training prior to receiving students?
    a. Yes
    b. No

3. Please describe the type of training they receive.

4. How much time is required to receive the training that they receive prior to receiving students?
    a. 2 hours or less
    b. 4 hours
    c. 8 hours
    d. 16 hours
    e. Not Applicable

5. Who delivers that training?
    a. Institutional personnel
    b. Educational program personnel
    c. Departmental personnel
    d. Not applicable

6. Is the training designed to meet the specific needs of respiratory care clinical preceptors?
    a. Yes
    b. No
    c. Not Applicable

7. I believe there is a need for a standardized preceptor training program for respiratory therapists.
    _____ Yes
    _____ No
    _____ Uncertain
    If no, thank you for completing this survey. You may submit your survey now.

8.   Please rate the importance of having a preceptor training program available for use by your institution.

Not Very Important			Somewhat Important			Very Important		
2	3	4	5	6	7	8	9	10

9. Please estimate the number of clinical preceptors who would need training each year to meet the needs of your institution: _____

10. What are the 3 most important preceptor training needs at your institution?
    a.
    b.
    c.

11. What are the 3 most important barriers to conducting successful preceptor training at your institution?
    a.
    b.
    c.

12. Please rate the effectiveness of each of the following methods of delivery to achieve the training needs of clinical preceptors in your institution.

	Not Very Effective			Somewhat Effective				Very Effective		
Classroom	1	2	3	4	5	6	7	8	9	10
Video	1	2	3	4	5	6	7	8	9	10
Online	1	2	3	4	5	6	7	8	9	10
Workshops	1	2	3	4	5	6	7	8	9	10
Computer Based Training	1	2	3	4	5	6	7	8	9	10
Web Conferencing	1	2	3	4	5	6	7	8	9	10

13. Please rank the preferred delivery methods in the order you feel would be most effective to achieve the training needs of clinical preceptors in your institution from 1 (most desirable) to 6 (least desirable).
    _____Classroom
    _____ Video
    _____ Online
    _____ Workshops
    _____ Computer Based Training
    _____Web Conferencing

14. I believe preceptor therapists in my area would seek preceptor training.

Strongly Disagree		Disagree			Neutral		Agree	Strongly Agree	
1	2	3	4	5	6	7	8	9	10

15. In which of the following ways would you, as a department manager, support preceptor training and development? (Indicate all that apply.)
    a. Paid time off to attend a workshop.
    b. Payment of registration fees.
    c. Use of institutional technology to complete a course.
    d. Continuing education credits (CEC)
    e. Other

16. I believe the optimal length of a preceptor training program is:
    a. ½ day (4 hours)
    b. 1 day (8 hours)
    c. 2 days (16 hours)

17. Do the practitioners who act as clinical preceptors in your area receive any type of reward from their employer(s) (i.e. career ladder opportunities, additional, pay, CEUs, etc.)?
    a. Yes
    b. No
    c. Uncertain

18. I believe the preceptor training program should ultimately lead to certification for the clinical preceptor.

Strongly Disagree		Disagree			Neutral		Agree	Strongly Agree	
1	2	3	4	5	6	7	8	9	10

19. What do you think a reasonable fee for delivering the equivalent of a 4-hour Preceptor Training Program that was fully approved for CEU credit would be in your area? Please write a dollar value per preceptor trained in the space provided.

THE ROLE OF THE RESPIRATORY THERAPIST IN PLANNING, IMPLEMENTING, AND EVALUATING A STATEWIDE TOBACCO SURVIVORSHIP NETWORK

Lawrence Bryant, PhD, RRT, MPH, BSW
Lynda T. Goodfellow, EdD, RRT, FAARC
Arzu Ari, PhD, RRT, CPFT

Abstract

Background: Respiratory therapists can play a vital role in mobilizing the community to educate young people on the hazards of tobacco use. Empowering survivors, students, community partners, and educators to collectively communicate these hazards may play a significant role in tobacco control advocacy efforts. The purpose of this paper is to discuss the role of the respiratory therapist in the planning, implementation and evaluation of a tobacco survivors network (TSN). **Methods:** Area community based organizations agreed to attend a focus group in August 2008 to discuss strategies for recruiting survivors for a one-day training to help establish a tobacco survivors network in the state of Georgia. This focus group provided recommendations and suggestions that laid the ground work for the formation of a survivors network. **Results:** Follow up surveys revealed that after the training participants had an increased awareness of the tobacco problem in Georgia. As a result, when asked if they thought differently about tobacco control, 92% of respondents noted that they did. Eleven respondents signed up to be part of our speaker's bureau, four of whom were cancer survivors. **Conclusion:** The formation of a Tobacco Survivors Network can lay the ground-work for both survivors and students to advocate for tobacco control and help prevent the initiation of smoking among youth. *Key words: survivor, respiratory therapy, tobacco prevention, advocacy, training, planning.*

Lawrence Bryant, PhD, RRT, MPH, BSW
Assistant Professor
Division of Respiratory Therapy
School of health Professions
Georgia State University
Atlanta, GA USA

Lynda T. Goodfellow, EdD, RRT, FAARC
Associate Professor and Director
Division of Respiratory Therapy
School of health Professions
Georgia State University
Atlanta, GA USA

Arzu Ari, PhD, RRT, CPFT
Assistant Professor
Division of Respiratory Therapy
School of health Professions
Georgia State University
Atlanta, GA USA

Correspondence and Request for Reprints:
Dr. Lawrence Bryant
Division of Respiratory Therapy,
School of Health Professions,
Georgia State University,
P.O. Box 4019
ccslob@langate.gsu.edu

The Role of the Respiratory Therapist in Planning, Implementing, and Evaluating a Statewide Tobacco Survivorship Network

Introduction

Lung cancer is a principal cause of deaths for both males and females in the United States.[1-3] In Georgia, lung cancer accounts for 75% of all smoking-related cancer deaths.[3] According to the American Cancer Society, 10,000 Georgians die every year from tobacco-related illnesses.[3] The cost and impact of lung cancer on the state's already fragile economy is staggering. Lung cancer was responsible for $1.8 billion in healthcare costs among adults 18 and older and $3.4 billion in lost productivity costs among adults 35 and older.[3] Tobacco use among youth has been implicated as a leading cause of death in Georgia.[1-3]

Approximately 23,000 (6%) middle school students and 81,000 (19%) high school students in Georgia smoke cigarettes.[1] Among high school students, one in five boys and nearly one in six girls are smokers. Additionally, about 18,000 (70%) middle school smokers and 41,000 (56%) high school smokers live with a smoker.[3]

In an effort to decrease smoking related cancer cases among Georgians, the state Department of Human Resources (DHR) has attempted to involve survivors in their advocacy efforts. The DHR strategy has been to increase the use of survivor services for persons with tobacco related pulmonary diseases and cancers. By involving survivors families, friends, healthcare providers, and lay caregivers, the DHR hopes to encourage survivors to act on their experience and share with youth the viscerally evident perils of tobacco use. The goal is heightened community awareness. To that end, within the DHR, the Comprehensive Cancer Control Program (CCCP) has collaborated with the Tobacco use Prevention and Cessation Program (TPCP) to implement a *Tobacco Survivor Initiative* which consists of three phases: (1) Recruitment of cancer survivors; (2) Training cancer survivors to tell their stories; and (3) Advocacy for increased cigarette taxation. The overall mission of DHR's Comprehensive Cancer Control Program and their Tobacco Use Prevention and Cessation Program is to reduce the use of tobacco and the economic and humanitarian burden placed on the state.

To address these objectives, a southern university's school of respiratory therapy was awarded funding by the DHR to establish a state tobacco survivors network. Through this initiative, survivors were recruited and trained on how to conduct speeches and presentations with youth in Georgia middle schools. North Carolina's Survivors and Victims of Empowerment (SAVE) played a very important role in the training. SAVE is a non-profit grassroots tobacco advocacy group whose success in establishing a statewide tobacco survivors network in North Carolina is well known and respected by DHR officials.[4-5] SAVE's sole purpose continues to be bringing the voices of tobacco survivors to tobacco use prevention education and policy forums in North Carolina.[4-5] The respiratory therapy program located at this southern university has taken the initiative in establishing a similar network in Georgia.[6]

A review of the literature reveals that respiratory therapists have been providing stronger leadership in the war on tobacco, by confronting the causes of lung disease.[15] The RT faculty involved in this project were responsible for planning all logistics and presenta-

tions pertaining to the one-day training of survivors. Initially, this began with recruiting survivors, community partners, and respiratory therapy students for participation in the training. Next, project leaders identified and created a database of organizations in the Metro Atlanta area with similar interests in tobacco control. A website was built for hosting all project related activities, and the project entitled *"Tobacco Survivors Network"* was created.[6] The purpose of this paper is to relate from our experience how respiratory educators can plan, implement, and evaluate programs that feature survivors of tobacco related illness in advocacy.

Methods

Local organizations involved in tobacco control and prevention, as well as members of S.A.V.E. were contacted and informed of the Tobacco Survivor Network's goals and objectives. Without exception, these organizations agreed to attend a focus group in August 2008 to share their experiences in tobacco control efforts in Georgia and to discuss strategies for recruiting survivors and members of the tobacco control community to attend a one-day training session. Researchers in social marketing theory have proposed that survivors stories are highly effective in conveying the negative consequences of tobacco use to youth.[7-8] Another study argues that focus groups are a powerful method for gathering information and exchanging ideas that work towards solving a particular problem.[9] The following community organizations contributed to this focus group: (1) The American Cancer Society, (2) The Lung Cancer Alliance, (3) S.A.V.E., (4) The Department of Health and Human Resources (DHR), (5) Georgia State University, Respiratory Therapy (program faculty and student advocates), (6) Saint Joseph's Health Care of Atlanta, and (7) The Tobacco Survivor Network of Georgia staff (project managers and principal investigator).

The following recommendations were brought forth from the focus group analysis and served as a foundation for the establishment of the survivor network and subsequent October 4 training. These recommendations included:

1. S.A.V.E. suggested implementing some programmatic strategies that would provide for the foundation of the network. These strategies focused on involving a variety of individuals who have been highly affected by tobacco use to tell their stories. This includes survivors impacted by diseases such as emphysema, heart attacks, lung cancer, and laryngectomies from laryngeal or mouth cancer, to advocate for tobacco use prevention, cessation, and policy change. As emphasized by S.A.V.E., research suggests that involving survivors in advocacy that relate to their particular disease is empowering.[3-10-13]
2. Individuals from the different groups wanted to participate in a panel discussion at the October 4 training and to take input from the audience during this session.
3. The group recommended that the term *survivors* include others indirectly impacted by smoking; including survivor family members and friends.[14]
4. It was suggested that a follow-up training for newly recruited survivors be held after October 2008.

All of the recommendations from the October 4 training session were carefully considered for inclusion in the Tobacco Survivor Network future framework. Overall, this focus group provided a great opportunity to meet with potential stakeholders for the first time, to es-

tablish a collective rapport, to develop lines for future communication, and to set the structure for future network goals and objectives.

The goal of the Tobacco Survivor Network is simply to prevent tobacco use by youth of all ages by linking survivors with schools and community centers to conduct presentations. To this aim, the objectives for this project were: (1) to recruit survivors as volunteers, (2) to attentively train these individuals, (3) to create a web-based center for volunteers and constituents, and (4) to evaluate the one-day training session and the project as a whole. These objectives are discussed in more detail in the following pages.

1. Participant recruitment

This objective consisted of recruiting persons diagnosed with tobacco-related cancers and other pulmonary diseases caused by smoking, along with their nuclear families and friends, to participate in the workshops and training. Respiratory therapy students were involved in the planning and execution of this process.[15] Participants were recruited through the following methods:

    a. Dissemination of invitation flyers by the project team.
    b. Mailings sent to prospective survivors using the St. Joseph's Health Care of Atlanta Cancer Survivor network mailing list.
    c. Organizers engaged in an active word of mouth campaign.

Participants interested in attending the training were asked to register on the newly developed network web-site. Registered individuals received a confirmation of their reservation. Seventy people signed up to attend this workshop, fifty one actually attended. In follow-up communications, some registrants stated that they were unable to attend because of state travel restrictions imposed by their remote location in the state. Others did not attend for personal reasons. Eleven individuals signed up for the speaker's bureau, six of whom were actual cancer survivors. The remaining participants were student advocates.

2. Program Training

This phase included a day-long training session for tobacco-related survivors and our community partners. The training was held in October 4, 2008 at the Emory University Conference Center in Atlanta. Survivors, their family members, friends, public health administrators, and students were trained on how to conduct speeches and presentations to youth in primary and secondary public and private schools, as well as with community-based organizations serving young people.

During the initial focus group, S.A.V.E. members were instrumental in suggesting activities that would enhance the learning experiences of participants. Contributors from S.A.V.E. discussed their project in North Carolina, and reviewed their program activities, accomplishments, and challenges in establishing a survivors network. The training was emotionally engaging from the start—six cancer survivors from their project who had had laryngectomies shared powerful stories of living with lung and throat cancer. They discussed how telling their stories helped prevent the initiation of significant numbers of cases of smoking in their state's middle schools.[5] Some survivors utilized voice boxes as a method of communication. S.A.V.E. members then discussed the ways in which victims of tobacco related illness could contribute significantly to policy change. Giving impactful presentations, the American Cancer Society (ACS) and The Department of Human Services representatives (DHR) also emphasized the role of survivors as advocates.

Grant money was used to facilitate this event and to buy supplies and handouts for participants. The details and logistics for the training workshop were handled by the project team members. Their tasks included finding a secure training location, arranging for meals, developing contracts with presenters and the conference center, securing audio/visual needs for presenters, and obtaining additional materials needed for the training. The team recorded all the logistical data, including key speaking points and potential speaker's information. Both a summary of the workshop content and contact information was placed on the website.

3. Project Website

The collective efforts of the team resulted in the formation of a new volunteer website, which is housed at our respiratory therapy school. This webpage consists of a link for community members to contact our project with survivor speaker requests. Speakers can then be contacted by our staff through phone or e-mail to conduct presentations to youth throughout the state of Georgia. Additionally, this website includes educational material, information, and links related to tobacco control and advocacy in general. The Tobacco Survivor Network of Georgia is currently pursuing additional funding to enhance our website and to pay survivors for their travel expenses.

4. Project Evaluation

Evaluation of this initiative was based on two criteria, (1) feedback from the focus group and (2) evaluations filled out by participants after the October 4 training. The final sections of this paper use these two criteria to assess our progress and to discuss our project's contribution to tobacco-use prevention in youth.

Results

Based on the focus group feedback and on the survivor post training evaluations, preliminary successes have been realized. Three respiratory therapy student advocates applied for and received mini-grants to make presentations at area middle schools. These presentations were initiated by school administrators. The students will continue to make future presentations when they are available. Further evaluation of the project objectives reveal that students and survivors had an increased awareness of Georgia's tobacco problem after attending the training. This finding was reflected in the post-training evaluations. For example, when asked if they thought differently about tobacco control after the training, 92% noted that their knowledge of tobacco issue had increased. One participant commented: *"Listening to the survivors stories really made an impact on me, it added an emotional tag."* Relevant themes from the post training evaluation showed that as a result of this increased awareness, participants wanted to become more involved in the fight against tobacco use in Georgia. Fifty one survivors, family members, respiratory students, and friends of survivors were trained as volunteers (table 1), of this number, eleven participants signed up for our speaker's bureau; four of these were actual cancer survivors. Research suggests that having survivors who have been impacted by tobacco tell their stories may be a highly effective and empowering coping strategy. Those with lung cancer, cancer of the larynx, and those with laryngectomies from laryngeal or mouth cancer may be highly effective advocates for tobacco use prevention.[10] The following comments reflect the sentiment of many participants: *"I want to be*

more active with the issue of tobacco control"; and "*This problem is very serious in our society*". Of particular significance is the fact that 80% of participants stated they felt that a strong Tobacco Survivors Network is needed in Georgia.[16] Fifteen participants stated that they would like to become actively involved in helping stem smoking through our network or through their own personal efforts.

Discussion

Overall, the goals and objectives of the initial phases of the Tobacco Survivors Network have been completed. Approximately fifty one survivors, family members, respiratory students, and friends of survivors were trained as volunteers (table 1). Eleven people signed up for the speaker's bureau, four of these were actual cancer survivors, the other seven were students interested in participating in our advocacy efforts. Several of these trained students and survivors have already made presentations at area middle schools. Post survey results indicated that the students had an increased knowledge of the hazards of tobacco use. Our newly developed website is active and has greatly assisted our project in communicating strategies for tobacco use prevention to educators in Georgia middle schools. Additionally, we are providing technical assistance and continuous training as well as providing a resource center for survivor network activities.

Recruitment and retention of a significant number of cancer survivors has been challeng-

Table 1

Breakdown of Participants (n-51)

Classification	Number	Percentage
Tobacco survivors	8	16
Students	23	46
Health care professionals	12	24
Family members	4	8
Not identified	3	6

ing. Many survivors were contacted but could not attend the training because of health reasons, doctor's appointments, or financial considerations. One survivor had a recurrence of his lung cancer. Associated costs prevented many of the health promotion coordinators who would be utilizing our services from attending the training. Additionally, because of resource limitations, it is difficult to assess the impact of the website in promoting our goals at this time.

Conclusion

These establishing phases have laid the groundwork for making a significant contribution in preventing deaths in Georgia from lung cancer and related illnesses caused by tobacco. We wish to express our appreciation in this report for the commitment, enthusiasm, and laudable efforts of our survivors and community partners in making this survivors network a success thus far. These committed people through the Tobacco Survivor Network have laid a solid foundation for addressing the overall mission of the State's Tobacco Use Prevention Program; that is, to reduce the use of tobacco and the burden it causes from related illness and disease in Georgia.

Future efforts for our project include enhancement to our website content to include

links to other community resources and organizations that provide cessation services. Additionally, the TSN has been given additional funding to promote increase participation in Georgia's tobacco quit line, especially among the state's youth and at-risk populations. Freshman respiratory therapy students are recruited yearly during school orientation to participate in TSN advocacy activities. These efforts promote increased student involvement, community engagement and facilitate continued collaboration with our partners in fighting the onset of tobacco use in the state of Georgia.

References

1. Cancer Prevention & Early Detection, Facts & Figures. 2008. American Cancer Society Web site 2009. Available at :http://www.cancer.org/downloads/STT/CPED_2008.pdf. Accessed February 10, 2009.

2. Centers for Disease control. DC. Healthy Youth. 9 February 2008. 9 February 2009 http://www.cdc.gov/HealthyYouth/tobacco/index.htm.

3. Georgia Data Summary. August 2008. 09 February 2009. Accessed February 10, 2009 http://health.state.ga.us/pdfs/epi/cdiee/CDIEE%20Data%20Summaries%202007/2007_Tobacco_Data_Summary.pdf.

4. Survivors and Victims of Tobacco Empowerment. Website. Available at: www.tobaccosurvivors.org/

5. Mathew M, Goldstein A, Hampton K. Survivors of tobacco-related diseases and advocacy for tobacco control. [Internet]. Available at http://TC.BMJJOURNALS.COM/MISC/OFORA/LICENCE.PDF

6. Letting Our Voices Empower Us. Website. 2008. Available at: http://chhs.gsu.edu/rt/loveu.asp

7. Pechmann C, Reibling, E. Planning an effective anti-smoking mass media campaign targeting adolescents. *Public Health management* Practice. 2000: 80-94.

8. Fitzgerald C, Rozett R, Gravious Renee, O'Connell M, Dubrow R. Smoking habits of students entering college. *Respiratory Care Educational Annual*, 2007; 16: 13-19.

9. Kitzinger J, Qualitative Research: Introducing focus groups. BMJ medical publication web site. 1995: 311: 299-302.

10. Goldman L, & Glantz S. Evaluation of anti-smoking advertising campaigns . *Journal of American Medical association.* 1998: 772-777.

11. Crogan N, Evans B, Bendel R. Storytelling intervention for patients with cancer: Part 1 pilot testing. *Oncology Nursing Forum*, 2008; 35: 257-264.

12. Gray R. Persons with cancer speak out: Reflections on an important trend in Canadian health care. *Palliat Care*, 1992; 8: 30-37

13. Crogan N, Evans B, Bendel R. Storytelling intervention for patients with cancer: Part 2 pilot testing. Oncology Nursing Forum, 2008; 35: 265-272.

14. Cueva Melany, Kuhnley R, Nanier A. Digman M. Story: The heartbeat of learning cancer education for Alaska Community healthcare providers. Convergence, 2006; 39: 80-90.

15. Wolf J, The art of teaching: What every respiratory therapist needs to know. AARC Times. 2005; 29: 36-48.

16. Centers for Disease Control and Prevention. Guidelines for school health programs to prevent tobacco use and addiction. MMWR Morbidity Morbid Mortal Wkly Rep 1994; 43:1-18.

COMPARISON OF PBL AND SIMULATION EDUCATIONAL METHODS FOR THE ACQUISITION OF MEDICAL KNOWLEDGE

Peggy W. Murphy, PhD
Kacia Engle, MD
Lainie J. Jorns, MD
Christopher P. Herrington, MD
LeShonda M. Lindsey, MA

Abstract

Background: Medical-related curricula often incorporate a variety of small group teaching methods such as simulation and problem-based learning (PBL). Both of these methods offer unique opportunities for acquiring medical knowledge. The purpose of this study was to determine which method simulation or problem- based learning is the most effective method for teaching students about organophosphate poisoning.

Methods: Two groups of students were presented the same case on organophosphate poisoning utilizing either simulation or problem-based learning as the instructional method. Students were given a pretest and posttest to measure the amount of knowledge gained after instruction. A self-satisfaction survey was used to address learner approval in order to determine the most preferred method for acquiring new material.

Data/Results: A total of 113 fourth- year medical students were divided into two groups according to simulation or problem-based learning (PBL) methods of instruction. The simulator group had a significantly higher average posttest score than the PBL group ($p<0.01$). Eighty-six percent of students in the simulation group agreed or strongly agreed that simulation was a superior method for learning new material as opposed to 71% in the PBL group who agreed or strongly agreed that PBL was the superior method for learning new material.

Conclusion: Medical-related programs want to provide the best instruction possible for training future health care professionals. For fourth-year medical students, simulation learning was better than problem-based learning for the acquisition of knowledge regarding organophosphate poisoning.

KEY WORDS: problem-based learning; simulation; clinical knowledge; organophosphate poisoning; small group teaching; medical school curricula

Kacia Engle, MD
Emergency Physicians, P.A.
Edina, Minnesota

Christopher P. Herrington, MD
Tulane University Hospital
New Orleans, Louisiana

Lainie J. Jorns, MD
Louisiana State University Health Science
Center
Shreveport, Louisiana

LeShonda M. Lindsey, MA
Louisiana State University Health Sciences
Shreveport, Louisiana

Correspondence and Request for Reprints:
Peggy W. Murphy, PhD
Louisiana State University Health Sciences
Center-Shreveport
School of Medicine
Dean's Office
1501 Kings Highway
Shreveport, Louisiana 71133-3932
Phone: 318-675-6570
Fax: 318-675-5244
E-mail: pmurph@lsuhsc.edu

Comparison of PBL and Simulation Educational Methods for the Acquisition of Medical Knowledge

Introduction

The administration and faculty at Louisiana State University Health Sciences Center in Shreveport (LSUHSC-S) conducted a self-study of the educational program and determined a need for change in direction of the medical school's education process. The instructional methods would focus on self-directed and independent learning incorporated into an integrative curriculum. Teaching strategies were designed to include smaller group discussions, problem-based learning, and simulation. These methods were adopted by the Medical Curriculum Council (MCC) for inclusion in the new curriculum.

Under the new curriculum, small group learning and independent study are incorporated throughout the first two years of medical school and in a fourth year clinical teaching and training course. Several small group sessions incorporate problem-based learning (PBL). Kinkade suggests that although PBL is widely used in US medical schools its use in the curriculum is limited.[1] The limited use maybe due to the fact that PBL is labor intensive and has not been show to yield better outcomes. PBL is mainly used for selected topics, educational experiences in elective courses or small group problem-solving interactions. In some instructional situations, learning occurs while trying to solve complex problems. In PBL, students are given real world problems to tackle and gain new knowledge and skills in their attempt to solve them. Distlehortst reports that PBL is often viewed as a generic approach to solving a patient problem.[2] To provide a more formal definition, PBL is a method of instruction which emphasizes clinical cases either real or hypothetical, small discussion groups with a scripted scenario, verbal cues and oral feedback provided by the instructor, collaborative independent study, hypothetico-deductive reasoning and a style faculty direction that focuses on group process instead of instructor imparted knowledge.[3, 4] Sessions are designed to examine all the possibilities while eliminating choices based on evidence in order to reach a differential diagnosis. Patient simulators are widely used throughout the curriculum for teaching and assessment. Uses of simulation models are becoming more common in the medical education.[5] Simulation provides a learner with a focused, non-threatening environment[3]. Patient simulators have realistic clinical features as they look and mirror physiological and pharmacological human responses.[5] Potential advantages of simulation training over traditional training methods include a safe environment for both patient and student during training, the ability to provide immediate feedback and the opportunity to repeat performance.[6]

To support interactive learning, the LSU Health Sciences Center's Simulation Center is designed to aid in the student's education of difficult skills and techniques through the use of simulated scenarios. The Center is utilized by medical and allied health students, along with residents in pediatrics, anesthesia, emergency medicine, and general surgery. The Center is equipped with various adult and pediatric simulation models. The wireless METI simulator, iStan[7] (Medical Technologies Incorporated, 102 Cattlemen Road, Sarasota, Florida 34232) is the primary simulator or model used by students. SimCube, a recording system, is used for electronic data storage[8] (B-line medical for Simcubes, 1300 19th Street, NW, Suite 100, Washington, D.C., 20036). Simulation can be easily integrated into school curriculum, efficiently and cost effectively.[9]

With increased use of simulation for teaching and evaluation, a need was identified to ascertain whether simulation was an adequate, if not a better, teaching method to obtain information. The objective of this study was to compare problem-based learning to simulation and determine which method is more effective for acquiring medical knowledge.

Methods

Data for this study were collected from 113 fourth year medical students rotating thru a clinical. The Fourth Year Academic Clinical and Teaching Training Selective (FACTTS) is a monthly course which is a compilation of essential knowledge and skills that faculty and students felt needed to be revisited prior to becoming an intern. The monthly course has four main objectives designed to provide more instruction and evaluation regarding: (1) advanced physical diagnostic skills, (2) patient education and communication skills, (3) statistics and critical appraisal of the literature and (4) how to teach. Each small group is limited to fifteen students and the course is taught eight times throughout the fourth year of medical school.

For a particular clinical knowledge case, the fourth year students were randomly divided into two groups over a period of eighteen months from August 2007 to November 2008. The two groups were presented the same case on organophosphate poisoning utilizing two different teaching methods. The first group was educated utilizing a PBL case. The second group was educated utilizing a simulation-based case. The first group, (PBL) was led by two emergency medicine residents while the second group, (simulation) was led by two interns. All preceptors were instructed by emergency medicine physicians who developed the case. The two interns were trained separately by experienced faculty and METI consultants on the use of the simulators.

Three days prior to the instructional sessions, the students were given a pretest to evaluate their baseline knowledge on the case and a posttest and student satisfaction survey were given fourteen days following the sessions. The pretest contained 31 multiple choice items which reflected a variety of medical content areas including organophosphate poisoning. The additional questions not related to organophosphate were included to prevent the students from knowing the subject of the case based on the pretest prior to the simulation or PBL sessions. As students worked through the case it was clear that the pretest had not provided hints to a differential diagnosis for the case. The posttest only contained the 17 organophosphate questions which appeared on the pretest.

The satisfaction survey contained 9 questions related to learning method preference. Students were given the same survey. Questions were answered based on the assigned case study group, PBL or simulator. Respondents did not answer questions outside of their assigned instructional method. Responses were calculated according to group assignment.

A case dealing with organophosphate poisoning was selected for this study due to the nature of medical cases associated with poisoning which have nonspecific signs and symptoms. These types of patients are often difficult to treat in the emergency department. A case with nonspecific signs and symptoms enables the development a broadened differential diagnosis. The range of symptoms challenged the two groups of students to create an extensive differential diagnosis and provided an opportunity to discuss with the preceptor each diagnosis as it pertains to the case.

During the problem-based learning session, the students led by a single preceptor, were presented information about the case using a single six page handout. The students were directed through each section of the handout and allowed time to discuss the information given in each section. These sections consisted of: initial symptoms, vital signs, physical examination; changes in symptoms, vital signs, and physical examination over time and the last section was laboratory test results. Students were given two questions about the case and encouraged to answer the questions themselves. The students were able to collaborate with other students to progress through the case and develop a differential diagnosis. Once a diagnosis was achieved, the students were led through a set of questions and answers which discussed the pathophysiology of the case.

During the simulator presentation, the students were introduced to the patient by a preceptor. The case was simulated using a full- bodied, adult size METI simulator[6] in a simulated emergency department room equipped with monitors to assess vital signs. The simulator was operated by a computer technologist located in an adjoining room. The technologist controlled the voice of the simulator and the simulator's responses during the real-time scenario using a physiologically based computer program designed by METI. The case itself was created by an internal medicine physician and fourth year medical student, familiar with the teaching case, and they tailored the responses of the simulator to replicate the signs and symptoms of the patient. The students, participating as interns in the emergency department, were then given the presenting chief complaint of the patient by the preceptor and allowed to take a pertinent history and perform a physical examination, order diagnostic tests, provide treatment, and witness the patient's response during a real-time case scenario. The students were allowed to review any tests ordered and ask pertinent questions regarding the patient. Once a diagnosis was reached during the real-time scenario, the students were led through a series of questions and formulated their answers concerning the symptoms, diagnostics and treatment of the case. Student answers were confirmed by the preceptor.

Results

A total of 113 seniors were randomly divided into two groups according to two methods of instruction, PBL and Simulator. There were 58 and 55 students in the PBL and Simulator groups respectively. The objective was to determine if there is a significant difference between the two methods on learning (as indicated by a significant difference between their average posttest scores). The students were scored on a pretest and a posttest. A non-significant difference in the average pretest score and a significant difference in average posttest score between the PBL and Simulator groups would possibly indicate that the method where students had a higher average posttest score is the most effective method. The Wilcoxon ranked-sum test was used to compare the two groups on their average pretest and posttest scores.

Table 1 gives descriptive statistics (mean ±standard deviation) for the PBL and Simulator groups and comparisons between the two groups on their average pretest and posttest scores. There was no significant difference between the PBL and Simulator groups on their average pretest scores indicating similarity between the two groups before they took the posttest. The Simulator group had a significantly higher average posttest score than the PBL group.

Table 1

Comparisons between PBL andSimulator Groups
Mean±Standard Deviation

Variable	Paper	Simulator	p-value
Pretest score	9.97 ± 2.21 (N=58)	10.55 ± 2.30 (N=55)	0.23
Posttest score	10.84 ±2.26 (N=57)	12.80± 2.05 (N=54)	<0.01

We can thus conclude that there was significantly greater learning for the Simulator group than the PBL group.

After comparing responses between the simulator group and the PBL group, eighty-six percent of the students in the Simulator group reported that simulation was an effective method for the instruction of new material as compared to 71% of the students in the PBL group who reported that PBL was an effective method. Both groups preferred small group learning using PBL or simulation in contrast to traditional lecture format.

Discussion

PBL and simulation can promote interactive learning in a small group setting and encourage application and synthesis of clinical knowledge.[3] In both groups, the students found difficulty in developing a main diagnosis due to the wide range of diagnoses that can be developed upon clinical presentation. Therefore, selecting the most effective teaching method for acquiring clinical knowledge is paramount to student learning. The overall results of this study demonstrate that students performed better using simulation for acquiring knowledge of clinical information when compared to PBL.

For simulation, faculty reported that students were engaged in the case longer when the students performed the hands-on activities in a realistic patient environment. Conditions for effective learning may reflect how the students relied more on the simulator or monitors to provide feedback instead of the faculty preceptor. The equipment and monitors which detailed the physiologic changes and physical examination findings offered visual, auditory, and tactile learning.[3] The students were also able to converse with the patient, observe the patient's appearances, monitor vital signs, and administer medications, oxygen, and other treatment based on patient response. This experience provided critical thinking and active learning while allowing the students to practice skills in a supportive environment.[9,10] Students were able to openly discuss symptoms, reach a differential diagnosis and detail the course of treatment without a fear of failure.

The immediate feedback based on patient response allowed the students to make decisions quickly and forced them to respond in real-time which is similar to the action that will be expected as a physician. The simulator case facilitated the student's ability to incorporate his or her general medical knowledge into a more focused diagnosis and treatment plan. Addi-

tionally, the ambiguous nature of the case actively engaged the student to focus on critical information and symptoms by generating a feeling of uncertainty. The apprehension that is provoked with this decision making most likely resembles real-time medical decision making and allowed the student to understand the importance of his or her actions. Hands-on practice of assessing patient symptoms, analyzing the history and findings on physical examination allowed students to reach a differential diagnosis. This fundamental process will assist the student in his or her transition from student to physician and ultimately lead to better patient care outcome.

Problem-based learning is used as an interactive educational methodology and has widespread use in medical school curriculums. Kinkade reports 70% of licensed medical schools in the United States incorporate PBL into their curriculums.[1] Kaufman, et.al states, clinical problem-based learning is used in place of lecture-based learning to improve understanding and retention of material, to overcome student passivity and to encourage student scientific reasoning.[11] The PBL method challenges students to think, reflect and vocalize without a patient involved. However, in PBL, the method is more instructor dependent especially for preparation of the case, student guidance and feedback. PBL has been shown to impart clinical knowledge and improve clinical performance when compared with traditional didactic lecture.[2,3] Although PBL is favorable for learning, in this study, simulation proved to be the superior method.

While students seem to appreciate both methods of small group learning, simulation students responded more positively to the learner-centered, hands-on approach for learning new material. The ability to mimic a clinical situation provided more excitement and experience for the simulation students.

Conclusion

This study focused on the better method for the acquisition of knowledge using PBL and simulation related to organophosphate poisoning. For fourth-year medical students, simulation methodology was more effective for learning clinical knowledge about organophosphate poisoning than PBL. Authors imply that these results can be applied to medical content in other health care professions. Since this study only examined the two teaching methodologies for knowledge, further study will include assessing clinical skills after instruction from PBL and simulation. The diagnosis and treatment of a poisoning case using a standardized patient to determine the transfer of knowledge to clinical skill ability is planned.

Editor's note: Although this study was conducted using medical students, the study's results may be informative to respiratory care educators or to motivate investigators to explore these methods of instruction using respiratory care students.

References

1.   Kinkade S. A snapshot of the status of problem-based learning in U.S. medical schools, 2003-04. Academic Medicine 2005;80:300-301.
2.   Distlehorst L, Dawson E, Robbs R, Barrows H. Problem-based learning outcomes: The glass half-full. Academic Medicine 2005;80:294-299.
3.   Steadman R, Coates W, Huang Y, Matevosian R, Larmon, B, McCullough L, et al. Simulation-based training is superior to problem-based learning for the acquisition of critical assessment and management skills. Critical Care Medicine 2006;34:151-157.
4.   Vernon T, Blake R. Does problem-based learning work? A meta-analysis of evaluative research. Academic Medicine 1993;68:550-563.
5.   Good M. Patient simulation for training basic and advanced clinical skills. Medical Education. 2003;37:S14-S21.
6.   Available from www.meti.com Medical Technologies, Inc. 102 Cattlemen Road Sarasota, Florida 34232, USA.
7.   Available from http://www.blinemedical.com B-line medical for Simcubes. 1300 19th Street, NW, Suite 100, Washington, D.C., 20036, USA.
8.   Grenvik A, Schaefer J. Medical simulation training coming of age. Critical Care Medicine. 2004;32:2549-2550.
9.   Gordon J, Oriol N, Cooper J. Bringing good teaching cases "to life": A simulator-based medical education service. Academic Medicine 2004;79:23-27.
10. Gordon J, Wilkerson W, Shaffer DW, Armstrong E. "Practicing" medicine without risk: Students' and educators' responses to high-fidelity patient simulation. Academic Medicine 2001;76:469-472.
11. Kaufman A, Mennin S, Waterman R, Duban S, Hansbarger C, Silverblatt H, et al. The New Mexico experiment: Educational innovation and institutional change. Academic Medicine 1989;64:285-294.

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