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Volume 9 Spring 2000

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Frequency with which Staff Respiratory Therapists Perform Selected Entry Level Tasks

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Abstract

Our survey investigated how frequently staff respiratory therapists performed 25 tasks specified on the National Board for Respiratory Care (NBRC) Entry Level Examination. Of 503 potential participants who identified themselves as "staff therapists," 217 (43.1%) returned surveys. Of the 25 tasks included on the survey, 19 (76%) had been performed by 50% or more of the staff therapists within the past month. One task showed a significant difference in frequency based on geographic location. Eight tasks were positively correlated with bed size; two were negatively correlated. There was a significant correlation between length of professional experience and frequency of performance for six tasks. Based on this survey and a previous survey (Van Scoder, Cullen, Johnson, & Nyhuis, 1999), it was concluded that the entry level examination content is more representative of the staff therapist job than the NBRC Written Registry Examination content.

Frequency with which Staff Respiratory Therapists Perform Selected Entry Level Tasks

Over the last 50 years, there has been a virtual explosion in the knowledge and technical skills necessary for safe and competent practice of respiratory care. Educators struggle to include in each program's curriculum the essential skills and characteristics needed for clinical practice. In 1993, the Pew Health Professions Commission recommended acquiring more broadly applicable competencies rather than a very narrow set of occupational skills (O'Neil, 1993).

Again in 1995, the Pew Commission called for allied health professionals with "qualities of a superb generalist, capable of comprehensive management of care, as opposed to the current orientation toward specialization" (O'Neil, 1995, p. 17). However, there is continuing pressure for respiratory therapists to maintain competence in an ever-growing number of clinical skills.

Recently, many professions, including medicine, nursing, and allied health, have incorporated problem solving, decision making, and critical thinking into their curriculums (Mishoe, 1993). The growing use of therapist-driven protocols, or respiratory care protocols, makes skills of this nature essential for effective practice. This suggests further emphasis in the respiratory care curriculum should be placed on skills requiring professional judgment (Mishoe & MacIntyre, 1997).

In 1992, the results of the National Consensus Conference on Respiratory Care Education suggested a greater emphasis on communication, critical thinking, and problem-solving skills will be necessary for the respiratory therapist of the future (Cullen et al., 1992). Numerous studies have documented that respiratory therapists can be more effective than other health care personnel in allocating respiratory care services, especially when protocols are in place (Mishoe & MacIntyre, 1997).

The increasing knowledge base, increased emphasis on assessment and decision-making skills, and limited time to teach these critically important skills leave educators with a sense of frustration and urgency in designing curriculum. The National Board for Respiratory Care (NBRC) provides one extremely valuable resource for curriculum design: a detailed content outline, or test matrix, for the credentialing examinations they administer (National Board for Respiratory Care, Inc. [NBRC], 1998).

One of the primary missions of the NBRC is to provide quality respiratory care credentialing examinations to qualified candidates (Wilson, 1999), thereby certifying the competence of respiratory care professionals passing these examinations. In order to ensure that the credentialing examinations reflect current practice, the NBRC conducts job analyses on a regular basis (Barnes, 1999). For respiratory care, these surveys were conducted in 1981, 1987, 1993, and most recently, 1997 (Wilson, Long, & Barnes, 1998).

The updated testing content first appeared on the entry level Certified Respiratory Therapist (CRT) examination in July 1999 (Barnes, 1999). The CRT examination matrix includes 248 testing items, with 48 items being unique to this exam (Barnes, 1999; Wilson et al., 1998). In addition, analysis of the content for the CRT examination shows a shift to higher cognitive levels compared to former testing matrices. Questions at the

analysis level now comprise 51% of the CRT examination, an increase of 68% compared to the former entry level examination (Barnes, 1999).

When conducting the job analysis used to determine what tasks would be included on the CRT examination, the NBRC allowed any interested person to request and complete a survey. As a result, respondents from many different respiratory care job functions, such as department/technical directors, educators, physicians, and supervisors, as well as respiratory therapists, completed the survey (NBRC, 1997). Of the 402 items surveyed, 248 were determined to be appropriate for the CRT examination. These tasks were rated as "quite important" or "extremely important" by the respondents and were performed by therapists at more than two thirds of work sites (Wilson et al., 1998).

In a survey of American Association for Respiratory Care (AARC) members identifying themselves as "staff therapists," completed in 1998, it was determined that many of the tasks on the NBRC Written Registry Examination (WRE) were performed infrequently by the respondents (Van Scoder, Cullen, Johnson, & Nyhuis, 1999). This was in contrast to the NBRC job analysis in which the tasks had apparently been rated as "quite important" or "extremely important." Since there was a discrepancy between how frequently a task is performed and the perceived importance of the task for the WRE, we wondered whether similar discrepancies would be found for items specific to the CRT examination.

Purpose

Respiratory therapy educators routinely use the NBRC examination content outline as they plan their curriculum. If staff therapists infrequently perform tasks on the outline, educators may need to make alternative arrangements to ensure that the content is appropriately covered in the curriculum. Since the NBRC examination content outline does not indicate how frequently tasks are performed, we undertook this study to provide that information. Our previous research showed that many of the tasks included on the WRE content outline were seldom performed (Van Scoder et al., 1999).

The items on this survey were limited to those tasks that the NBRC content outline identified as being exclusive to the CRT exam. In conducting the survey, we hoped to answer the following questions:

1. How often do staff therapists perform selected tasks identified on the CRT exam content outline?
2. Is there a significant difference in how often tasks are performed based on geographic region, job site, or length of professional experience?
3. Were the staff therapists who responded to our CRT survey significantly different from the staff therapists who responded to our survey on the WRE conducted in 1998?

Methods

Subjects

The subjects for the study were members of the AARC who identified "staff therapist" as their primary job responsibility on their 1999 AARC membership form. At the time

the survey was conducted, there were 11,066 members in that category, listed in order of U.S. Postal Service zip code. A systematic random sample was obtained by selecting every 22nd name from the list, which resulted in a sample of 503 subjects.

Instrument

The survey instrument (see Appendix) contained four demographic questions and a list of 25 tasks. The list of tasks was adapted from the *NBRC Combined Detailed Content Outline for Entry Level and Advanced Respiratory Therapists* (NBRC, 1998). Only those items that were identified on the content outline as appearing on the CRT examination but not on the WRE were used for the survey.

Although the NBRC content outline often bundles a number of tasks together (e.g., positive expiratory pressure, incentive spirometry, intrapulmonary percussive ventilation, and chest physiotherapy are grouped together for task IIID12f on the content outline), we "debundled" all of these tasks since our previous research showed that there is sometimes a great deal of difference in how often each of the bundled tasks are performed by staff therapists (Van Scoder et al., 1999). This process identified 74 tasks.

If we had retained all 74 tasks, it would have resulted in a survey too lengthy for our purposes. In order to obtain a survey of more reasonable length, we developed a systematic sample of the tasks by using every third task from the original 74. For each of the 25 tasks included on the survey, staff therapists were instructed to mark a box indicating when they had last performed that task: *within the last month*, *within the last year*, or *more than 1 year ago or never*. All responses were anonymous.

Data Collection and Analysis

The survey, along with a cover letter and a postage-paid return envelope, was mailed to the 503 subjects. Data collection ended six weeks after the surveys were mailed. Frequencies and percentages were determined for each response to each survey question. The Kruskal-Wallis test was used to determine whether there was a significant difference in how often tasks were performed based on geographic region. A Gamma value was calculated to determine whether there was a significant correlation between hospital bed size or length of professional experience and how often tasks were performed. The chi-square test was used to determine whether the staff therapists who responded to the survey were significantly different from the staff therapists who responded to the earlier survey on the WRE content.

Results

There were 217 useable surveys returned before data collection ended, which represented 43.1% of those surveyed and 2% of the total population. The Registered Respiratory Therapist (RRT) credential was held by 83.9% of the respondents, while 15.7% reported that their highest credential was Certified Respiratory Therapy Technician (CRTT), or CRT. One respondent held no credential. As seen in Table 1, the respondents were distributed throughout the United States, with the majority residing in either the midwestern or southern regions. The smallest group of respondents came from

Table 1
Job Location of Staff Therapists

Region	Percent
Eastern	18.9
Southern	34.6
Midwestern	38.2
Western	8.3

Note. Eastern = MA, RI, CT, NH, ME, VT, NY, NJ, PA. Southern = FL, MD, DE, SC, NC, GA, DC, VA, WV, MS, TN, KY, AL, LA, TX, OK, AR. Midwestern = MI, OH, IL, WI, IN, MO, MN, KS, IA, NE, SD, ND. Western = UT, NV, ID, AZ, WY, NM, CO, MT, CA, HI, OR, WA, AK.

the western region. The majority of the respondents (56.7%) reported 11 or more years of experience in respiratory therapy (see Table 2). As shown in Table 3, 93.1% of the respondents worked in hospitals.

Of the 56 tasks included on the survey, 19 (76%) had been performed by 50% or more of the staff therapists within the last month (see Table 4). The task most likely to have been performed was "Administered aerosol therapy." Only four of the tasks were identified by more than half of the staff therapists as having been performed more than 1 year ago or never. The task least likely to have been performed within the last year was "Reviewed V_D/V_T data in the patient record."

Only one task, "Selected and obtained percussors and vibrators," showed a significant difference ($p < .05$) in how often it was performed based on geographic region. Staff therapists in the midwestern region were nearly three times as likely to have performed this task within the last month than staff therapists in the eastern region.

When the staff therapists' job site was examined, we did not include the home care or subacute/skilled nursing facility categories because so few of the respondents worked at those sites. Since the remaining categories were ranked in order of hospital bed size, we

Table 2
Length of Respiratory Experience of Staff Therapists

Years	Percent
1 or less	3.2
2 to 5	18.4
6 to 10	21.7
11 or more	56.7

Table 3
Primary Job Setting of Staff Therapists

Job setting	Percent
1- to 100-bed hospital	13.0
101- to 200-bed hospital	17.6
201- to 400-bed hospital	39.4
401-plus-bed hospital	23.1
Home care	4.6
Subacute/skilled nursing facility	1.9
Other	0.5

were able to correlate hospital bed size with how frequently a task was performed. This analysis yielded eight tasks that were significantly ($p < .05$) positively correlated with hospital bed size (see Table 5). Two tasks, "Counseled patient and family concerning smoking cessation" and "Maintained record of therapy administered," yielded a significant negative correlation with hospital bed size.

The correlation between a staff therapist's length of professional experience and frequency of performance was significant at the $p < .05$ level for six tasks. Three tasks, "Modified aerosol therapy by changing dilution of medication," "Suctioned tracheostomy tubes," and "Interpreted results of arterial blood gas analysis," were positively correlated with length of experience. However, a significant negative correlation was discovered for "Performed quality control for metered dose inhalers," "Selected and obtained percussors and vibrators," and "Based on patient response, recommended inserting a chest tube."

A comparison of the respondents to this survey with the respondents to our earlier WRE survey showed that the two groups were not significantly different at the $p < .05$ level based on geographic region, job site, credential, or length of professional experience.

Discussion

The population from which our sample was drawn was AARC members who identified themselves as staff therapists. Since responses to the survey were anonymous, we are unable to determine whether nonrespondents are significantly different from respondents. Also, we cannot make the assumption that staff therapists who are members of the AARC are representative of all staff therapists.

Further complicating our sampling was the fact that shortly before we began our survey, the NBRC implemented the CRT credential and permitted all of those holding the CRTT credential to use the new credential. We feared that this might change the

Table 4
Percent of Staff Therapists Performing Entry Level Tasks (N = 217)

Task	More than 1 year ago or never	Within the last year	Within the last month
Administered aerosol therapy	0.5	2.3	97.2
Maintained record of therapy administered	0.5	3.2	96.3
Interpreted results of arterial blood gas analysis	1.4	4.6	94.0
Determined appropriateness of prescribed therapy and goals for pathophysiological state	2.3	9.3	88.4
Suctioned tracheostomy tubes	2.3	13.4	84.3
Initiated nasal/mask ventilation	5.5	12.4	82.0
Selected appropriate ventilator to achieve adequate artificial ventilation	13.0	7.9	79.2
Modified incentive breathing devices (e.g., increased or decreased incentive goals)	10.6	15.7	73.7
Instituted and modified weaning procedures	11.1	16.1	72.8
Based on patient response, modified weaning procedures	9.3	18.1	72.7
Based on patient response, recommended intubation	12.0	17.5	70.6
Based on patient response, recommended use of diuretic agents	9.2	28.1	62.7
Modified aerosol therapy by changing dilution of medication	15.7	21.7	62.7

Table 4 Continued
Percent of Staff Therapists Performing Entry Level Tasks (N = 217)

Task	More than 1 year ago or never	Within the last year	Within the last month
Based on patient response, recommended use of narcotic agents	19.8	19.4	60.8
Communicated information relevant to discharge planning	18.4	23.0	58.5
Based on patient response, recommended using or changing artificial airway	18.5	25.0	56.5
Instructed in inspiratory muscle training techniques	24.9	22.6	52.5
Counseled patient and family concerning smoking cessation	23.1	25.5	51.4
Based on patient response, recommended use of anti-inflammatory agents	17.5	31.8	50.7
Selected and obtained percussors and vibrators	33.0	19.1	47.9
Performed quality control for metered dose inhalers	42.4	20.3	37.3
Based on patient response, recommended use of surfactant agents	67.5	10.4	22.2
Based on patient response, recommended inserting a chest tube	51.4	29.6	19.0
Based on patient response, recommended that IPV therapy be instituted	68.5	18.8	12.7
Reviewed V_D/V_T data in the patient record	73.7	16.6	9.7

makeup of the AARC staff therapist population by providing an influx of persons who had formerly identified themselves as staff technicians. However, a comparison of the current sample with the sample who responded to the earlier survey on the WRE content showed that the two groups were not significantly different based on credential or any of the other demographics we obtained.

The similarity between the respondents to the two surveys allows us to make some inferences based on the data collected. None of the tasks included on the survey of WRE content had been performed by at least half of the staff therapists within the last month (Van Scoder et al., 1999), while 76% of those included on the entry level survey had been performed within the last month. Therefore, it is reasonable to conclude that the content of the entry level examination is congruent with the tasks actually performed by staff therapists, but the content of the WRE is not.

Because the tasks contained on the CRT examination outline are more frequently performed, it is relatively easy for program faculty to include them in students' clinical experiences. However, the rarely performed tasks included in the WRE content provide a clinical scheduling challenge for faculty.

Although not as prevalent as with the WRE content, some tasks included on the CRT outline are infrequently performed by staff therapists. The most glaring example is "Reviewed V_D/V_T data in the patient record," which nearly three fourths of the therapists reported they had not done within the last year. The inclusion of this item on the content outline cannot be explained by the NBRC's penchant for bundling tasks, since it was not bundled with other items on the NBRC survey.

Table 5

Tasks More Frequently Performed in Large Hospitals Versus Small Hospitals

Task	*p* value
Suctioned tracheostomy tubes	< .0001
Selected appropriate ventilator to achieve adequate artificial ventilation	< .0001
Based on patient response, recommended using or changing artificial airway	.0006
Based on patient response, recommended use of surfactant agents	.0006
Based on patient response, modified weaning procedures	.0031
Based on patient response, recommended intubation	.0144
Instituted and modified weaning procedures	.0380
Based on patient response, recommended IPV therapy be instituted	.0434

The difference between the NBRC's results and ours is most likely due to the difference in our sampling techniques. They surveyed department and technical directors, supervisors, respiratory care practitioners, pulmonary function practitioners, educators, and physicians (NBRC, 1997). Based on the assumption that the person who best knows a job's content is the person who actually does the job, we surveyed only staff therapists. Also, we selected our subjects via a systematic random sample, whereas the NBRC's subjects were self-selected (George & Cohen, 1997).

The results of this study, as well as the results of our previous study on the WRE content, support the assertion that the CRT examination content is more inclusive of the tasks performed by staff therapists than the WRE content. It may also be the case that the NBRC's use of a self-selected sample that includes persons other than staff therapists, as well as the NBRC's practice of bundling tasks on their surveys, leads to distorted results when they compile their content outlines.

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Appendix

Survey of Staff Therapists

For each of the following, place an "x" in the first box if you, personally, have performed the activity in the last month. Place an "x" in the second box if it has been more than one month but less than twelve months since you have performed the activity. Place an "x" in the third box if it has been more than twelve months since you have performed the activity, or if you have never performed the activity.

	When did you last do this?		
	Within the last month	Within the last year	More than 1 year ago or never
1. Reviewed dead space to tidal volume ratio (V_D/V_T) data in the patient record.	❑	❑	❑
2. Determined appropriateness of prescribed therapy and goals for identified pathophysiological state . . .	❑	❑	❑
3. Selected and obtained percussors and vibrators	❑	❑	❑
4. Performed quality control for metered dose inhalers (MDI)	❑	❑	❑
5. Counseled patient and family concerning smoking cessation	❑	❑	❑
6. Interpreted results of arterial blood gas analysis	❑	❑	❑
7. Maintained record of therapy administered [date, time, frequency of therapy, medication and ventilatory data]	❑	❑	❑
8. Communicated information relevant to discharge planning [e.g., scheduling, avoiding conflicts, sequencing of therapies]	❑	❑	❑
9. Suctioned tracheostomy tubes	❑	❑	❑
10. Administered aerosol therapy	❑	❑	❑
11. Instructed in inspiratory muscle training techniques.	❑	❑	❑
12. Selected appropirate ventilator to achieve adequate artificial ventilation	❑	❑	❑

	When did you last do this?		
	Within the last month	Within the last year	More than 1 year ago or never
13. Initiated nasal/mask ventilation.	❑	❑	❑
14. Instituted and modified weaning procedures	❑	❑	❑
15. Modified incentive breathing devices [e.g., increased or decreased incentive goals].	❑	❑	❑
16. Modified aerosol therapy by changing dilution of medication	❑	❑	❑
17. Based on patient response, modified weaning procedures [e.g., SIMV, pressure support, T-piece trials]	❑	❑	❑
18. Based on patient response, recommended using or changing artifical airway [e.g., endotracheal tube, tracheostomy]	❑	❑	❑
19. Based on patient response, recommended intubation	❑	❑	❑
20. Based on patient response, recommended that intrapulmonary percussive ventilation (IPV) be instituted for bronchopulmonary hygiene.	❑	❑	❑
21. Based on patient response, recommended inserting a chest tube	❑	❑	❑
22. Based on patient response, recommended use of antiinflammatory agents	❑	❑	❑
23. Based on patient response, recommended use of diuretic agents	❑	❑	❑
24. Based on patient response, recommended use of narcotic agents.	❑	❑	❑
25. Based on patient response, recommended use of surfactant agents	❑	❑	❑

In order to help with the interpretation of the results of this survey, please answer the following questions about yourself. Check only one response for each item.

A. The setting in which I currently practice is located in:

_____ 1. MA, RI, CT, NH, ME, VT

_____ 2. FL, MD, DE, SC, NC, GA, DC, VA, WV

_____ 3. NY, NJ, PA

_____ 4. MI, OH, IL, WI, IN

_____ 5. MS, TN, KY, AL

_____ 6. MO, MN, KS, IA, NE, SD, ND

_____ 7. LA, TX, OK, AR

_____ 8. UT, NV, ID, AZ, WY, NM, CO, MT

_____ 9. CA, HI, OR, WA, AK

_____ 10. Other: _____

B. My primary job is in the following setting:

_____ 1. 1-100 bed hospital

_____ 2. 101-200 bed hospital

_____ 3. 201-400 bed hospital

_____ 4. 401 - or more bed hospital

_____ 5. home care

_____ 6. subacute/skilled nursing facility

_____ 7. Other: _____

C. The highest respiratory care credential I possess is:

_____ 1. CRTT or CRT

_____ 2. RRT (includes CRTT)

_____ 3. Neither of the above

D. My length of experience in respiratory therapy is:

_____ 1. 1 year or less

_____ 2. 2 to 5 years

_____ 3. 6 to 10 years

_____ 4. 11 years or more

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Creating Interdisciplinary Team Practice Through Computer Conferencing

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Abstract

The researchers tested whether computer conferencing could support interdisciplinary team practice, identified respiratory care (RC) and nursing student attitudes toward interdisciplinary teamwork, and measured faculty time commitment. Health professions students (n = 165) from RC, nursing, occupational and physical therapy, pharmacy, physician assistant, speech and language pathology, and social work participated. Pre- and post-survey measurements showed that RC students viewed distance education less positively after the project, and indicated they were adequately trained. Students had trouble accessing the system and felt the project should not be continued in the future; conferencing system failures and limited computer access were contributing factors. Students' views toward interdisciplinary teamwork and stereotypes of other professions were obtained. Faculty found the project time-consuming but worthwhile.

Creating Interdisciplinary Team Practice Through Computer Conferencing

Interdisciplinary teamwork is essential for quality health care delivery. Several accreditation agencies include multidisciplinary or interdisciplinary criteria in their standards. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requires multidisciplinary collaboration in its criteria (JCAHO, 1999). Recently, the National Board for Respiratory Care, Inc. (NBRC) added an item on the Written Registry Examination that requires respiratory care practitioners to be able to review interdisciplinary patient and family care plans (NBRC, 1998).

The importance of interdisciplinary team skills for subacute care (Bunch, 1997a, 1997b), advanced cardiac life support training (Barnes & Durbin, 1992), and geriatric care (Cullen, D., Giordano, M., Massengill, P., Jr., & Sullivan, J., 1991) have been cited in the respiratory care (RC) literature. Little is written about the process for interdisciplinary team training in the RC literature.

The allied health literature cites stereotypes that occupational therapy (OT) and physical therapy (PT) students have of one another. Parker and Chan (1986) and Streed and Stoecker (1991) demonstrated that OT and PT students perceive their own profession more positively than their colleagues. In a more recent study, Titiloye, Katz, and Balogun (1998) found that interdisciplinary education minimized negative stereotypes between OT and PT students.

Students attending clinical sites where interdisciplinary teamwork is limited or lacking do not receive an appropriate exposure. Clinical sites where interdisciplinary teamwork is practiced serve as effective training grounds; however, the staff at these sites may not have the time to educate students about the specific skills associated with interdisciplinary teamwork.

Moving interdisciplinary teamwork into the classroom also has its limitations. It is a logistical challenge to offer a course that fits into the curricula of multiple health professions' programs both in the proper semester sequence and time of day.

We addressed whether computer conferencing, a medium that utilizes electronic communication, could bring together students from multiple health professions to work on an interdisciplinary project. During computer conferencing, faculty and students present and discuss course content with one another through electronic messages on conferencing software. This form of communication allows all participants greater freedom in time and place, as most conferencing systems are accessible through the Internet (Driscoll, 1998; Moore & Kearsley, 1996; Palloff & Pratt, 1999). The recent proliferation of the Internet allows students access to computer conferencing from a variety of locations, including schools, work sites, hospitals, and public libraries (Irving & Levy, 1999).

We posed the following research questions in this study:

1. Can computer conferencing create an interdisciplinary learning environment?
2. How do students feel about interdisciplinary teamwork?
3. How much faculty time is required to conduct the computer conferencing?

Methodology

Faculties from eight different health professional programs in an urban university were recruited to participate in a 4-week interdisciplinary module that utilized computer conferencing. The seven professions of nursing (NUR), OT, pharmacy (PHARM), PT, RC, social work (SW), and speech and language pathology (SLP) participated in the actual module. A group of physician assistant (PA) students served as the control group. Students enrolled in a designated course from each profession were included in the study.

Procedures

The 4-week module required students to develop an interdisciplinary care plan for one of several rehabilitation cases involving patients/clients representing culturally diverse backgrounds and requiring smoking cessation interventions. Group process within the student teams was facilitated by the assignment of student roles: facilitator, summarizer, reporter, and group processor (Harasim, Hiltz, Teles, & Turoff, 1995; Mears, 1997).

Each week student teams received an assignment and comments on prior work. Assignments required students to post messages at least twice each week. This module was imbedded in an existing senior or graduate level course from each participating program. Student teams consisted of four members. The uneven numbers of students from each profession prevented all teams from having same discipline composition. Students received resources (electronic and paper) for WebBoard (conferencing software) and smoking cessation.

Faculty members assumed tasks that fit into the primary roles of faculty discipline and faculty case manager. In the faculty discipline role, faculty trained students to use WebBoard, addressed students' technology questions, sent the project coordinator a list of participating students, administered survey instruments, and assigned student grades. As faculty case manager, faculty created conferences on WebBoard, posted weekly assignments, answered student questions from the multidisciplinary teams, and provided summary comments for each team at the end of the module.

One faculty member served as the project's coordinator. The coordinator set up the student teams, sent faculty templates for the assignments, sent out weekly reminders to keep the participating faculty on schedule, provided technical support to faculty, and oversaw the functioning of each conference board. Faculty also received some technical support from the university's information technology division.

Instruments

Students took two measures that assessed their response to the computer conferencing medium. An 11-item, 7-point semantic differential scale measured their attitude toward distance education. Measured pre- and post-project, this scale had face validity, content validity, and a Cronbach's alpha of .85 (Becker & Gibson, 1999). The second measure addressed the students' perceptions of using WebBoard and was measured post-project. This measure consisted of a 13-item, 5-point Likert scale (from 1 = *strongly disagree* to 5 = *strongly agree*) and questions about computer access and past experience with electronic communication. No prior reliability data were available for this instrument.

Three measures of interdisciplinary function were obtained pre- and post-project. The Interdisciplinary Education Perception Scale (IEPS) had 18-items measured on a 5-point Likert scale (from 1 = *strongly disagree* to 5 = *strongly agree*). It demonstrated content validity and a Cronbach's alpha of .87 (Luecht, Madsen, Taugher, & Petterson, 1990).

The Health Team Stereotype Scale (HTSS) was a 54-item semantic differential scale scored on a 7-point scale (Parker & Chan, 1986; Streed & Stoecker, 1991). The number of items was reduced by asking three faculty from each of the participating disciplines to rate each item from 1 = *very unimportant* to 4 = *very important* for its appropriateness as a stereotype measure. Fourteen faculty responded and represented all disciplines except SW. Items receiving a rating of 3 or 4 by 75% of the raters were included in the final instrument, which resulted in 23 items. A reliability measure for this modified scale was computed using the current study population.

The students also completed pre- and post-project information on smoking cessation. Most of that data is beyond the scope of this paper; however, that questionnaire asked students to rate their knowledge and experience of each participating health profession on a 5-point Likert scale (from 1 = *very knowledgeable or very much experience* to 5 = *very little knowledge or very little experience*). Students entered a 4-digit code on all pre- and post-survey instruments.

Pilot Test

A pilot test of the pre- and post-project instruments and the entire 4-week module was conducted with four students from different health professions. Upon completion of the pilot study, the assignments were given more clarity, and several items on the instruments were modified to ensure that all participating disciplines were listed in the appropriate places.

Data Analysis

All statistical analyses were conducted using SPSS™ version 9.0 at $\alpha = .05$. Frequency data for the numbers of students in each participating discipline were tallied at the end of the project. Descriptive statistics for RC student knowledge and experience with each participating discipline, prior experience with electronic communication, and access to electronic resources were also conducted. Frequency data for RC students' gender, age, and racial background was obtained from departmental records.

Paired sample *t* tests were conducted to assess for RC student changes in their attitude toward distance education, IEPS, HTSS, and knowledge and experience with other health professions. Although RC students completed the HTSS for all participating disciplines, only the RC and NUR data were computed, as students had less experience with the other professions.

The PA data was also evaluated pre- and post-project for changes in attitude toward distance education and IEPS as controls. Independent *t* tests utilizing the scales' median value were conducted to determine the direction of RC student opinions toward distance education, interdisciplinary team function, and computer conferencing pre- and post-project. A Pearson product-moment correlation was used to correlate students' off-campus computer access with the ease of completing the assignments.

Four raters conducted a semantic evaluation of student comments about the conferencing software. The raters, two faculty members and two graduate assistants, independently identified the themes expressed in student comments and the frequency of those themes. A 75% agreement among raters was required to confirm the presence and frequency of each theme to achieve reliability.

Faculty reported the amount of time they spent adding students to the conferencing system, creating conferences, posting weekly assignments, evaluating the final care plan, and evaluating each of their students. Average times for each task were computed.

Results

A total of 165 health professions students participated. These students (number in parentheses) came from the professions of RC (25), NUR (48), OT (4), PHARM (26), PT (44), SW (6), and SLP (12). Forty-eight PA students served as the control group. The RC students had a mean age of 26.8 years, were 68% female, and came from diverse ethnic backgrounds (8 African American, 2 Hispanic, 5 Pacific Islander or Indian, and 10 White).

Some students only answered one of the two surveys (partial response); others answered both the pre- and post-project surveys, which allowed us to do a matched-pair analysis. The response rates for each discipline were as follows (partial, matched pair in parentheses): RC (100%, 65%), NUR (96%, 75%), and PA (100%, 69%). The lower matched-pair findings resulted from students not using the same code for pre- and post-project surveys.

Reliability

The Cronbach reliability scores for health team stereotype scales for RC (n = 132) and NUR (n = 140) were α = .47, .68, respectively. The Cronbach reliability scores for the attitude toward distance education scale (n = 148), IEPS (n = 139), and the computer conferencing (n = 76) measures were α = .91, .86, and .58, respectively.

Computer Conferencing Measures

Demographic information from the 19 RC students who completed the post-project survey indicated that only one student had prior experience with an Internet course. Students had more experience with e-mail; seven used e-mail less than once a month; three, once a month; and nine, more than once a month. Nine of 18 students answered the question about access to a computer off-campus. Four RC students indicated access at home; four, at work; and one, elsewhere. Eight of ten students utilized their access to off-campus computer resources to complete some or all of the assignments related to this project.

RC students rated their opinions of the conferencing system (n = 19). Students were neutral toward nearly half of the conferencing features. These results are summarized in Table 1. There was a correlation (r = .532, p = .023) between off-campus access to computers and the ease of completing assignments.

The semantic analysis of computer conferencing comments indicated that RC students (number in parentheses) enjoyed meeting students from other professions and learning

Table 1
RC Students' Views toward Conferencing that Differed from Neutral (n = 19)

Item	*M*	*SD*
I received adequate training in how to use WebBoard prior to getting the interdisciplinary team assignment.	3.74*	.93
I needed to get additional help to use WebBoard after the initial inservice.	3.67*	.89
I used Long Island University's computer resources to complete *all* of my WebBoard assignments.	3.84*	1.01
The assignments I completed on WebBoard helped me to better master information on smoking cessation.	2.79	.98
I participated more in my WebBoard group discussions than I would have participated if assigned to small group discussions with the same team members in person.	2.32*	1.38
I felt I could express my ideas as well through WebBoard as I would have been able to express them verbally in person.	2.74	1.33
I felt more comfortable expressing my ideas through WebBoard than I would have if I worked with the same team members in person.	2.63	1.30
I found that reading the information posted by my fellow group members helped me understand the roles of team members from other health care professions.	2.68	1.16
I would like to have more of my course content in my primary discipline offered through WebBoard instead of spending as much time attending classes in person.	2.26*	1.37
I think the interdisciplinary student team experience should continue in the future.	2.42*	1.17
I felt that the expectations for completing the interdisciplinary student team project were very clear.	3.37	1.07
I felt that using WebBoard to develop a care plan helped my team to develop a better care plan than we would have if we met in person.	2.47	1.26
I had no trouble getting access to a computer to complete the team assignment.	2.16*	1.46

Note. Answers were scored on a scale of 1 = *strongly disagree* to 5 = *strongly agree*. Test value for the one sample *t* test of $M = 3$. RC = respiratory care.
*$p < .05$.

about others' professional roles (3), wanted more time to complete assignments (4), had difficulty accessing computers (2), and found nothing valuable (3).

The control group of PA students had no changes in the majority of their views toward distance education pre- and post-project. On the two measures where differences occurred, the PA students felt post-project that distance education would be more successful and more practical. RC students felt that distance education would be more useless, inappropriate, unimaginative, unsuccessful, impractical, and passive after the project.

A measure of the control group's strength of opinion on each of the distance education scale items showed that PA students were neutral toward practicality and simplicity pre-project, and positive toward the remaining pre-project and all post-project items. The RC students had positive attitudes about 7 of 11 items pre-project, in contrast to neutral views afterward. Table 2 summarizes these results.

Interdisciplinary Measures

The responses to the IEPS were stable in the control group of PA students pre- and post-project, with one exception: PA students felt that individuals in their profession had less trust in each other's professional judgment after the project. RC students found individuals in their profession were less willing to share information and resources with other professionals post-project.

On the IEPS, RC students had 15 beliefs differing significantly from the median value prior to the project, in contrast to only 9 afterward. In the five items where change occurred, the student ratings moved from a stronger agreement toward neutral. Results are summarized in Table 3.

Table 2
RC Students' Attitudes toward Distance Education Pre- (n = 22) and Post-Project (n = 19)

Distance education scale items	Pre-project *M* (*SD*)	Post-project *M* (*SD*)
Interesting-boring	3.18 (1.97)	4.11 (2.02)
Affordable-costly	3.71 (2.08)	4.26 (2.02)
Useful-useless	2.48 (1.40)* *	4.21 (1.99)
Appropriate-inappropriate	2.65 (1.18)* *	4.32 (2.00)
Time saving-time consuming	3.64 (2.30)	4.95 (2.30)
Creative-unimaginative	2.52 (1.65)* *	3.84 (1.86)
Successful-unsuccessful	3.00 (1.35)*	4.42 (1.87)
Practical-impractical	2.96 (1.69)*	4.16 (1.57)
Non-threatening-threatening	2.59 (1.53)* *	3.32 (1.63)
Active-passive	2.96 (1.64)*	3.74 (1.79)
Simple-complex	4.14 (1.46)	4.68 (1.77)

Note. Students scored evaluative pairs on a 7-point Likert scale. Test value for the one sample *t* test of *M* = 4. RC = respiratory care.
*$p < .05$. **$p < .001$.

The matched-pair analysis showed that nursing students viewed themselves similarly pre- and post-project; however, RC students found nursing students to be more open-minded and more comprehensive after the project. The results also showed that RC students viewed themselves more positively than nursing students in ten areas pre-project and eight areas post-project. Similarly, nursing students viewed themselves more positively in 11 areas pre-project and 10 areas post-project. Table 4 summarizes these results.

The pre- and post-project mean values for knowledge and experience that RC students had with the participating professions are reported in Table 5. RC students were most familiar with their own profession, followed closely by NUR. Knowledge and experience with other health professions did not change over the course of this study.

Faculty Time Commitments

The average time commitment for each stage of the computer conferencing project as reported by five of the eight participating faculty members (63%) is summarized in Table 6.

Discussion

The computer conferencing project succeeded in bringing together students from seven different health professions. The response rate of 65% in the paired sample tests for RC students limits the accuracy of the *t*-test analyses.

Another limitation relates to the student teams. The uneven number of participants from each discipline prevented the formation of teams representing all disciplines. Also, each team member did not always participate fully. The interdisciplinary findings might be different if more diverse team representation and full participation had occurred.

A few reliability measures were low. Low reliabilities on the HTSS (.47 and .68) may have been due to the repetition of the same 23 measures for 8 different disciplines. Also, the results from Table 5 show that RC students had limited knowledge and experience with several other disciplines. Unfamiliarity with the RC profession from other disciplines may have contributed to this lower rating.

The computer conferencing measure also had a low reliability. This might have occurred as a result of a time-consuming survey. No single item would have increased the reliability significantly if it were removed from the item pool.

The results showed that only one RC student had prior experience with an Internet course and less than half of the RC respondents utilized e-mail more than once a month. These data suggest that the class had relatively little experience with electronic communication.

Computer access was also an issue. It showed up both in the quantitative analysis and the student comments. Nine of the 18 students who answered the question stated they had computer access outside of the university. Four of these 18 students had Internet access at home (22%). The majority of students (8 out of 10) who had access to computers outside the university used their external access to complete at least some of the assignments. Computer access problems were heightened when WebBoard wasn't accessible on two of the four weekends during the module.

Table 3
Pre- (n = 23) and Post-Project (n = 19) RC Students' Interdisciplinary Beliefs

Beliefs from IEPS	Beliefs differing from neutral *M* (*SD*) Pre-project	Post-project
Individuals in my profession are well-trained.	4.13 (.46)**	3.79 (.79)**
Individuals in my profession are able to work closely with individuals in other professions.	3.96 (.64)**	3.56 (.92)*
Individuals in my profession demonstrate a great deal of autonomy.	3.91 (.60)**	3.79 (.71)**
Individuals in other professions respect the work done by my profession.	3.14 (1.15)	3.32 (1.16)
Individuals in my profession are very positive about their goals and objectives.	3.83 (1.03)*	3.47 (.90)*
Individuals in my profession need to cooperate with other professions.	4.24 (.70)**	3.74 (.87)*
Individuals in my profession are very positive about their contributions and accomplishments.	4.00 (.69)**	3.47 (1.12)
Individuals in my profession must depend upon the work of people in other professions.	3.87 (1.06)*	3.37 (1.01)
Individuals in other professions think highly of my profession.	2.91 (1.27)	3.16 (1.34)
Individuals in my profession trust each other's professional judgment.	3.70 (.70)**	3.79 (.79)**
Individuals in my profession have a higher status than individuals in other professions.	2.77 (1.11)	2.63 (1.07)
Individuals in my profession make every effort to understand the capabilities and contributions of other professions.	3.70 (1.18)*	3.37 (1.01)
Individuals in my profession are extremely competent.	3.86 (.71)**	3.74 (.87)*
Individuals in my profession are willing to share information and resources with other professionals.	4.39 (.66)**	3.68 (1.06)*

Table 3 Continued
Pre- (n = 23) and Post-Project (n = 19) RC Students' Interdisciplinary Beliefs

Beliefs from IEPS	Beliefs differing from neutral *M* (*SD*) Pre-project	Post-project
Individuals in my profession have good relations with people in other professions.	4.00 (.80)**	3.37 (1.12)
Individuals in my profession think highly of other related professions.	3.86 (.77)**	3.42 (.90)
Individuals in my profession work well with each other.	4.26 (.62)**	3.84 (.96)*
Individuals in other professions often seek the advice of people in my profession.	3.52 (1.16)*	3.37 (1.30)

Note. Answers were scored on a scale of 1 = *strongly disagree* to 5 = *strongly agree*. Test value for the one sample *t* test of *M* = 3. RC = respiratory care; IEPS = Interdisciplinary Education Perception Scale.
*$p < .05$. **$p < .001$.

National statistics show that in urban settings of the northeastern United States, 30% of adults have a computer in their homes and 19% have Internet connections (Irving & Levy, 1999). These numbers decrease as family income decreases and with African American or Hispanic racial backgrounds. The students served in a multiracial urban setting need access to electronic resources on campus to prevent the widening of this gap. Interestingly, despite the limited resources, the majority of students in this study participated fully in the project.

Both RC and PA students viewed distance education positively prior to the project. Post-project, the RC students' view changed toward neutral values, whereas the PA control group retained more positive views. The RC students were given the equivalent of 2 hours of class time to complete their weekly assignments. Students needed to organize their time management to complete assignments. Furthermore, this form of class participation required that all learners be active at all times. The more negative view by RC students may have related to the stress imposed by this more active form of learning and accessing WebBoard.

The data related to interdisciplinary teams showed that RC students had stereotypes of nursing students and identified the RC student views toward interdisciplinary teams. Consistent with the PT literature (Parker & Chan, 1986; Streed & Stoecker, 1991; Titiloye et al., 1998), both RC and nursing students rated their own profession more favorably in a number of items both in pre- and post-project surveys.

The specific findings that RC and nursing students have toward one another and the RC students' interdisciplinary views are important only in that they identify the students'

Table 4
Pre- and Post-Project RC and NUR Student Stereotypes of One Another

Items from modified HTSS	RC students' NUR/RC attitudes NUR *M* - RC *M* (*SD*)		NUR students' RN/RC attitudes RN *M* - RC *M* (*SD*)	
	Pre-project *n* = 21	Post-project *n* = 17	Pre-project *n* = 36	Post-project *n* = 30
Tactful-rude	1.38* (2.13)	2.00* (2.50)	-.26 (1.40)	-.20 (1.13)
Impersonal-interpersonal	-.42 (2.34)	.82 (3.05)	-.12 (2.18)	.47 (1.53)
Sociable-unsociable	1.86* (2.37)	1.94* (2.86)	-.94* (2.01)	-.52 (1.40)
Independent-subordinate	.58 (1.57)	.89 (2.54)	-.69 (2.04)	-.53* (1.31)
Understandable-confusing	1.25* (1.62)	1.24* (1.75)	-.74* (1.54)	-.63* (1.30)
Kind-cruel	1.63* (1.83)	1.47* (2.45)	-.11 (1.37)	-.37 (1.38)
Professional-nonprofessional	.48 (1.60)	.69 (1.70)	-.64* (1.59)	-.41 (1.24)
Active-passive	.30 (1.34)	.39 (1.72)	-.49* (1.17)	-.20 (1.03)
Unskilled-skilled	.79 (2.32)	-.53 (1.87)	.29 (2.04)	.47 (1.31)
Well-mannered-dominating	1.62** (1.47)	1.47 (2.90)	-.35 (2.10)	-.17 (1.37)
Narrow minded-open minded	-1.16 (2.43)	-.53 (2.48)	.59 (1.76)	.77* (1.36)
Competent-incompetent	0.75* (1.12)	1.18 (2.35)	-.60* (1.29)	-.80* (1.21)
Cooperative-competent [*sic*]	1.26** (1.24)	1.41* (2.37)	-.53* (1.13)	-.79* (1.61)
Intelligent-unintelligent	0.52* (.93)	.47 (1.01)	-.29 (1.25)	-.70* (1.29)

Table 4 Continued
Pre- and Post-Project RC and NUR Student Stereotypes of One Another

Items from modified HTSS	RC students' NUR/RC attitudes NUR *M* - RC *M* (*SD*)		NUR students' RN/RC attitudes RN *M* - RC *M* (*SD*)	
	Pre-project *n* = 21	Post-project *n* = 17	Pre-project *n* = 36	Post-project *n* = 30
Educated-uninformed	.38 (1.47)	1.06* (1.52)	-.31 (1.04)	-.52* (1.01)
Narrow-comprehensive	-1.47* (1.98)	-.88 (1.90)	.67* (1.22)	.82* (1.47)
Idealistic-realistic	-.70 (1.75)	-.94 (3.05)	.71* (1.71)	.96* (1.51)
Attentive-inconsiderate	.74 (1.59)	1.71* (2.20)	-.25 (1.30)	-.31 (1.31)
Conservative-innovative	.10 (2.17)	.18 (2.77)	.11 (1.56)	.38 (1.29)
Curious-indifferent	1.55** (1.47)	1.29* (2.05)	-.36 (1.81)	-.19 (1.33)
Negligent-responsible	-.20 (1.79)	-.12 (1.96)	.83* (1.56)	.46 (1.48)
Inexperienced-experienced	-.71 (1.68)	-.29 (.99)	.44* (1.18)	.21 (1.01)
Important-insignificant	-.29 (2.05)	.47 (2.07)	-1.08* (1.79)	-.83** (1.09)

Note. Students' stereotypes of one another (scored on a 7-point Likert scale) were tested through the matched pair *t* test. RC = respiratory care; NUR = nursing; HTSS = Health Team Stereotype Scale.
*$p < .05$. **$p < .001$.

current perceptions. RC faculty can use these perceptions to work with students to identify what it was about their experiences that led them to their current beliefs. Teasing out the underlying variables and providing explanations for any misconceptions might help students view other professionals and interdisciplinary team functioning more highly. The major benefit of identifying these underlying variables then lies in the ability to dispel myths and promote more collegial work experiences.

The faculty found this 4-week project time-consuming. Some time commitments were related to learning a new software program. Also, some of the tasks such as getting

Table 5
Comparison of RC Students' Knowledge about and Experience with Other Health Professions

	Knowledge		Experience	
Profession	Pre-project *M* (*SD*)	Post-project *M* (*SD*)	Pre-project *M* (*SD*)	Post-project *M* (*SD*)
Nursing	2.96 (.82)	2.58 (.84)	2.17 (1.23)	1.95 (.85)
Occupational therapy	3.36 (.79)	3.32 (.75)	3.95 (.95)	4.21 (.98)
Pharmacy	2.87 (1.10)	2.74 (.87)	3.26 (1.39)	3.53 (1.47)
Physical therapy	2.91 (.95)	3.00 (.82)	3.57 (1.20)	3.42 (1.22)
Physician assistant	2.78 (1.04)	2.74 (.93)	3.26 (1.10)	3.26 (.99)
Respiratory care	1.35 (.57)	1.63 (1.26)	1.09 (.29)	1.05 (.23)
Social work	3.39 (.84)	3.16 (.83)	4.04 (1.11)	3.95 (1.13)
Speech and language pathology	3.70 (.70)	3.00 (.82)	4.13 (1.01)	4.05 (1.13)

Note. Student data from pre- (n = 23) and post-project (n = 19) surveys. Ratings were made on a 5-point Likert scale (from 1 = *very knowledgeable or very much experience* to 5 = *very little knowledge or very little experience*). None of the matched pair comparisons (n = 17) reached statistical significance $p < .05$. RC = respiratory care.

the conferences set up could be delegated to a trained graduate assistant. Despite the time commitment, faculty were enthusiastic about continuing work in this area.

Overall, the project succeeded in providing an "in class" interdisciplinary practice and identification of RC interdisciplinary attitudes and beliefs. While students learned to negotiate the technology, they preferred in-person interactions. Although students did not perceive computer conferencing as a better way to collaborate, conferencing facilitated effective communication across disciplines. Providing students with access to electronic technology is key for facilitating broader classroom experiences and learning the potential of this communication form. Faculty found the experience time-consuming yet worthwhile.

Table 6
Faculty Time Commitment for Conducting Computer Conferencing

Task	Average time
Add each student to the conference	5 minutes/student
Set up the required conferences on WebBoard	2.5 hours/conference
Post the weekly assignment and monitor assigned conferences	2 hours/week
Read and comment on the final care plans for each assigned conference	2.5 hours/care plan
Evaluate the work of each individual student	1 hour/student

Note. Average time commitment based upon the results from five of eight participating faculty.

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Survey and Analysis of Faculty Salaries in Respiratory Care Programs in the United States

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Abstract

Few published surveys have addressed faculty salaries in respiratory therapy (RT) programs in the United States. A 1-page survey instrument was developed to address the following research question: "What is the current status of salary levels for faculty in RT programs in the United States?" The survey was mailed to 314 RT programs in the United States listed in 1997 as offering an associate degree or greater. Of 309 programs that could be included, after correcting for closures, 180 surveys were returned for an overall response rate of 58%. All salary figures are adjusted to a 12-month base. The mean (standard deviation) of salaries by rank across all programs nationally was $45,908 (13,182) for instructors, $50,951 (9,696) for assistant professors, $56,320 (10,614) for associate professors, and $69,034 (16,055) for full professors. We concluded that the response rate was adequate to provide national salary data for RT educators to serve as a benchmark for 1999.

Survey and Analysis of Faculty Salaries in Respiratory Care Programs in the United States

Few published surveys have addressed faculty salaries in respiratory therapy (RT) programs in the United States. Furthermore, there is a wide variance between the academic requirements for RT educators (Joint Review Committee for Respiratory Therapy Education [JRCRTE], 1997). In academic fields such as chemistry, biology, and physics, faculty members at universities usually possess an advanced degree one level above the level they are teaching. However, it can be the case that RT faculty have the same degree of education in the discipline as the courses they are teaching (Gibbons, 1997).

A review of the literature revealed minimal data on faculty salary levels in respiratory care to determine how salaries vary with degree levels and academic rank of faculty, or if they are equitable between similar associate or baccalaureate programs and institutions. An Internet search revealed no published articles on faculty salary surveys for RT educators. The American Association of University Professors (AAUP) 1997-1998 annual faculty salary report, published in the journal *Academe*, made no reference to respiratory care, respiratory therapy, or cardiopulmonary science (Bell, 1998).

An independent salary survey of RT educators was conducted in 1982 by a group from the University of Kansas and published in *AART Times* in 1983 (Mathews, Gregson, & Ludwig, 1983). This study found that faculty salaries differed considerably on a regional basis. A salary survey conducted by the American Association for Respiratory Care for educational institutions was carried out during the fall of 1986 and reported hourly rates for program personnel (American Association for Respiratory Care [AARC], 1986).

Two unpublished studies have been performed: one in 1993 from the University of Kansas Medical Center School of Allied Health, Department of Respiratory Care, and another in 1995 by the North Dakota School of Respiratory Care program in Bismarck, North Dakota (W. Beachey, personal communication, December 29, 1998; B. Ludwig, personal communication, July 27, 1992).

Since there is little past data and no current data on faculty salaries among RT educators, we designed and implemented a survey study in 1998-1999 to address the issue. The purpose of the study is to provide a descriptive survey of salary levels among RT educators in the United States.

Methods and Procedures

A list of all RT educational programs was obtained from the accrediting body for respiratory care, which at that time was the JRCRTE, now known as the Committee on Accreditation for Respiratory Care (CoARC). The total number of educational programs listed in 1997 numbered 374, including four in Puerto Rico (JRCRTE, 1997). Only programs offering associate or baccalaureate degrees were included in this survey, resulting in a total of 314 programs.

Each RT educational program was cataloged into one of the nine United States Census divisions, and these nine divisions were further grouped into four geographical regions using the AAUP model as follows (Gibbons, 1997):

Region 1: Northeast, including New England (CT, ME, MA, NH, RI, VA) and Middle Atlantic (NJ, NY, PA)

Region 2: North Central, including East North Central (IL, IN, MI, OH, WI) and West North Central (IA, KS, MN, NE, ND, SD).

Region 3: South, including East South Central (AL, KY, MS, TN), West South Central (AR, LA, OK, TX), and South Atlantic (DE, DC, FL, GA, MD, NC, SC, VA, WV).

Region 4: West, including Mountain (AZ, CO, ID, MT, NV, NM, UT, WY) and Pacific (AK, CA, HI, OR, WA).

Four volunteer RT educators were sent the initial draft of the survey instrument as a pilot trial. The survey instrument (see Appendix) was modified based on recommendations of the pilot study participants. Survey instruments with instructions were mailed on December 26, 1998, to 314 RT programs listed as offering an associate degree or greater. All respondents were offered a summary report of salary information, to be mailed on completion of the study.

Approximately 5 weeks after the initial mailing, a follow-up letter and second copy of the survey instrument were mailed to programs that had not responded. All survey results included in the current study were received by March 6, 1999, and are considered to reflect salaries of educators for the academic year 1998-1999.

Thirteen programs listed as associate degree programs in the 1997 JRCRTE published booklet of educational programs were returned indicating that they had obtained baccalaureate status. The total numbers were adjusted to reflect the changes, resulting in a total of 47 baccalaureate programs, instead of 34, and 267 associate programs, instead of 280. Surveys from two associate degree programs in the United States were returned as undeliverable. Surveys were sent to the one baccalaureate program and two associate programs in Puerto Rico. The technician program was not included in the mailing. Of the three surveys sent to Puerto Rico, only one baccalaureate and one therapist program responded. Since the salary levels from Puerto Rico were sufficiently different that they could be considered as outliers, they were not included in the statistical analysis. Subtracting these 5 programs from the original list of 314, we obtained a final list of 309 programs for the survey.

The overall response rate to the first mailing was 45%, with 41% of the associate and 63% of the baccalaureate degree programs responding. With the second mailing, an additional 45 programs responded, making the overall response rate 58%, with 55% of the associate and 78% of the baccalaureate degree programs returning the survey instrument.

Data analysis was accomplished utilizing SPSS version 7.0 statistical software. The primary outcome variable was salary, adjusted to a 12-month basis. Programs listing other than a 12-month contract were adjusted to a 12-month basis by dividing the salary listed by the percentage of a 12-month contract that they listed. If the program listed a 9-month contract, the 9-month contract was divided by 12 months to obtain a percentage of 0.75. This was divided into the 9-month contract amount listed.

For example, a 9-month contract listed as $50,000 would be divided by 0.75, resulting in a 12-month adjusted salary of $66,667. Programs listing similar monthly contracts, such as 10-month, were computed using the same method. If a program listed its contract

as days, e.g., 220-day contract, the days were divided by 365 to obtain a percentage (0.60 in this example), which was then similarly divided into the salary listed.

For example, a 220-day contract listing a salary of $50,000 would result in a 12-month adjusted salary of $83,333. Mean and standard deviation for salary was computed. Distribution of academic degrees versus gender of faculty was tested using a chi-square at a significance level of 0.05. The association between years of teaching experience and salary level was examined using a Pearson product-moment correlation.

Results

Table 1 gives a profile of the obtained sample of 180 programs, listing frequencies of program numbers and faculty by institution level, program degree level, distribution of academic degrees, gender, and number of personnel in associate and baccalaureate programs, respectively. In 180 programs responding, there were a total of 472 individual faculty cases. The category of "Other" for institutional level was an option on the survey

Table 1
Sample Profile Listing Frequencies of Programs (N = 180) and Faculty (N = 472)

	Technical	2-year college	4-year college	University	Other
Programs	18	108	24	26	4
Faculty	55 (11.7%)	258 (54.7%)	63 (13.3%)	85 (18.0%)	11 (2.3%)
Program degree level					
Associate		144 (80%)			
Baccalaureate		36 (20%)			
Gender					
Male		254 (53.8%)			
Female		217 (46.0%)			
Personnel per program					
Associate		364 (2.53 full-time faculty per program)			
Baccalaureate		108 (3.0 full-time faculty per program)			
Faculty degree levels					
Doctorate		52 (11%)			
Master's		212 (45%)			
Baccalaureate		153 (32%)			
Associate		48 (10%)			

Note. One respondent did not indicate gender; seven respondents did not indicate degree level.

Table 2
Annual (12-Month) Salary by Personnel Academic Rank, Degree, and Position for All Regions and Programs, 1998-1999 (N = 460)

	Position *M* (*SD*)				
Degree	Professor	Associate	Assistant	Instructor	Other
Doctorate	$77,277 (15,294)	$58,645 (8,388)	$55,771 (8,384)	$56,792 (17,270)	$71,000 (*n* = 1)
Master's	$65,922 (14,330)	$58,072 (10,111)	$52,788 (9,695)	$52,065 (13,244)	$51,325 (9,293)
Baccalaureate	$65,055 (15,845)	$52,158 (11,480)	$43,626 (6,858)	$43,814 (11,343)	$49,031 (15,366)
Associate	$57,196 (13,865)	$50,842 (15,764)	(*n* = 0)	$37,965 (10,206)	$28,250 (1,768)

Position	Position salary *M* (*SD*)[a]
Program director	$58,542 (14,342)
Director of clinical education	$49,204 (12,573)
Faculty	$45,498 (14,798)

Note. Twelve respondents did not indicate salary. Professor = Full Professor; Associate = Associate Professor; Assistant = Assistant Professor; Other = no rank indicated.
[a]Data extrapolated from "AARC Completes 1992 Human Resource Survey," by D. Bunch and M. Cathcart, May 1992, *AARC Times, 16,* pp. 56-63.

form chosen by four programs and included a consortium with a medical center, among others.

Table 2 lists the primary outcome variable of annual 12-month salary by faculty academic rank, degree, and position for all surveys returned. Four hundred and sixty responses reported both rank and degree, and were used to tabulate salaries by rank, degree, and personnel position.

Table 3 gives the mean and standard deviation for salary levels for each of the four regions, including both associate and baccalaureate programs, using all faculty salaries. The survey results found minimal variation in salaries of educators across regions.

Table 4 gives mean salary levels and standard deviation, adjusted to a 12-month basis, for faculty in associate and baccalaureate programs respectively, cross-tabulated by faculty gender. Salary levels on average are higher for baccalaureate program faculty compared to associate degree program faculty. Average salaries are also higher for males compared to females, in both program levels.

Other differences were found in the sample between male and female faculty respondents. The average number of years of experience for the 212 females was 10.78

Table 3
Annual (12-Month) Salary by Region for Associate and Baccalaureate Program Faculty, 1998-1999 (N = 467)

	Region 1	Region 2	Region 3	Region 4
M (*SD*)	$52,173 (13,516)	$54,388 (14,892)	$49,541 (11,951)	$54,703 (20,103)
n	69	97	210	91

Note. Five respondents did not indicate region. Region 1 = CT, ME, MA, NH, RI, VA, NJ, NY, PA; Region 2 = IL, IN, MI, OH, WI, IA, KS, MN, NE, ND, SD; Region 3 = AL, KY, MS, TN, AR, LA, OK, TX, DE, DC, FL, GA, MD, NC, SC, VA, WV; Region 4 = AZ, CO, ID, MT, NV, NM, UT, WY, AK, CA, HI, OR, WA.

years (*SD* = 6.68) and for the 241 males, 15.06 years (*SD* = 7.91), based on 453 valid responses. There were also differences in the distribution of academic degrees among males and females.

Table 5 shows that 154 of 250 male faculty (62%) possess doctorate and master's degrees, while only 109 of 214 female faculty (51%) do so. Conversely, the proportion of lower degrees such as baccalaureate and associate were greater among females than males. This difference was significant ($p < 0.05$) when tested with a chi-square statistic.

Discussion

One characteristic of the sample that is different from more traditional fields in the liberal arts, and possibly in other professional disciplines, was the presence of a relatively large number of undergraduate degrees among teaching faculty. The survey requested only full-time program faculty, so it is unlikely this represents clinical teaching faculty in every case.

Out of 465 valid (complete) responses for full-time program faculty, 201 (43%) indicated possession of a baccalaureate or associate degree. It is surprising that in postsecondary education there would be such a lack of graduate degrees among faculty. Although not examined in this study, it would be interesting to compare the proportion of teaching faculty lacking graduate degrees in other allied health disciplines.

The 1986 AARC survey of educational institutions reported an average of $16.96 per hour for educational program directors, which could be extrapolated to a yearly salary of $35,277. This would annualize the salary figures in the AARC study and be comparable

Table 4
Annual (12-Month) Salaries by Program Level and Gender, 1998-1999 (N = 466)

	Associate degree *M* (*SD*)	Baccalaureate degree *M* (*SD*)
Male	$54,601 (15,464)	$57,086 (13,303)
Female	$47,837 (14,256)	$48,337 (11,110)
All	$51,361 (15,246)	$53,898 (13,152)

Note. Six respondents did not indicate gender.

Table 5
Degree Distribution of Male and Female Faculty, 1998-1999 (N = 464)

Degree	Male	Female
Doctorate	34	17
Master's	120	92
Baccalaureate	77	76
Associate	19	29
Total	250	214

Note. $Chi^2_{3\ df} = 8.71$ ($p = 0.033$). Eight respondents did not indicate degree.

to the 12-month annualized salaries in our study. The AARC did not state whether they used a 9-month or 12-month base for determining annual salaries for educators. Our study lists the 1999 program director salaries as $58,542 per year, which is approximately equal to a 4% increase per year from 1986 to 1999.

The AARC reported an average of $13.79 per hour for educational instructors in 1986, which would be equivalent to $28,683 per year. Our study lists the mean faculty instructor salary nationally as $45,498 per year (see Table 2), which is approximately equal to a 4% increase per year from 1986 to 1999. No other data in the AARC (1986) study correlated closely enough to the information presented in this study to allow further comparisons.

The unpublished study conducted by the University of Kansas Medical Center School of Allied Health, Department of Respiratory Care, in May 1993 did not correlate closely enough to the information presented in this study to make any further comparisons (B. Ludwig, personal communication, July 27, 1992).

The unpublished survey (W. Beachey, personal communication, December 29, 1998) of 35 baccalaureate programs done in December 1995 by the North Dakota School of Respiratory Care program in Bismarck found $44,399 as the 1995 mean faculty salary in

Table 6
National Annual Salary Comparison Between Hospital RT Department Directors and Program Directors in Educational Facilities, and Between RTs in Hospitals and Faculty Instructors in Educational Facilities, 1998-1999[a]

Position	Salary
Hospital RTs	
Department directors	$56,709
Therapists	$47,212
Educators	
Program directors	$58,542
Faculty instructors	$45,498

[a]Data extrapolated from "AARC Completes 1992 Human Resource Survey," by D. Bunch and M. Cathcart, May 1992, *AARC Times, 16,* pp. 56-63.

baccalaureate programs across all regions and positions (program director, director of clinical education, and other faculty). Our study found $53,898 (13,152) as the mean (standard deviation) faculty salary for baccalaureate programs in 1999 (see Table 4). These figures represent an approximate 5% increase per year from 1995 to 1999, which correlates closely to the generalized comparison of a 4% increase per year for program director and instructor salaries indicated from the 1986 AARC survey.

The AARC performed a human resource study that addressed salaries for about 81,000 respiratory therapists employed in hospitals (Bunch & Cathcart, 1992). The study listed a 29.9% salary increase for hospital RT department directors over a 5-year period from 1987 to 1992. This resulted in about a 6% salary increase per year. The AARC also reported a 40% increase for respiratory therapists during the same time period, resulting in an 8% increase per year. Wages were compared between 1987 and 1992 and were reported as hourly salary. The 1992 AARC Human Resource Survey reported the director salary as $19.20 per hour and the therapist salary as $14.55 per hour in 1992 (Bunch & Cathcart).

On an annualized basis, the yearly salary for the director would be $39,936 per year and $30,264 for the respiratory therapist. This could then be compared to the mean national, annual 12-month salaries for program directors of $58,542 and $45,498 for faculty instructors in educational facilities listed in Tables 2 and 6.

The hospital department director salary in 1992 (Bunch & Cathcart) of $39,936 supports the impression that if the directors continued to obtain a 6% increase per year, the salaries of hospital department directors would be approximately equivalent to the educational program director salary in 1999 of $58,542. Similarly, the hospital RT salary in 1992 of $30,264 would be approximately equivalent to the educational faculty instructor salary in 1999 of $45,498, if we assume an average raise of 7% each year (see Tables 2 and 6).

Although on average, salaries for male faculty were higher than female salaries (see Table 4) for associate and baccalaureate programs, this difference could be accounted for by years of experience and by a higher proportion of lower academic degrees held by female faculty. The association between years of teaching experience and salary level was found to be 0.61 (Pearson r, $p < 0.0001$), a strong positive correlation. The average years of teaching experience for females and males were 10.8 and 15.1 years, respectively. Males would be expected to earn more with more years of experience.

In fact when male and female salaries were compared for a given range of teaching experience such as 10 to 15 years and with doctoral degrees, the average salary for females (n = 5) was $73,060 (32,502) and $58,613 (5,274) for males (n = 5). One very highly paid female faculty member both raised the mean and increased the variation seen in this subset. The distribution of academic degrees differed between men and women faculty as well, as shown in Table 5. More males possessed higher academic degrees than females (62% versus 51%), and salary levels were seen to increase with academic degree level, as shown in Table 2.

The salary data reported here for 1999 are averaged across multiple categories, which can mask differences between particular settings. For example, although salary is given by degree and academic rank (see Table 2), the categories of program level, type of institution, and geographic region are all collapsed. As a result, large variability is seen as represented by the sizable standard deviations. To be most applicable to a given educational setting, a selection for specific levels of these categories needs to be made.

Although this report is limited in length, a selection for salaries in specific, focused settings is easily performed using the coding variables in the database.

Conclusion

A number of faculty teaching in universities, colleges, and community colleges/technical institutes in both associate and baccalaureate RT programs list no graduate degree. Some faculty teaching in RT programs possess only an associate degree (JRCRTE, 1997). The data in our study suggests that there has been an approximate 4% increase per year in salaries for faculty in RT educational programs, on average, from 1986 to 1999. This was seen for program directors as well as faculty in all educational programs.

The human resource survey done by the AARC in May 1992 (Bunch & Cathcart) suggests a 6% salary increase per year for hospital RT department directors and a 7% increase for therapists. If these salaries are projected to 1999 salary figures, the indication is that educators and clinical respiratory therapists in comparable positions have approximately equivalent salaries.

Mean salary levels appeared to be higher in baccalaureate versus associate programs, and increased with higher academic rank and degree. Mean salary levels varied from highest to lowest for program directors, directors of clinical education, and program faculty, respectively. Although average salaries for males appeared to be higher than for female faculty, this difference can be largely accounted for by greater years of teaching experience and a higher proportion of academic degrees among males.

This study may be useful to administrators by offering an objective, factually-based description of salary levels for RT faculty that may be used to develop more equitable salaries among institutions.

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Appendix

RESPIRATORY THERAPY EDUCATORS SALARY SURVEY

I. ACADEMIC SETTING

* Please fill in your response or place a check in the selection that describes the status of your program

PROGRAM DEGREE LEVEL *(Please indicate only the highest program degree level)*

1. Associate_____ 2. Baccalaureate_____

INSTITUTION LEVEL

1. Technical Institute_____ 2. Community College (2 year)_____
3. College (4 year)_____ 4. University (doctorate granting)_____
5. Other (please list)_____

INSTITUTION FUNDING

1. State supported_____ 2. Private funding_____

DOES YOUR INSTITUTION OFFER TENURE TRACK FOR FACULTY?

1. Yes_____ 2. No_____

II. FACULTY SALARY INFORMATION

* Please fill in your response or place a check in the selection that describes the status of each full-time (9 or 12 month) faculty position in your program

FACULTY POSITION - *Program Director*

Rank: 1. Professor_____
2. Associate_____
3. Assistant_____
4. Instructor_____
5. Other *(please list)*_____
_____

Highest degree: 1. Doctorate_____
2. Master's_____
3. Bachelor's_____
4. Associate's_____
5. Other *(please list)*____
_____

Gender: 1. Female_____ 2. Male_____

Number of years teaching experience in Respiratory Therapy: _____
(Round off to the nearest year)

Annual salary: _____ Based on: 1. 12 month____ 2. 9 month____
(Please list your actual salary)

FACULTY POSITION - *Director of Clinical Education*

Rank: 1. Professor_____ Highest degree: 1. Doctorate_____
2. Associate_____ 2. Master's_____
3. Assistant_____ 3. Bachelor's_____
4. Instructor_____ 4. Associate's_____
5. Other *(please list)*_____ 5. Other *(please list)*____
_____ _____

Gender: 1. Female_____ 2. Male_____

Number of years teaching experience in Respiratory Therapy: _____
(Round off to the nearest year)

Annual salary: _____ Based on: 1. 12 month____ 2. 9 month____
(Please list your actual salary)

FACULTY POSITION - *Additional Faculty*

Rank: 1. Professor_____ Highest degree: 1. Doctorate_____
2. Associate_____ 2. Master's_____
3. Assistant_____ 3. Bachelor's_____
4. Instructor_____ 4. Associate's_____
5. Other *(please list)*_____ 5. Other *(please list)*____
_____ _____

Gender: 1. Female_____ 2. Male_____

Number of years teaching experience in Respiratory Therapy: _____
(Round off to the nearest year)

Annual salary: _____ Based on: 1. 12 month____ 2. 9 month____
(Please list your actual salary)

State ID#: _____
(For mailing purposes only)

Please Continue on second sheet if you have additional faculty

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A First-Year Experience with Problem-Based Learning in a Baccalaureate Cardiorespiratory Care Program

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Abstract

A problem-based learning (PBL) curriculum was implemented at the University of South Alabama in response to interests internal and external to the profession. Students are provided lectures in physiology, assessment, therapy, and PBL process during an initial 8-week period, followed by PBL and clinical courses. Students meet in small groups with a facilitator, two to three times weekly for case study, and determination and discussion of learning issues. Evaluation, enrichment lecture, and laboratory sessions are held. Student evaluation includes written examinations, independent case activities, and evaluation of interpersonal skills. Program evaluation has demonstrated that PBL students have performed better than most of their predecessors on the National Board for Respiratory Care (NBRC) Entry Level Examination. Additional evaluation methods include the Watson-Glaser Critical Thinking Appraisal and NBRC examinations. Most students enjoy the process. Modifications are underway.

A First-Year Experience with Problem-Based Learning in a Baccalaureate Cardiorespiratory Care Program

Need for Problem-Based Learning in the Curriculum

Respiratory therapy education has been influenced from both outside and within the profession. During the 1980s and early 1990s, several well-publicized reports on health professions education, most notably from the Pew Health Professions Commission, listed the desirable characteristics for the health professions workforce of 2005. These characteristics included lifelong learning, the use of teaching-learning processes that promote information management versus memorization, and curricular effectiveness (O'Neil, 1993; Shugars, O'Neil, & Bader, 1991). The Pew Commission's workshop on core curricula in allied health education encouraged improved skills in communication, critical thinking, problem solving, and teamwork, among others (Finocchio & Johnson, 1995).

Within respiratory therapy, the pass rate on the Clinical Simulation Examination (CSE) administered by the National Board for Respiratory Care (NBRC) has consistently been between 50% and 60%. Since this examination measures critical thinking and decision-making skills, traditional methods of preparing students apparently have not been successful.

The Delphi study of the future educational needs for respiratory therapy practitioners identified cognitive, affective, and psychomotor traits, a broad base of sciences, health promotion and disease prevention activities, cost containment, and medical-legal aspects (O'Daniel et al., 1992). The results of this study triggered the profession to examine its educational direction and to determine an agenda for change (Cullen et al., 1993). This educational direction included multicompetency, a broadened scope of practice, and the use of alternate care sites, not often used in traditional curricula (Cullen et al., 1994).

The response by educators has included multiskilling, interdisciplinary education, consortia and articulation agreements among institutions, increased attention to geriatrics and therapist-driven protocols, education in smoking cessation and asthma education, distance learning methods, and the use of problem-based learning (PBL). PBL usually involves the use of the small group case-study method of learning, as opposed to lectures.

The Delphi study, and the American Association for Respiratory Care consensus conferences that followed, demonstrated that communities of interest within and outside respiratory therapy were dissatisfied with the traditional curriculum and pedagogy (Cullen et al., 1993, 1994; O'Daniel et al., 1992). A need for curriculum expansion, improved critical-thinking skills, the ability to practice outside the acute care hospital, improved communications skills, and a spirit of interdisciplinism exists. Methods of providing these skills within the constraints of a traditional associate or baccalaureate degree curriculum need to be explored.

The Cardiorespiratory Care (CRC) program at the University of South Alabama (USA) was established in 1979. The first students began in 1980 and graduated in 1982. The program structure consists of a 2-year pre-professional phase, followed by a 2-year professional phase. Admission into the professional phase is accomplished by submitting an application, achieving a satisfactory science/mathematics and overall grade point

average, and successfully completing an interview process. Enrollment in the professional phase is limited to 18 students, primarily because of clinical constraints.

At the time the PBL curriculum began, the program had graduated 16 classes. All graduates passed the NBRC Entry Level Examination, 90% passed the Advanced Practitioner Examination, and 86% passed the CSE, but not always on their first attempt. Faculty concern about the CSE pass rate led them to explore avenues to improve success on this exam, particularly the decision-making section. The faculty have conducted a CSE workshop annually and provided students with written and computerized clinical simulations.

In addition, my experience with PBL in a medical school curriculum gave me reason to believe PBL may be a mechanism to improve students' decision-making skills. The faculty also identified the need for improved skills in communication, lifelong learning, and subacute care. Concurrent with the implementation of a semester-based academic calendar, a PBL curriculum was implemented at USA, as described below.

PBL Curriculum at USA

Program Goals

The CRC program goal is to prepare graduates as advanced respiratory therapists, as evidenced by passing the registry examinations of the NBRC. Consistent with the goal of improving decision-making skills and the desire to meet the challenges outlined by the Pew Commission (Finocchio & Johnson, 1995) and the profession (O'Daniel et al., 1992), additional goals as stated in the program handbook are to foster the educational and personal development of the respiratory therapy student who will

1. take personal responsibility for learning, both during and following formal respiratory care education;
2. command a relevant knowledge base characterized by depth, breadth, and most of all, flexibility;
3. be skilled in the critical evaluation and acquisition of new knowledge, with a commitment to lifelong learning;
4. be proficient at clinical reasoning;
5. have good interpersonal skills; and
6. be well prepared for entry into clinical courses.

The mechanism of achieving these objectives involves an approach that will shift the emphasis of the program from teaching to learning by requiring students to be active, independent, and self-directed learners and problem solvers, rather than passive recipients of information. Such an approach should also emphasize the development of attitudes and skills that stress the acquisition of new knowledge, rather than the memorization of existing knowledge, by limiting the amount of factual information that students are expected to memorize.

Implementation

The PBL component of the program is based on the ideas I collected as a facilitator in the PBL program at the Ohio State University (OSU) College of Medicine and from the

literature. I prepared the case studies for the first year, and prepared the USA faculty as facilitators. A manual for case writing was adapted from the OSU program for use by the USA faculty, as was a manual for the students and facilitators.

The CRC program at USA consists of four academic semesters, each 16 weeks long. The faculty chose to divide most of the courses into half semesters because 8-week sessions are more compatible with the subject material presented. The program begins with an 8-week session of lecture/laboratory courses in respiratory anatomy and physiology, patient assessment, and basic therapy. An introduction to the structure and protocol of PBL is included in the patient assessment course to prepare students for use of the case studies.

After the first 8 weeks, the students enroll in two courses. One is a PBL course that presents the types of patients encountered on medical and surgical floors, such as those with chronic obstructive pulmonary disease, postoperative pulmonary conditions, pneumonia, and other non-intensive care pulmonary problems. The other course is a clinical practicum, wherein the students work with patients who are similar in many respects to the patients discussed in the PBL course.

The protocol for PBL is as follows: The students are placed in groups of 5 to 7. Each group has a faculty facilitator. The patient cases are developed by the faculty from actual patients and use the progressive disclosure method: successive pages with the chief complaint, the patient's history, the physical examination, laboratory tests, and additional pages with the progress and therapists' notes. Each case contains an appendix that includes an abstract, suggested learning issues (objectives), resources with page or chapter numbers, and NBRC exam matrix references. The facilitator uses the appendix as a means of keeping the discussion focused on the matrix references. For example, if the discussion strays, the facilitator may ask a question that will guide the students back to relevant issues.

At the beginning of the case, a recorder is identified. The recorder will write facts, hypotheses (assessments), and learning issues on an erasable board. A reader is also identified to read aloud each page of the case as it is distributed. Another student role-plays the patient for the other students to practice their history-taking skills. As the case unfolds, students identify the facts of the case. At any time, they may brainstorm and list possible assessments based on the facts. As the case progresses, students are able to confirm or rule out those assessments, also based on the facts.

When the students are presented with unfamiliar terminology or drugs, they immediately refer to reference books. During a case, students are searching for knowledge, tasks, or affective skills that are roles of the respiratory therapist. When these skills arise from the case, they are stated as learning issues. Learning issues are the student-formulated objectives that become the basis for choosing resources and references upon which the written examinations are based. Learning issues are usually stated as content areas (such as oxygen therapy) and levels of organization (such as indications, equipment use, and evaluation, consistent with matrix headings). At the conclusion of each session (2 hours), students evaluate the session by determining if the process was followed and if they believe they adequately discussed the case and the learning issues from the previous session.

Between sessions, students read the material they specified and use other learning resources (videotapes, Internet, etc.) to study the learning issues. The learning issues are

then discussed at the beginning of the next session, followed by continuation of the case until it is completed.

Throughout the case, the facilitator's responsibilities include asking leading and clarifying questions to maintain student focus on the stated learning issues and NBRC matrix references. Usually, if the facilitator is asked a direct question, he refers to the group to determine what is already known. He asks if this question rises to the level of a learning issue or if it is something that can be readily accessed by referring to one of the texts brought to the session. In addition to the small group sessions, the class can decide if it needs additional information about a particular topic. If more information is deemed necessary, an enrichment lecture is requested. As necessary, at the students' or facilitator's discretion, a laboratory session is held when the learning issues include equipment that is unfamiliar to the students.

At the conclusion of the case, there is a meeting of all students in which the list of learning issues and references are agreed upon by all students. This list is presented to the facilitator. The examination is composed from this list. Each case is completed in 1 to 2 weeks or 3 to 6 sessions.

Therefore, each week 6 to 12 contact hours are used for the PBL course, depending on the need for enrichment lectures, laboratory sessions, and student assessment. The structure and content of clinical courses has been modified to concur with the types of patients and settings found in the PBL course.

In the second semester of the junior year, the PBL cases involve patients receiving intensive care. Most of these patients require mechanical ventilation. Various components of mechanical ventilation (indications, monitoring, weaning, etc.) are introduced sequentially within these cases. In each subsequent case, students are reminded to review previous components. Therefore, students constantly review concepts learned from previous cases.

The senior year consists of three specialties: (a) cardiovascular diagnostics, (b) neonatal/pediatrics, and (c) subacute care. Each specialty consists of a PBL course and a clinical course. Senior group sessions meet twice a week. This schedule is consistent with my experience with second-year medical students, who are able to identify their learning issues more efficiently, eliminating the necessity of three sessions a week. It also affords the seniors a little more time to study their learning issues. In addition to these three courses, the faculty teach courses in research methods, educational methods, and management.

Evaluation Techniques

Student evaluation in the PBL classes consists of three components: (a) written examinations, (b) an individual process assessment, and (c) a facilitator evaluation of student progress. The written examination developed by the facilitators is administered at the conclusion of each case. The written examinations are based on the learning issues established by the students, the resources they identified, and group discussion. Discussions between group recorders and facilitators are held as the learning issues are specified to ensure continuity between groups. A meeting is conducted between groups at the end of each case to ensure all students understand the learning issues and references to be used in the construction of the exam.

An individual process assessment (IPA) is the second component of the course evaluation. The IPA is an additional case study students work through independently. Each student lists the facts of the case, hypotheses, and learning issues. Each student then addresses three of the learning issues in a three-page typewritten presentation.

Third, a Facilitator Assessment of Student Performance (FASP) is completed by both students and facilitators (see Appendix A). The FASP is an evaluation of communications skills, roles, and participation skills pertaining to the student's behavior during the small group sessions. A FASP is completed at the midpoint of the class as a formative evaluation and again at the end of the course as a summative evaluation.

The students evaluate the facilitators at the conclusion of each course. They are evaluated as to their ability to fulfill the roles of a facilitator, i.e., organizing the case, keeping the groups focused, and avoiding directiveness (the tendency to run the small group sessions by lecturing and directly answering students' questions), among others. Appendix B provides a sample of the facilitator evaluation.

Lessons and Modifications

As the first semester of PBL progressed, the students advised the faculty of problems with the process. At the conclusion of each group session, a brief evaluation period occurred where students were encouraged to voice their opinions about the PBL process. In addition, several impromptu meetings of students and faculty were called to discuss the overall process. The greatest problem students expressed was their disbelief that both groups were listing the same learning issues and resources, which led to dissimilar study for the written examinations. The faculty implemented brief meetings between the recorders of the groups at the conclusion of each 2-hour session and a meeting of the whole class at the end of the case to arrive at common learning issues and resources in preparation for the exams.

Another topic of discussion was pharmacology and drugs. Early in the clinical course, clinical instructors noted that students did not seem prepared to administer drugs, despite a brief introduction to these drugs in the 8-week preparation. Therefore, a 16-contact-hour introductory pharmacology course was implemented for the juniors during the 8-week introduction.

Another question related to drugs was how much the students needed to know about the drugs introduced in the case. Students and faculty arrived at three classifications: (a) drugs respiratory therapists administer, (b) drugs affecting the cardiopulmonary system, and (c) noncardiopulmonary drugs. The faculty decided that students needed to know a full range of material (names, indications, dosages, routes of administration, contraindications, and hazards) about the drugs therapists administer (e.g., Albuterol). Students needed to know the names, actions, indications, and contraindications of cardiovascular drugs (e.g., aminophylline and digitalis). The faculty suggested students needed to know the names, categories, and main effects of noncardiopulmonary drugs (e.g., famotidine).

Faculty also decided to include arterial blood gas analysis and pulmonary function testing in the 8-week lecture session. While the program might be criticized by PBL purists for making these modifications in content, faculty were most concerned that the

students practice more safely, since they begin working with patients so early in the curriculum. Some clinical instructors voiced similar concerns.

While PBL does not entail more classroom time per instructor or student than the traditional curriculum, discussions about learning issues, examination reviews, program modification, case modification, and examination content consumed more time than in the traditional curriculum. Now that one cycle of all junior-level cases has occurred and these cases have been modified, this time commitment may decrease. Faculty and students will continue to communicate between and after small-group sessions to ensure continuity between groups and to revise examinations.

Ongoing Evaluation

The program uses results of the NBRC Entry Level, Advanced Practitioner, and Clinical Simulation Examinations, as well as the actual credentialing examinations to evaluate program success. As mentioned earlier, USA graduates have experienced success on these examinations. Now the faculty is using these examinations and others as indicators of the success of the PBL method.

The first indication of the PBL program's success was the April 1999 administration of the entry level examination. This examination is not part of a grade for a class; however, students must achieve at least a 70% score to advance to the senior year clinical courses. The average score in April 1999 was 75%. Eleven of 12, or 92%, of the students achieved a score of 70% or better. This level of success was equaled by only one of the past 10 classes, while the other 9 outgoing junior classes achieved a lower pass rate (33% to 90%). Even though some students believed they were not sufficiently prepared for the self-assessment entry level examination, they scored higher than most of their predecessors.

In April 2000, the advanced practitioner and clinical simulation self-evaluations were administered to the seniors. Those scores will become a part of the evaluation of the PBL process, especially the NBRC CSE, as it measures critical-thinking ability. The faculty will also compare the registry examination scores from students in the traditional curriculum (graduates in 1998 and 1999) to those in the classes of 2000, 2001, and beyond. The faculty is interested to determine if PBL makes a difference in the scores and pass rates on the CSE.

Since August 1997, incoming juniors have taken the Watson-Glaser Critical Thinking Appraisal, Form A. The Watson-Glaser is a test of general critical-thinking skills, not linked to any particular discipline. The same students take the Watson-Glaser shortly before graduation. To date, three incoming classes have taken the Watson-Glaser; one graduating class has also taken it. PBL students' scores will be compared with the scores of traditional curriculum students to determine if their critical-thinking abilities have changed as measured by the Watson-Glaser.

Student response to the PBL method has varied. Those who are really entrenched in learning by listening to lectures and being told exactly what pages to read and what to memorize have the most difficult time. However, most of the students have expressed satisfaction with the method and have stated that they enjoy PBL. Several have said they prefer PBL and would not want to return to the lecture-based curriculum. Student grades have not changed appreciably.

Presently the facilitator and student handbooks have been revised to conform to the changes made in the process. All cases have been revised to conform more closely to a Subjective-Objective-Assessment-Plan (SOAP) charting format, and changes were made in the cases where confusing points existed. The faculty have added additional NBRC matrix references as needed. Cases have been written for the three senior courses and will undergo the same scrutiny after they have been used.

Summary

In the fall of 1998, the faculty at USA implemented a PBL curriculum in the baccalaureate CRC program in response to interests internal (O'Daniel et al., 1992) and external (Finocchio & Johnson, 1995) to the profession. Students are instructed on the PBL process and are provided lectures during the initial 8-week period. This introduction is followed by PBL courses and clinical courses. Students meet in groups of five to seven with a facilitator, two to three times weekly. In addition, sessions for evaluation, additional lecture, and laboratory practice are held. Student evaluation consists of written examinations, independent case activities, and evaluation of a student's communication and participation skills.

Program evaluation is only beginning. PBL students have performed better than most of their predecessors on the NBRC Entry Level Examination. Additional evaluation methods include the Watson-Glaser Critical Thinking Appraisal and the other NBRC credentialing examinations. Most students enjoy the PBL process. Modifications are underway to assist those having difficulty. The second junior class and first senior class of PBL are now in session. A follow-up to this article will be forthcoming once additional evaluations and experiences are completed.

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Appendix A

University of South Alabama
Department of Cardiorespiratory Science
Facilitator Assessment of Student Performance (FASP)

Student:_____ Semester_____
Facilitator:_____

Key
✓ = satisfactory
O = Not observed (can't tell or not sure)
N = Needs improvement (requires student attention)

PBL STUDENT MEETING PERFORMANCE CHECKLIST					
No.	Mark	Item	No.	Mark	Item
1		Attends group meeting regularly	11		Demonstrates preparedness for group meetings
2		Is ready to begin meeting at scheduled time	12		Poses questions that stimulate case discussion
3		Accepts constructive criticism from other group members in a graceful manner	13		Contributes to the formulation and testing of hypotheses during group meeting
4		Demonstrates respect for the opinions of other group members by listening attentively to their statements	14		Contributes to the identification and formulation of learning issues in a constructive manner
5		Contributes to the group's efforts by taking a turn with outside assignments or group meeting tasks	15		Challenges the assertions of other group members in a fashion that elicits healthy group debate
6		Strikes a balance between giving and receiving information (talking and listening)	16		Effectively relates facts to hypotheses
7		Demonstrates cooperation in solving group problems and conflict	17		Effectively relates hypotheses to learning issues
8		Makes an effort to identify basic science learning issues	18		Exhibits thoughtful self-reflection during the group debriefing process
9		Shows genuine care and concern for the feelings of others	19		Strikes a balance between posing questions and asserting facts (asking and telling)
10		Shares the products of personal study with the group (journal or newspaper articles, diagrams, book chapters, etc.)	20		Reading
Demonstrates facilitation of the group's interaction by taking on any one of the following roles					
21		Communication facilitator: clarifies, summarizes, ties disjointed ideas together	23		Leader: initiates action, discussion. Directs movement of the group towards common goals
22		Recorder: (or scribe) records the important concepts offered in the discussion	24		Task master: Makes efforts to redirect the group back to the task when digressions occur

Comments/suggestions:_____

University of South Alabama FASP modified from Ohio State University FASP by John Curry, PhD.

Appendix B

University of South Alabama
Cardiorespiratory Care

PBL Facilitator Evaluation

Listed below are the roles of facilitators, as recognized by experts in PBL. As facilitators, we strive to fulfill these roles. We need your input regarding our ability to do so. Use the key below to rate your facilitator's ability to fulfill each of the following roles.

Facilitator_____ Semester and year_____

Key:

5 = always fulfills this role, resulting in effective group process
4 = usually fulfills this role; if this role is forgotten, it does not hinder the group's progress
3 = frequently does not fulfill this role, resulting in group confusion
2 = usually does not fulfill this role, resulting in near chaos within the group
1 = never fulfills this role; this facilitator should no longer facilitate if this behavior continues

_____ 1. Organizes the group and establishes a comfortable atmosphere at the initial meeting.

_____ 2. Assures that the group starts each meeting with having someone volunteer to be a reader, recorder, examiner, and patient, as needed.

_____ 3. Distributes case materials at the appropriate time.

_____ 4. Assures that each group session ends with a self-evaluation.

_____ 5. Keeps the group focused on its goals as respiratory therapists.

_____ 6. Monitors the discussion and keeps records.

_____ 7. Stimulates and manipulates the group with carefully worded and selected open-ended questions.

_____ 8. Evaluates student performance and participation.

_____ 9. Evaluates the PBL cases.

_____ 10. Shows patience by allowing students opportunity to focus on appropriate goals on their own.

_____ 11. Encourages students to challenge each other on the information they are providing; reassures them that they are not being personally impugned when they are challenged.

_____ 12. Does not break a silence, simply to stimulate conversation.

_____ 13. Does not answer direct questions with direct answers.

_____ 14. Does not suggest topics for discussion.

_____ 15. Does not tell students whether a direction they are pursuing is right or wrong.

_____ 16. Does not direct the group to add a particular learning issue to their list.

_____ 17. Is flexible in reviewing and redesigning group scheduling when appropriate; respects student suggestions.

_____ 18. Overall impression, using the same key.

Comments and suggestions for improvement:_____

_____

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_____

_____

_____

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