Continuing Competency: An Evaluation for Retention 180 Days After the Annual Competency Assurance Program

THESIS

Presented in Partial Fulfillment of the Requirements for the Degree Master of Science in the Graduate School of The Ohio State University

By
Brittany R. Locklear
Graduate Program in Allied Medical

The Ohio State University
2011

Master's Examination Committee:
F. Herbert Douce, MS, Advisor, Sarah Varekojis, PhD, Jill Clutter, PhD
Abstract

**Background:** Respiratory therapists at a large metropolitan academic medical center completed an Annual Competency Assurance Program (ACAP) to assess competency through performing procedures and cognitive assessments. **Objective:** The purpose of this study is to: 1) determine if there is a statistically significant difference in retention of performance procedure scores and cognitive assessment scores 180 days after ACAP, 2) with and without the use of electronic educational intervention. **Methods:** Eighteen therapists who attended 2010 ACAP were recruited to participate in the study. Participants were randomly divided into two groups receiving either electronic educational intervention (experimental group) or no electronic educational intervention (control group). Each volunteer in the study participated in a short recreation of ACAP, completing two performance procedures: tracheostomy tube change (infrequently performed procedure) and a bronchoalveolar lavage (frequently performed procedure). Both performance procedures were conducted, evaluated, and graded using the original criteria from ACAP. The volunteers also completed a multiple choice cognitive assessment, with questions pertaining to the performance procedures. The cognitive assessment was conducted and graded using the original criteria from ACAP. **Results:** Compared to the ACAP scores both groups showed a decline on all four measures on the 180 day posttest scores. The BAL performance score fell below the minimum.
competency level. The tracheostomy tube change performance had a statically significant change, \( p = 0.04 \), although the scores declined. **Conclusion:** Three of the four measures remained above the minimum competency level, although all scores declined, suggesting some retention.
Dedication

This document is dedicated to my wonderful husband.
Acknowledgments

I would like to thank Herb Douce, Dr. Sarah Varekojis, and Dr. Jill Clutter for their direction, assistance, and guidance. In particular, Herb Douce’s recommendations and encouragement have been invaluable for the completion of this project.
Vita

June 2001 ........................................... Lawrence North High School
2006....................................................... B.S. Allied Medicine

Fields of Study

Major Field: Allied Medical
# Table of Contents

Abstract ........................................................................................................................................... ii

Dedication ........................................................................................................................................ iv

Acknowledgments ............................................................................................................................. v

Vita ...................................................................................................................................................... vi

List of Tables ................................................................................................................................... xi

Chapter 1: Introduction ...................................................................................................................... 1

Chapter 2: Review of Literature ........................................................................................................ 7

Chapter 3: Methods ............................................................................................................................ 19

Chapter 4: Results and Discussion ................................................................................................... 22

Chapter 5: Professional Journal ....................................................................................................... 30

  Abstract .......................................................................................................................................... 31

  Introduction ..................................................................................................................................... 32

  Methods ......................................................................................................................................... 35

  Results .......................................................................................................................................... 38

  Discussion ...................................................................................................................................... 42

  Conclusions .................................................................................................................................... 45
List of Tables

Table 1. Comparison of Means of ACAP Scores .......................................................... 22
Table 2. Demographics of Experimental and Control Groups........................................23
Table 3. Means and Standard Deviations of Pretest and Posttest.................................24
Table 4. Difference in ACAP and 180 Day Posttest Scores........................................25
Table 5. Correlation of Preparation Minutes and Retention........................................26
Table 6. Comparison of Means of ACAP Scores .......................................................... 38
Table 7. Demographics of Experimental and Control Groups.........................................39
Table 8. Means and Standard Deviations of Pretest and Posttest.................................40
Table 9. Difference in ACAP and 180 Day Posttest Scores........................................41
Table 10. Correlation of Preparation Minutes and Retention........................................42
Chapter 1: Introduction

Health care is a constantly changing environment with new knowledge and technology implemented every day. Individual practitioners were successful in completing their respective education, examination, and licensure at one point in time. However, the initial skills and knowledge are not adequate to assure a practitioner is competent after the passage of a few years in this changing environment. Health care in particular is a continuously changing environment with the development of new medications and the rapid progression of technology; consequently continuing competency is crucial. Practitioners need to demonstrate their continuing competence to ensure the safety of patients. In 1999, the Institute of Medicine (IOM) reported the headline, “Medical mistakes 8th top killer. Medical errors blamed for many deaths; as many as 98,000 a year in U.S. linked to mistakes.”1 This number has since grown to more than 100,000 deaths per year and 15 million incidents of medical harm in the U.S., according to the Patient Safety Advocates’ in 2009.2 One of the reasons listed for the medical errors included clinicians with having insufficient training and education.2 Therefore, the need for continuing competency is an extremely important issue within all professions.

The issue of continuing competency and the methods by which competency is measured or assessed is not a new topic. For a half century accreditation boards, health
profession educators, and private organizations have advocated to state professional licensing boards to address continuing competency for health care practitioners. In 1995, the Pew Health Professions Commission issued the report, "Reforming Health Care Workforce Regulation: Policy Considerations for the 21st Century", in which it called for changes in the way health care practitioners demonstrate competency. The primary foundation for the changes was to assure patient safety in the continuously evolving health care environment. Practitioners, professional organizations, and licensure boards met to discuss the Pew report and the best way to implement methods and changes in the evaluation of continuing competency. The changes were to ensure "health care professionals who demonstrated minimum levels of competence when they earn their license continue to be competent years and decades after they have been in practice." As a result, several states have mandated continuing education units (CEUs) as the sole provider for assuring competency and license renewal. Research has shown CEUs alone are not sufficient to ensure professional competency. Some organizations have implemented competency assurance programs using peer review and feedback to assess for quality and appropriateness of care. However, peer review and feedback is unreliable due to bias data, which threatens the validity of the judgments supported by the data. Virtual simulation, a process in which a practitioner can practice maneuvers prior to the patient, is becoming popular among competency assurance programs. Cognitive assessments are also employed by competency assurance programs to ensure theoretical knowledge.
Although the discussions were started over a decade ago, there has been inadequate progress made on assuring continuing competency. The ability to provide safe and quality health care depends on establishing a competent health care workforce, which begins from the start of their practice and must be maintainable throughout their practice. Patients and their families expect each caregiver to be competent to perform their duties within their professional scope of practice. It is the responsibility of health care professionals, employers, and licensing boards to promote and document continuing competency, while abiding by the principles of evidence-based medicine to establish standards of practice.

Consequently in 2007, a respiratory therapy department in a large metropolitan academic medical center implemented an Annual Competency Assurance Program (ACAP). The overall goal of the program was to provide quality patient care, while improving patient outcomes, and decreasing medical errors. The program was designed to ensure staff therapists are proficient and maintain competency in all areas of practice. The program mandated all staff therapists to participate and successfully pass all three sections of ACAP. Typically a staff therapist can complete all three sections of ACAP within four hours from start to end. Prior to ACAP, staff therapists are provided educational material via the intranet, in-service modules, and unlimited time to practice on simulation equipment. Peer reviewers in the department are available to answer questions and coach staff on performing procedures.

Section one of ACAP consists of topics reviewed by poster board, followed with a short assessment or quiz. The topics chosen included new policies, procedures,
charting, and patient assessment. Section two consists of performance of procedures, in which a peer reviewer observes and assesses a therapist’s technique. The peer reviewer gives a scenario to the therapist and then asks the therapist to perform the procedure. The peer reviewer is not allowed to lead or guide the therapist through the procedure. The topics chosen for the performance procedure are related to new procedures and current procedures. Each performance procedure is graded using a criteria form. The criteria form indicates the tasks which need to be completed in order to accomplish the performance procedure. Each task is awarded points for completion; if the task is not performed correctly the peer reviewer will award no points. If there are no points awarded the peer reviewer must mark one of the following: 1) needed support, more practice needed or took too much time, 2) skill performed incorrectly, needs to re-learn skill, 3) unable to demonstrate skill. Section three consists of a multiple choice exam, called a cognitive assessment. The topics chosen for the cognitive assessment pertain to the performance procedures and topics related to respiratory therapy with respect to the scope of practice. The cognitive assessment is developed by the peer reviewers within the department. Each staff therapist rotates through each section receiving a graded score for each performance procedure, the cognitive assessment, and the review of poster boards. If the staff therapist fails any portion of ACAP, remediation follows after the completion of ACAP. The staff therapist meets with a peer reviewer to discuss the items which were not passed. Then the staff therapist is reassessed one week after the remediation.
While ACAP addresses the issue of competency assurance, ACAP does not evaluate for retention. According to Henderson, "Continuing competency is the ongoing action consistent with the idea that constant learning and application of new skills and knowledge are key to competence." To ensure the efforts invested into ACAP are effective, an evaluation of retention must be assessed. Retention is the difference between the ACAP scores and the scores 180 days after ACAP. For this study, retention will determine if a therapist is applying the new skills and knowledge to ensure continuing competency.

The purpose of this quasi experimental study is to evaluate retention of performance procedure scores and cognitive assessment scores 180 days after the Annual Competency Assurance Program. The study will try to answer the following questions:

1. Is there a difference between the performance procedures scores and cognitive assessment scores at the ACAP and the performance procedures scores and cognitive assessment scores 180 days after?

2. Is there a difference in retention for frequently used performance procedures?

3. Is there a difference in retention for infrequently used performance procedures?

4. Is there a difference in retention with the use of monthly electronic educational interventions?

5. Is there a difference in retention without the use of monthly electronic educational interventions?
6. Is there a relationship between the number of preparation hours and retention of performance procedure scores and cognitive assessment scores?
Chapter 2: Review of Literature

This review of literature, addresses topics related to continuing competency by investigating licensure and credential renewal, continuing education units, medical errors, methods implementation and evaluation within the health care profession. This literature review was conducted using Pubmed, CINAHL, and Google, researching articles, professional organizations, and peer reviewed papers. The search was conducted from 1990-2009 using the following key words: competency assurance in respiratory therapy, competency assurance, measuring competency, competency documentation, health care competency, continuing competency, and competency evaluation.

Recommendations for continuing competency have been in discussion for half a century. Since the late 1990’s the concern for continuing competency has grown due to an unacceptable number of preventable medical errors and issues with quality of care. The Institute of Medicine (IOM) released a report in April 2003, "Health Professions Education- A Bridge to Quality", which suggested all licensed health care professionals demonstrate their continuing competency to practice patient care. The IOM reported, "health care professionals are not adequately prepared to provide safe and quality care, and are not adequate in their ongoing proficiency." The IOM suggested accreditation, licensing, and certification organizations should ensure health care practitioners develop and maintain competency in five core areas: 1) delivering patient centered care, 2)
working as part of an interdisciplinary teams, 3) practicing evidence based medicine, 4) focusing on quality improvement, and 5) using information technology. Also, the IOM report identified continuing education as being insufficient to demonstrate a practitioner’s competency. Instead, the IOM suggests, competency of a practitioner should be evaluated through a systems approach, which includes remediation or interventions to focus on specific areas where competency is lacking. The IOM suggested the evaluation gap be closed by testing the practitioner to give surety the competencies are not only attained, but exhibited during patient care procedures.\(^7\)

Although the IOM has put forth suggestions for continuing competency, the Joint Commission (JCAHO) is an accreditation organization, which requires competency assessments. JCAHO was formed in 1951 to accredit and certify health care organizations.\(^8\) The Social Security Amendments of 1965, allowed hospitals accredited by JCAHO to participate in Medicare and Medicaid programs. Under this accreditation participation JCAHO has the authority to terminate a health care organization from the Medicare and Medicaid program if they are found to be deficient in quality of care.\(^9\) JCAHO requires hospitals to complete and document competency assessments for the purpose of maintaining quality of care. The assessment may include an array of methods such as peer feedback and review, verifying certification and licensure, reviewing test results with written or oral competency, observation of skills, or collecting information from previous employers. The assessments must be focused on the clinical skills needed to perform the health care practitioner’s assignment. However, a self assessment is unacceptable and does not represent competency.\(^8\)
Even though JCAHO has a clear definition for continuing competency, a definition has not been clarified among the many professions within health care. The Citizen Advocacy Center (CAC) put a call to health care professions in 2000 to agree upon a selected definition, which could be adopted to describe assuring competency. One definition used by the National Organization for Competency Assurance (NOCA) states, “Continuing competency suggests current, ongoing action consistent with the idea that constant learning and application of new skills and knowledge are key to competence.”

There are many terms and definitions for competency assurance such as “licensure maintenance”, used by the National Council of State Board of Nursing. Health care professions have not agreed upon a definition because the choice of words and how they imply the purpose, responsibility, and approach to competency assurance are not agreeable.

There have been several methods trialed for evaluating competency, such as records review, on site practice reviews, performance evaluations, and written or oral examinations. The traditional methods of evaluating continuing competency are peer review and continuing education units (CEU’s), but no one method for evaluating continuing competency has provided sufficient evidence it is more reliable than the other. There is more documentation on the methods which did not succeed versus successful methods.

Peer review is the traditional method of continuing competency and the most widely used by JCAHO and legal authorities. The process is an evaluation by other health care practitioners of the quality and appropriateness of care executed by a
practitioner. The government supports peer review through the Health Care Quality Improvement Act of 1986 (HCQI), which argues the need for effective peer review.\textsuperscript{12}

Peer review can be conducted in many formats such as surveys or in person interviews. The reviewer can be managers, peers, customers, and employers who can give feedback on a practitioner's performance. However, the many avenues in which peer review can be employed there is often difficulty in obtaining valid data. The reliability of the information, especially if less than desired, may threaten validity of judgments supported by the data. Some nursing unions have also questioned the legality of peers reviewing peers and suggested supervisors conduct the review.\textsuperscript{6}

Many health professions now require CEU’s as the sole criterion for renewal of licensure, credentialing, and competency. For example, The Ohio Respiratory Care Board (ORCB), states a respiratory therapist must complete 1 contact hour of ethics, 15 contact hours of content related to clinical respiratory care, and 4 contact hours of indirect content or pass a reexamination according to the boards renewal requirements. The ORCB recognizes CEU’s awarded by professional associations and respiratory educational programs without scrutiny of their methods or standards. The ORCB currently does not have licensees demonstrate or document continuing competency as a condition for license renewal.\textsuperscript{13}

CEU’s may take the form of three categories: passive (lectures, seminars, group presentations), interactive (workshops, rounds, in-services), and self-directed (internet based education, audio tapes, video presentations).\textsuperscript{14} CEUs often lack assessments for participants who engage in continuing education units. For example, the CAC reported
faculty lecturers seldom know the participants in the audience and never give the opportunity for self assessment of the lecture. The CAC also reported most lectures are suited for the average professional, rarely addressing issues related to the needs of the individuals.\textsuperscript{15} Currently the evaluation methods for CEU’s has concentrated on attendance rather than the impact of the education of the program on patient care and practice, according to Kester, Rice, and Stroller.\textsuperscript{14} The CAC suggested CEU’s should be administered, but with a pre and post competency assessment test, with appropriate topics to measure new knowledge and skill level.\textsuperscript{6}

Continuing education is now being questioned for the assurance for competency because of the lack of active participation and demonstration of knowledge and skills. Dental leaders Schleyer and Dodell conducted a survey on how computer based CEU programs are regulated for license renewal amongst dentists. The survey reviewed the 1) license renewal period, 2) the limitations on clinical and nonclinical topics, 3) onsite versus independent study courses, 4) required number of CEU hours, and 5) other criterion regarding CEUs in all 50 states and the District of Columbia. Schleyer and Dodell found 45 states and the District of Columbia require CEUs for license renewal. There was an average of 20 hours of CEUs required to per year.\textsuperscript{16} The results are as follows:

- 65% percent of the states put constraints on the number of independent study CEU
- 7 states put restrictions on the number of clinical and non clinical CEU hours
• 17 states restricted the number of non clinical hours
• 10 states specified a minimum number of clinical hours

The survey found computer based CEUs had no requirements or restrictions. The lack of provisions for computer based CEUs gave uncertainty to dental leaders, according to Schleyer and Dodell, “The decision to require CE for licensure renewal was controversial. Dental leaders debated whether such a step really would lead to an improvement of practitioner competence.”

Private organizations such as the Citizen Advocacy Center (CAC) believe CEU’s alone are not enough to gauge if a professional is competent enough to fulfill their duties. A recommendation by, Swankin, LeBuhn, and Morrison is to eradicating CEU’s for health care practitioners in their agenda for state legislature in 2006.

It is difficult to measure the effectiveness of CEU’s, which is due to few studies and the barriers presented when assessing the outcomes for improved patient care. Currently CEU’s do not specify the need to examine outcomes related to improved patient care from their programs. Research conducted by the National Organization for Competency Assurance (NOCA) revealed professionals only retain about 10% of the information presented in a lecture. The research also revealed the quality of the learning is seldom assessed for appropriateness; most experiences are not useful to the workplace. Professionals aren’t evaluated or asked to demonstrate what they have just learned.

However, there are methods which professional organizations are putting into practice, such as The National Respiratory Care Board (NBRC). In 2002 the NBRC implemented a continuing competency program, which requires all respiratory therapists
to complete to maintain their credentials. The program was designed to “enhance and/or contribute to the continuing competence of credentialed respiratory therapist and pulmonary function technologist and demonstrate concern for patient safety.”

The program requires all therapists to show proof of continuing education and current standards of practice have been met. There are three options in which a therapist can complete this task: complete 20 hours of CEU’s, retake and pass the respective examination for the highest credential held, pass an NBRC credentialing examination not previously completed. Although, the program appears to be geared towards the concern of patient safety and competency, there is no demonstration of psychomotor competency. The CEU’s can be the same CEU’s used for licensure; the material may not pertain to typical job duties. The testing is not a test of psychomotor skill but of cognitive skills. A simulation study has shown in-service and lecture training implants medical knowledge, but lacks teaching for the motor skills needed to perform the task. A practitioner might understand the concept and procedure, but may not be able to perform the psychomotor skill in the clinical environment.

A mail survey conducted by Van Scoder evaluated respiratory therapists' attitudes toward re-credentialing, using a random sample of 1,000 respiratory therapist from the 23,996 active member list of the American Association for Respiratory Care (AARC). The survey consisted of questions relating to primary job duties, credential held by participants, numbers of years worked in respiratory therapy, and statements concerning re-credentialing. The study revealed 46% of respiratory therapists do not support credential renewal associated with the NBRC. The reason is due to the lack of evidence
to support credential renewal guarantees a therapist competency or improves competency. Only 44% of respondents agreed to support CEUs if credential renewal were a requirement given from the NBRC.\textsuperscript{18}

The results of the survey are questionable because this was a voluntary survey. As with any survey there is concern if the participants were representative of the population of respiratory therapists. The study was not able to access respiratory therapists who were not active members of the AARC, which excluded potential participants. With any survey there is also concern with non response error, in this survey 438 (43.8\%) were not returned for useable data.\textsuperscript{18}

However, other studies which use simulation technology to compare traditional methods conducted by Tuttle, provide information on methods of training and evaluating competency. The study focused on proper procedure and psychomotor skills of the respiratory care department, performing the mini bronchoalveolar lavage (mini BAL), at the University of Pittsburgh Medical Center Presbyterian Hospital. Using three educators from the respiratory care department as evaluators, the study was conducted in 4 phases. In phase one, 24 staff respiratory therapist (RTs) were randomly selected to undergo a simulation based test on the mini-BAL, using a patient simulator mannequin, in a virtual ICU setting. In phase two, 83 staff RTs were allowed unlimited access to a Web based course pertaining to the mini-BAL, including a video. They were asked to take 2 tests, one online, then one on a patient simulator. In phase three, the same 83 RTs were instructed to attend a workshop, which used the patient simulator for training and
practice, then reevaluated with the patient simulator test. In phase four, skill retention was evaluated using the simulator tests 90 days after the initial test.³

Phase one yielded a mean score of 73 ± 10%, representing the traditional training methods and phase two yielded a mean score 77 ± 11%, representing the impact of the Web based curriculum. Overall, the result of phase one and two concluded the unlimited access to the Web and the traditional method did not have an impact on performance. However, there was improvement in phase three with 95 ± 5% of the participants showing an effect from the simulation based training. Phase four also showed an increase in skill retention with 92 ± 8% of participants being assessed 90 days later. Both phase three and four concluded simulator training had an effect on performance.³

Although, the study appears to be valid, the study was only conducted at one facility. Without repeatability in other facilities, it is questionable if the simulator testing would produce the same results. The study only describes the average years of experience and average numbers of mini-BALs of the 24 RTs in phase one. There is no further description of the 83 RTs in phase two and three or of the 24 RTs in phase four. Also, no explanation was presented in determining the logic behind the 24 randomly selected RTs for phase one and phase four. The curriculum and video used in this study was not described and/or provided any information showing proof of validity and reliability. It is questionable if the content meets the current standards of practice, along with policy and procedure. In phase three it was discovered that six new employees who only underwent the simulator training, thus skewing the results of phase three.³
In another study, Crawford used virtual reality and written assessments to determine knowledge and skill in flexible bronchoscopy, the combination of both a written assessment and skill evaluation are observed. The participants were twelve volunteers in a university pulmonary training program. They were asked to complete a 50 question exam relating to bronchoscopy theory and to identify and enter five particular bronchial segments on command using a virtual reality skill station. The results yielded 71% of the trainees correctly identifying and entering the bronchial segments on command. Furthermore, 50% (3/6) of the trainees who completed more than 200 bronchoscopies effectively entered all five segments. The other 50% who had performed less than 200 bronchoscopies did not effectively entered and identify all five segments. Only 51% of the questions on the 50 question exam were answered correctly from the twelve trainees. The study showed no relationship between academic knowledge and technical skill. Furthermore, neither skill nor knowledge was related with the number of bronchoscopies performed or years of training.\textsuperscript{19}

The study is limited due to the evaluation of only a few trainees in a single institution, which warrants additional studies in larger institutions. If the study was duplicated in larger institutions multiple times one could then make more confident statements concerning the results. Although, the results can't be confidently stated, the trainees concluded, "the simulation was realistic, simulator practice would improve skill and the written assessment would benefit as a learning instrument."\textsuperscript{19}

The testing of psychomotor and cognitive skill retention is a major factor for continuing competency; by providing evidence the prior assessments were effective. In a
quasi experimental study conducted by Bishop, eleven RTs from a 253 bed hospital were assessed for psychomotor and cognitive skill retention of tracheal intubation one year after initial training. The study chose tracheal intubation because it is an infrequently used skill within the hospital where the RTs worked. The median number of tracheal intubations by any given therapist was 5, while the range was from 0 to 14 per year.

Before the psychomotor retention assessment and recertification, RTs took a cognitive exam consisting of 21 questions pertaining to pre-intubation assessment of the airway, airway anatomy, head position, appropriate use of blades, and other factors associated with airway management. Then RTs were taken to the operating room where an anesthesiologist observed the intubation to see if the critical steps were followed, while a second observer checked the skills performed. The RTs were only recertified by the attending anesthesiologist when all of the steps were performed correctly and the intubation was successful.

The results showed a poor correlation (r=0.25, p>0.1) between the number of intubations for emergencies in the prior year and the number of intubations required to be recertified. A correlation of 0.25 is not statically significant and would not be clinically useful. There was a negative correlation (r=-0.8, p<0.05) between the number of intubations required to be recertified and the score on the 21 question exam, the higher the score the less intubations needed for recertification. The findings provide evidence that the infrequent routine of intubation did not ensure psychomotor skill retention. There was also suggested evidence that cognitive knowledge does not correlate with the skill performance necessary to complete the task.
The limitations to this study are the facility size where the study was conducted. The 253 bed hospital with only eleven RTs may provide evidence there was a small patient population, which may support the reason for the lack of psychomotor skill retention. A larger facility may provide different results because of patient population providing a better opportunity of tracheal intubation. Other limitations in the study were the assessment results from the previous year. The previous results could have provide a foundation to compare the current results to see if there was an improvement or no improvement.  

In conclusion, the studies have provided evidence continuing competency is better assessed through demonstration of psychomotor skill versus a cognitive exam. These studies have provided evidence that infrequent use of skills leads to loss of psychomotor skills, which could potentially cause harm to patients. None of the above studies have been conducted in a large facility with an active competency assurance program. The studies also have not provided evidence of the number of hours participants put forth to prepare for such assessments. There have been no interventions to assist in the retention of psychomotor skills after the initial assessment.
Chapter 3: Methods

During September, 2010 a large metropolitan academic medical center, conducted an Annual Competency Assurance Program for 175 staff respiratory therapists within in the department. From the 175 therapists only 147 therapists perform the procedures relating to this study; they constitute the population for this study. The program consisted of performing procedures and a cognitive assessment. The questions on the cognitive assessment pertain to the performance procedures and other topics related to respiratory therapy with respect to the scope of practice. Prior to ACAP, staff was provided access to educational material via the intranet, in-service modules, and unlimited time to practice on simulation equipment. Peer reviewers were available to answer questions and coach staff on performance procedures. Topics were chosen based upon frequency of use and new policies and procedures. For the year 2010 the following were chosen: seven performance procedures, sixteen topics for review by poster board with a short quiz, and a 30-50 question multiple choice cognitive assessments (number of questions depends on primary work environment). Staff also completed a short inventory on the time spent preparing for ACAP and their demographic characteristics.

For the purpose of this study two procedures were chosen to be re-evaluated based upon their frequency of use. The mini bronchoalveolar lavage (Non-Bronch BAL) was chosen as the frequently used performance procedure. The mini BAL is performed
consistently in each of the intensive care units (ICU) by staff therapists. The mini BAL is also a frequently ordered procedure by physicians to test for bacterial, viral, or fungal growth. Tracheostomy tube changes were chosen for the infrequently used performance procedure. The tracheostomy tube change policy and procedure was revised in 2009 from a physician only procedure, to include staff therapist who are qualified to reinsert a tracheostomy tube. Since a tracheostomy tube change does not occur consistently it was considered infrequent. To ensure inter-rater reliability, I observed the peer reviewer for the BAL performance procedure and tracheostomy tube change for the appropriate use of the criteria form. Upon comparing scores with the evaluator, the percent of agreement was found to be 81%.

The study was reviewed and approved by the Behavioral and Social Science Institutional Review Board (2010B0385). Recruitment for the study began after ACAP, with a call for 40 volunteers (23% of the available population) who participated in ACAP. Recruiting was conducted by email (see Appendix A). Four recruitment reminders were sent by email during a three week period prior to the start of the study (see Appendix B). Upon volunteering to participate, therapist were asked to send a reply email for consent providing the last four digits of their primary phone number. This number was used to identify each therapist throughout the study. The participating therapists were given a five dollar Starbucks® gift card initially and entered into a drawing for a fifty dollar gift card, to be awarded at the end of the study. Then the therapists were randomly divided into two groups. Group one therapists received no electronic educational intervention during the 180 day period; this was the control group.
Group two therapists received electronic educational interventions, 120, 150, 180 days following ACAP during a 180 day period; this was the experimental group. The electronic educational intervention consisted of three slide shows using PowerPoint® on the topics of: 1) review of tracheostomy tubes, 2) instruction on performing a BAL, 3) instruction on performing a tracheostomy tube change. The BAL slide show was taken directly from the respiratory therapy department. The remaining slide shows I created using the policy and procedures and educational material from the respiratory therapy department. Once the 180 day period elapsed portions of the ACAP were recreated. I evaluated the performance procedure 180 days after ACAP using the original criteria form used at ACAP (see Appendix C and D). After the performance of the procedures, the participants completed a cognitive assessment (see Appendix E). Only questions from the original assessment which pertain to the performance procedures comprised the shorten assessment. The cognitive assessment was graded using the original score sheet from the ACAP (see Appendix F).

An independent t-test was used to compare ACAP means between the experimental and control groups. Paired t-tests were used to determine if there were any statistically significant differences between ACAP and the 180 day posttest scores in both groups for BAL and tracheostomy tube changes. A Pearson correlation coefficient was calculated to determine if there was a statistically significant relationship between the number of preparation minutes and performance procedures scores and cognitive assessment scores, independent of all other variables. The alpha level was set at p < 0.05, with a 95% confidence level.
Chapter 4: Results and Discussion

Nineteen respiratory therapists volunteered and consented to participate in the study. However, one participant was excluded from the study because they were not a participant at ACAP, but an evaluator. The experimental and control group each had nine volunteers. Prior to the start of the study the pretest scores from the experimental and control groups were compared. Table 1 is a comparison of means in the ACAP scores. There were no significant differences among the groups, suggesting both groups were evenly distributed.

<table>
<thead>
<tr>
<th></th>
<th>Control Group</th>
<th>Experimental Group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- BAL Performance</td>
<td>96.78 (6.59)</td>
<td>96.67 (5.00)</td>
<td>.968</td>
</tr>
<tr>
<td>Pre- Trach Performance</td>
<td>97.78 (6.67)</td>
<td>98.89 (3.33)</td>
<td>.661</td>
</tr>
<tr>
<td>Pre- BAL Cognitive</td>
<td>82.22 (15.64)</td>
<td>80.00 (17.32)</td>
<td>.779</td>
</tr>
<tr>
<td>Pre- Trach Cognitive</td>
<td>100 (0.00)</td>
<td>95.56 (8.82)</td>
<td>.169</td>
</tr>
</tbody>
</table>

Table 1: Comparison of Means of ACAP Scores
Table 2 describes the demographics of the experimental group and the control group. There were no observation of differences noted in the demographic characteristics of the experimental and control groups.

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental Group</td>
</tr>
<tr>
<td>Facility Employed</td>
<td></td>
</tr>
<tr>
<td>Main Facility</td>
<td>6</td>
</tr>
<tr>
<td>Satellite Facility</td>
<td>3</td>
</tr>
<tr>
<td>Primary Job Responsibilities</td>
<td></td>
</tr>
<tr>
<td>Pulmonary Function/Diagnostics</td>
<td>1</td>
</tr>
<tr>
<td>Cardiac Intensive Care Unit</td>
<td>1</td>
</tr>
<tr>
<td>Medical Intensive Care Unit</td>
<td>1</td>
</tr>
<tr>
<td>Surgical Intensive Care Unit</td>
<td>1</td>
</tr>
<tr>
<td>Neonatal Intensive Care Unit</td>
<td>2</td>
</tr>
<tr>
<td>Medical and Surgical Intensive Care Unit</td>
<td>3</td>
</tr>
<tr>
<td>Credentials Currently Held</td>
<td></td>
</tr>
<tr>
<td>Certified Respiratory Therapist</td>
<td>0</td>
</tr>
<tr>
<td>Registered Respiratory Therapist</td>
<td>9</td>
</tr>
<tr>
<td>Certified Pulmonary Function Technologist*</td>
<td>1</td>
</tr>
<tr>
<td>Perinatal/Pediatric Specialist*</td>
<td>1</td>
</tr>
<tr>
<td>Highest Academic Degree in Respiratory Therapy</td>
<td></td>
</tr>
<tr>
<td>Associate</td>
<td>6</td>
</tr>
<tr>
<td>Bachelor</td>
<td>3</td>
</tr>
<tr>
<td>Highest Academic Degree</td>
<td></td>
</tr>
<tr>
<td>Associate</td>
<td>5</td>
</tr>
<tr>
<td>Bachelor</td>
<td>4</td>
</tr>
<tr>
<td>Masters</td>
<td>0</td>
</tr>
<tr>
<td>Years Worked in Respiratory Therapy (mean and standard deviation)</td>
<td>12.56 (11.99)</td>
</tr>
</tbody>
</table>

Table 2: Demographics of Experimental and Control Groups
*In addition to RRT
Table 3 presents the means and standard deviations of the ACAP and 180 day posttest for BAL cognitive, BAL performance, tracheostomy tube change cognitive and tracheostomy tube change performance for the experimental and control groups.

Compared to the ACAP scores both groups showed a decline on all four measures on the 180 day posttest scores. It should be noted that the BAL cognitive posttest scores fell below the minimum 80% passing threshold. The control group showed no statistically significant differences between ACAP scores and 180 day posttest scores on all four measures. However, there was a statistically significant difference for the tracheostomy tube change performance in the experimental group with a \( p = 0.04 \). The results also identified the BAL performance procedure in the experimental group was approaching a statistically significant difference with a \( p = 0.062 \).

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Experimental Group n = 9</th>
<th>Control Group n = 9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
</tr>
<tr>
<td>BAL-Cognitive</td>
<td>80.00 (17.32)</td>
<td>68.89 (26.67)</td>
</tr>
<tr>
<td>BAL-Performance</td>
<td>96.67 (5.00)</td>
<td>85.56 (18.11)</td>
</tr>
<tr>
<td>Trach Tube Change Cognitive</td>
<td>95.56 (8.82)</td>
<td>88.89 (14.53)</td>
</tr>
<tr>
<td>Trach Tube Change Performance</td>
<td>98.89 (3.33)</td>
<td>93.89 (7.82)</td>
</tr>
</tbody>
</table>

Table 3: Means and Standard Deviations of Pretest and Posttest
Table 4 presents the differences in ACAP minus the 180 day post test scores for BAL cognitive, BAL performance, tracheostomy tube change cognitive and tracheostomy tube change performance for the experimental and control groups. The difference in score is the definition of retention. Both groups showed a negative difference in scores.

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Experimental Group n = 9</th>
<th>Control Group n = 9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference</td>
<td>Difference</td>
</tr>
<tr>
<td>BAL-Cognitive</td>
<td>-11.11 (30.19)</td>
<td>-8.89 (17.64)</td>
</tr>
<tr>
<td>BAL-Performance</td>
<td>-11.11 (15.37)</td>
<td>-12.33 (20.83)</td>
</tr>
<tr>
<td>Trach Tube Change Cognitive</td>
<td>-6.67 (17.32)</td>
<td>-8.89 (14.53)</td>
</tr>
<tr>
<td>Trach Tube Change Performance</td>
<td>-5.00 (6.12)</td>
<td>-3.33 (8.66)</td>
</tr>
</tbody>
</table>

Table 4: Difference in ACAP and 180 Day Posttest Scores

Table 5 presents the Pearson correlation coefficients assessing the relationship between the number of preparation minutes to retention of BAL performance, BAL cognitive, tracheostomy tube change performance, and tracheostomy tube change cognitive for all 18 participants. Three of the four correlations coefficients between the number of minutes and retention were approaching a negative 1, suggesting a weak relationship.
Table 5: Correlation of Preparation Minutes and Retention (n=18)

Although it is often difficult to determine how long a practitioner maintains their skills; it is thought by many knowledge achieved through simulation is retained longer than knowledge achieved through a lecture.³ Our study adds a new dimension to the investigation of continuing competency. The study is different from other studies in that it attempts to investigate retention, by using an experimental approach with electronic education intervention over a longer length of time. While previous studies have tested for retention at the 90 day and one year interval, our study tested at the 180 day interval. We found all scores trending in a decline and BAL cognitive fell below the competency level for both groups. The declines may be attributed to the pretest being a requirement directly related to job evaluations. However, the posttest was a voluntary participation, in which the need to perform well was not imperative.

Preparation minutes and retention showed a weak relationship, but three of the four were approaching negative 1, and none statistically significant. The increase in
preparation minutes did not have an impact on the retention scores nor did the preparation minutes hinder the scores.

One of four assessments in the experimental group showed a statistically significant difference in the tracheostomy tube change performance score, even though the scores decline. The change was small and did not decline below the competency level. One possible cause for the decline may be attributed to a lack of review of the electronic educational interventions. The study did not have a system in place to monitor or measure how many times the participants viewed the material. Tuttle’s study had a similar problem in not being able to monitor the Web-based material. The results from Tuttle’s study found the Web-based and video material did not significantly impact procedure performance. Due to the lack of verification in monitoring the electronic educational intervention there is no evidence the study contributed to the decline in scores. The study was also unable to determine the amount of interaction among both groups.

When considering the standard deviations of the mean scores for the experimental and control groups there were relatively large amounts of variability, most likely due to the small sample size. The high variability is comparable to other studies such as Tuttle’s study on simulation technology, where the sample size was also small with lots of variability. The limitation of small sample size does not rule out the possibility of random chance, especially with the statistically significant difference in tracheotomy tube change in the experimental group. There is also the possibility the small sample size could have skewed the results causing inflation or deflation in the mean values.
The frequency of the procedure may have also had an effect on the results. The BAL was considered to be the frequently used skill in both facilities, but during the study it was found the BAL was not frequently used on night shift at the second institution. It was found all seven of the participants work night shift at the second institution, which allowed for limited and inconsistent opportunities for BAL performance. The limited opportunity may have been one the forces behind the decline in posttest performance and cognitive BAL assessment scores. The minimum passing threshold was set at 80% per the institution; however the pretest scores were barely above passing. It should be noted that only the posttest scores for BAL cognitive fell below the passing threshold. Tuttle’s and Bishop’s studies also noted the perceived frequency of use was inconsistent among staff, which reflected in the overall scores and variability.\textsuperscript{3,7}

When defining retention as no difference in ACAP and 180 posttest scores, the study suggests some retention. Even though the scores decline there is some evidence of retention because three of the four measures remained above the minimum competency level. All scores in both groups, except the BAL cognitive assessment, remained above the minimum competency level. The study results suggest without the use of simulation the scores may have further declined, possibly below the competency level.

Limitations to this study include voluntary participation, which lead to a small size, therefore impacting results. Tuttle's study could make no direct comparison of retention at the 90 day interval, due to a limitation in the data and a small sample size.\textsuperscript{4} ACAP was conducted in a nearby controlled academic university, during a compensated time. For convenience of the participants this study was conducted at two different
academic medical centers before and after work hours. The difference in location and time may have contributed to the decline scores depending upon fatigue, mood, and anxiety. There was no verification to establish frequency of each procedure. There was no verification or evidence that the experimental group actually viewed the educational materials.

Continuing competency programs such as ACAP should be further studied to determine their effectiveness in cognitive and performance retention. Further research should also be conducted to control for the verification of viewing the educational material and establishing the frequency of procedure. Further research should also be conducted to determine if programs such as ACAP leads to improved quality of care and efficiency.
Chapter 5: Professional Journal

Continuing Competency: An evaluation for retention 180 days after the Annual Competency Assurance Program

By

Brittany R. Locklear, B.A
The Ohio State University
2011

F. Herbert Douce, MS, Advisor, Sarah Varekojis, PhD, Jill Clutter, PhD
Abstract

**Background:** Respiratory therapists at a large metropolitan academic medical center completed an Annual Competency Assurance Program (ACAP) to assess competency through performing procedures and cognitive assessments. **Objective:** The purpose of this study is to: 1) determine if there is a statistically significant difference in retention of performance procedure scores and cognitive assessment scores 180 days after ACAP, 2) with and without the use of electronic educational intervention. **Methods:** Eighteen therapists who attended 2010 ACAP were recruited to participate in the study. Participants were randomly divided into two groups receiving either electronic educational intervention (experimental group) or no electronic educational intervention (control group). Each volunteer in the study participated in a short recreation of ACAP, completing two performance procedures: tracheostomy tube change (infrequently performed procedure) and a bronchoalveolar lavage (frequently performed procedure). Both performance procedures were conducted, evaluated, and graded using the original criteria from ACAP. The volunteers also completed a multiple choice cognitive assessment, with questions pertaining to the performance procedures. The cognitive assessment was conducted and graded using the original criteria from ACAP. **Results:** Compared to the ACAP scores both groups showed a decline on all four measures on the 180 day posttest scores. The BAL performance score fell below the minimum competency level. The tracheostomy tube change performance had a statically significant change, p = 0.04, although the scores declined. **Conclusion:** Three of the four
This is the first sentence of the page.

measures remained above the minimum competency level, although all scores declined, suggesting some retention.

Introduction

Health care is a constantly changing environment with new knowledge and technology implemented every day. Individual practitioners were successful in completing their respective education, examination, and licensure at one point in time. However, the initial skills and knowledge are not adequate to assure a practitioner is competent after the passage of a few years in this changing environment. Practitioners need to demonstrate their continuing competence to ensure the safety of patients. In 1999, the Institute of Medicine (IOM) reported the headline, “Medical mistakes 8th top killer. Medical errors blamed for many deaths; as many as 98,000 a year in U.S. linked to mistakes.”¹ This number has since grown to more than 100,000 deaths per year and 15 million incidents of medical harm in the U.S., according to the Patient Safety Advocates’ in 2009.² One of the reasons listed for the medical errors included clinicians with having insufficient training and education.² Therefore, the need for continuing competency is an extremely important issue within all professions.

Several states have mandated continuing education units (CEUs) as the sole provider for assuring competency and license renewal. Research has shown CEUs alone are not sufficient to ensure professional competency.³ Some organizations have implemented competency assurance programs using peer review and feedback to assess for quality and appropriateness of care. However, peer review and feedback is unreliable
due to bias data, which threatens the validity of the judgments supported by the data. Virtual simulation, a process in which a practitioner can practice maneuvers prior to the patient, is becoming popular among competency assurance programs. Cognitive assessments are also employed by competency assurance programs to ensure theoretical knowledge.

Consequently in 2007, a respiratory therapy department in a large metropolitan academic medical center implemented an Annual Competency Assurance Program (ACAP). The overall goal of the program was to provide quality patient care, while improving patient outcomes, and decreasing medical errors. The program was designed to ensure staff therapists are proficient and maintain competency in all areas of practice. The program mandated all staff therapists to participate and successfully pass all three sections of ACAP. Typically a staff therapist can complete all three sections of ACAP within four hours from start to end. Prior to ACAP, staff therapists are provided educational material via the intranet, in-service modules, and unlimited time to practice on simulation equipment. Peer reviewers in the department are available to answer questions and coach staff on performing procedures.

While ACAP addresses the issue of competency assurance, ACAP does not evaluate for retention. According to Henderson, "Continuing competency is the ongoing action consistent with the idea that constant learning and application of new skills and knowledge are key to competence." To ensure the efforts invested into ACAP are effective, an evaluation of retention must be assessed. Retention is the difference between the ACAP scores and the scores 180 days after ACAP. For this study, retention
will determine if a therapist is applying the new skills and knowledge to ensure continuing competency.

The purpose of this quasi experimental study is to evaluate retention of performance procedure scores and cognitive assessment scores 180 days after the Annual Competency Assurance Program. The study will try to answer the following questions:

1. Is there a difference between the performance procedures scores and cognitive assessment scores at the ACAP and the performance procedures scores and cognitive assessment scores 180 days after?
2. Is there a difference in retention for frequently used performance procedures?
3. Is there a difference in retention for infrequently used performance procedures?
4. Is there a difference in retention with the use of monthly electronic educational interventions?
5. Is there a difference in retention without the use of monthly electronic educational interventions?
6. Is there a relationship between the number of preparation hours and retention of performance procedure scores and cognitive assessment scores?
Methods

During September, 2010 a large metropolitan academic medical center, conducted an Annual Competency Assurance Program for 175 staff respiratory therapists within in the department. From the 175 therapists only 147 therapists perform the procedures relating to this study; they constitute the population for this study. The program consisted of performing procedures and a cognitive assessment. The questions on the cognitive assessment pertain to the performance procedures and other topics related to respiratory therapy with respect to the scope of practice. Prior to ACAP, staff was provided access to educational material via the intranet, in-service modules, and unlimited time to practice on simulation equipment. Peer reviewers were available to answer questions and coach staff on performance procedures. Topics were chosen based upon frequency of use and new policies and procedures. For the year 2010 the following were chosen: seven performance procedures, sixteen topics for review by poster board with a short quiz, and a 30-50 question multiple choice cognitive assessments (number of questions depends on primary work environment). Staff also completed a short inventory on the time spent preparing for ACAP and their demographic characteristics.

For the purpose of this study two procedures were chosen to be re-evaluated based upon their frequency of use. The mini bronchoalveolar lavage (Non-Bronch BAL) was chosen as the frequently used performance procedure. The mini BAL is performed consistently in each of the intensive care units (ICU) by staff therapists. The mini BAL is also a frequently ordered procedure by physicians to test for bacterial, viral, or fungal
growth. Tracheostomy tube changes were chosen for the infrequently used performance procedure. The tracheostomy tube change policy and procedure was revised in 2009 from a physician only procedure, to include staff therapist who are qualified to reinsert a tracheostomy tube. Since a tracheostomy tube change does not occur consistently it was considered infrequent. To ensure inter-rater reliability, I observed the peer reviewer for the BAL performance procedure and tracheostomy tube change for the appropriate use of the criteria form. Upon comparing scores with the evaluator, the percent of agreement was found to be 81%.

The study was reviewed and approved by the Behavioral and Social Science Institutional Review Board (2010B0385). Recruitment for the study began after ACAP, with a call for 40 volunteers (23% of the available population) who participated in ACAP. Recruiting was conducted by email (see Appendix A). Four recruitment reminders were sent by email during a three week period prior to the start of the study (see Appendix B). Upon volunteering to participate, therapist were asked to send a reply email for consent providing the last four digits of their primary phone number. This number was used to identify each therapist throughout the study. The participating therapists were given a five dollar Starbucks® gift card initially and entered into a drawing for a fifty dollar gift card, to be awarded at the end of the study. Then the therapists were randomly divided into two groups. Group one therapists received no electronic educational intervention during the 180 day period; this was the control group. Group two therapists received electronic educational interventions, 120, 150, 180 days following ACAP during a 180 day period; this was the experimental group. The
electronic educational intervention consisted of three slide shows using PowerPoint® on the topics of: 1) review of tracheostomy tubes, 2) instruction on performing a BAL, 3) instruction on performing a tracheostomy tube change. The BAL slide show was taken directly from the respiratory therapy department. The remaining slide shows I created using the policy and procedures and educational material from the respiratory therapy department. Once the 180 day period elapsed portions of the ACAP were recreated. I evaluated the performance procedure 180 days after ACAP using the original criteria form used at ACAP (see Appendix C and D). After the performance of the procedures, the participants completed a cognitive assessment (see Appendix E). Only questions from the original assessment which pertain to the performance procedures comprised the shorten assessment. The cognitive assessment was graded using the original score sheet from the ACAP (see Appendix F).

An independent t-test was used to compare ACAP means between the experimental and control groups. Paired t-tests were used to determine if there were any statistically significant differences between ACAP and the 180 day posttest scores in both groups for BAL and tracheostomy tube changes. A Pearson correlation coefficient was calculated to determine if there was a statistically significant relationship between the number of preparation minutes and performance procedures scores and cognitive assessment scores, independent of all other variables. The alpha level was set at p < 0.05, with a 95% confidence level.
Results

Prior to the start of the study the pretest scores from the experimental and control groups were compared. Table 1 is a comparison of means in the ACAP scores. There were no significant differences among the groups, suggesting both groups were equal.

<table>
<thead>
<tr>
<th></th>
<th>Control Group</th>
<th>Experimental Group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- BAL Performance</td>
<td>96.78 (6.59)</td>
<td>96.67 (5.00)</td>
<td>.968</td>
</tr>
<tr>
<td>Pre- Trach Performance</td>
<td>97.78 (6.67)</td>
<td>98.89 (3.33)</td>
<td>.661</td>
</tr>
<tr>
<td>Pre- BAL Cognitive</td>
<td>82.22 (15.64)</td>
<td>80.00 (17.32)</td>
<td>.779</td>
</tr>
<tr>
<td>Pre- Trach Cognitive</td>
<td>100 (0.00)</td>
<td>95.56 (8.82)</td>
<td>.169</td>
</tr>
</tbody>
</table>

Table 6: Comparison of Means of ACAP Scores

Nineteen respiratory therapists volunteered and consented to participate in the study. However, one participant was excluded from the study because they were not a participant at ACAP, but an evaluator. The experimental and control group each had nine volunteers. Table 2 describes the demographics of the experimental group and the control group. There were no observation of differences noted in the demographic characteristics of the experimental and control groups.
Table 7: Demographics of Experimental and Control Groups

*In addition to RRT

Table 3 presents the means and standard deviations of the ACAP and 180 day posttest for BAL cognitive, BAL performance, tracheostomy tube change cognitive and
tracheostomy tube change performance for the experimental and control groups.

Compared to the ACAP scores both groups showed a decline on all four measures on the 180 day posttest scores. It should be noted that the BAL cognitive posttest scores fell below the minimum 80% passing threshold. The control group showed no statistically significant differences between ACAP scores and 180 day posttest scores on all four measures. However, there was a statistically significant difference for the tracheostomy tube change performance in the experimental group with a \( p = 0.04 \). The results also identified the BAL performance procedure in the experimental group was approaching a statistically significant difference with a \( p = .062 \).

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Experimental Group n = 9</th>
<th>Control Group n = 9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
</tr>
<tr>
<td>BAL-Cognitive</td>
<td>80.00 (17.32)</td>
<td>68.89 (26.67)</td>
</tr>
<tr>
<td>BAL-Performance</td>
<td>96.67 (5.00)</td>
<td>85.56 (18.11)</td>
</tr>
<tr>
<td>Trach Tube Change</td>
<td>95.56 (8.82)</td>
<td>88.89 (14.53)</td>
</tr>
<tr>
<td>Cognitive</td>
<td>98.89 (3.33)</td>
<td>93.89 (7.82)</td>
</tr>
</tbody>
</table>

Table 8: Means and Standard Deviations of Pretest and Posttest

Table 4 presents the differences in ACAP minus the 180 day post test scores for BAL cognitive, BAL performance, tracheostomy tube change cognitive and tracheostomy tube change performance for the experimental and control groups. The
difference in score is the definition of retention. Both groups showed a negative difference in scores.

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference</td>
<td>Difference</td>
</tr>
<tr>
<td>BAL-Cognitive</td>
<td>-11.11 (30.19)</td>
<td>-8.89 (17.64)</td>
</tr>
<tr>
<td>BAL-Performance</td>
<td>-11.11 (15.37)</td>
<td>-12.33 (20.83)</td>
</tr>
<tr>
<td>Trach Tube Change</td>
<td>-6.67 (17.32)</td>
<td>-8.89 (14.53)</td>
</tr>
<tr>
<td>Cognitive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>-5.00 (6.12)</td>
<td>-3.33 (8.66)</td>
</tr>
</tbody>
</table>

Table 9: Difference in ACAP and 180 Day Posttest Scores

Table 5 presents the Pearson correlation coefficients assessing the relationship between the number of preparation minutes to retention of BAL performance, BAL cognitive, tracheostomy tube change performance, and tracheostomy tube change cognitive for all 18 participants. Three of the four correlations coefficients between the number of minutes and retention were approaching a negative 1, suggesting a weak relationship.
<table>
<thead>
<tr>
<th></th>
<th>Cognitive Retention</th>
<th>Performance Retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>r</td>
<td>p</td>
</tr>
<tr>
<td>BAL Preparation (min)</td>
<td>38.11</td>
<td>.121</td>
</tr>
<tr>
<td>Trach Tube Change Preparation (min)</td>
<td>37.83</td>
<td>-.220</td>
</tr>
</tbody>
</table>

Table 10: Correlation of Preparation Minutes and Retention (n=18)

Discussion

Although it is often difficult to determine how long a practitioner maintains their skills; it is thought by many knowledge achieved through simulation is retained longer than knowledge achieved through a lecture. Our study adds a new dimension to the investigation of continuing competency. The study is different from other studies in that it attempts to investigate retention, by using an experimental approach with electronic education intervention over a longer length of time. While previous studies have tested for retention at the 90 day and one year interval, our study tested at the 180 day interval. We found all scores trending in a decline and BAL cognitive fell below the competency level for both groups. The declines may be attributed to the pretest being a requirement directly related to job evaluations. However, the posttest was a voluntary participation, in which the need to perform well was not imperative.

Preparation minutes and retention showed a weak relationship, but three of the four were approaching negative 1, and none statistically significant. The increase in
preparation minutes did not have an impact on the retention scores nor did the preparation minutes hinder the scores.

One of four assessments in the experimental group showed a statistically significant difference in the tracheostomy tube change performance score, even though the scores decline. The change was small and did not decline below the competency level. One possible cause for the decline may be attributed to a lack of review of the electronic educational interventions. The study did not have a system in place to monitor or measure how many times the participants viewed the material. Tuttle’s study had a similar problem in not being able to monitor the Web-based material. The results from Tuttle’s study found the Web-based and video material did not significantly impact procedure performance.\(^5\) Due to the lack of verification in monitoring the electronic educational intervention there is no evidence the study contributed to the decline in scores. The study was also unable to determine the amount of interaction among both groups.

When considering the standard deviations of the mean scores for the experimental and control groups there were relatively large amounts of variability, most likely due to the small sample size. The high variability is comparable to other studies such as Tuttle’s study on simulation technology, where the sample size was also small with lots of variability.\(^5\) The limitation of small sample size does not rule out the possibility of random chance, especially with the statistically significant difference in tracheotomy tube change in the experimental group. There is also the possibility the small sample size could have skewed the results causing inflation or deflation in the mean values.
The frequency of the procedure may have also had an effect on the results. The BAL was considered to be the frequently used skill in both facilities, but during the study it was found the BAL was not frequently used on night shift at the second institution. It was found all seven of the participants work night shift at the second institution, which allowed for limited and inconsistent opportunities for BAL performance. The limited opportunity may have been one the forces behind the decline in posttest performance and cognitive BAL assessment scores. The minimum passing threshold was set at 80% per the institution; however the pretest scores were barely above passing. It should be noted that only the posttest scores for BAL cognitive fell below the passing threshold. Tuttle’s and Bishop’s studies also noted the perceived frequency of use was inconsistent among staff, which reflected in the overall scores and variability.\textsuperscript{5,6}

When defining retention as no difference in ACAP and 180 posttest scores, the study suggests some retention. Even though the scores decline there is some evidence of retention because three of the four measures remained above the minimum competency level. All scores in both groups, except the BAL cognitive assessment, remained above the minimum competency level. The study results suggest without the use of simulation maybe the scores would have further declined.

Limitations to this study include voluntary participation, which lead to a small size, therefore impacting results. Tuttle's study could make no direct comparison of retention at the 90 day interval, due to a limitation in the data and a small sample size.\textsuperscript{5} ACAP was conducted in a nearby controlled academic university, during a compensated time. For convenience of the participants this study was conducted at two different
academic medical centers before and after work hours. The difference in location and
time may have contributed to the decline scores depending upon fatigue, mood, and
anxiety. There was no verification to establish frequency of each procedure. There was
no verification or evidence that the experimental group actually viewed the educational
materials.

Continuing competency programs such as ACAP should be further studied to
determine their effectiveness in cognitive and performance retention. Further research
should also be conducted to control for the verification of viewing the educational
material and establishing the frequency of procedure. Further research should also be
conducted to determine if programs such as ACAP leads to improved quality of care and
efficiency.

Conclusions

Currently there are no laws which require competency verification in the
performance of procedures and cognitive assessments for respiratory therapists.
However, the Joint Commission on Accreditation of Health Care Organizations and state
licensing boards expect that hospitals monitor and evaluate the competency of their staff
to ensure safe patient care. Evaluating health care professionals on performance
procedures and cognitive knowledge remains a challenge for many hospital departments,
and merits further investigation. The usefulness of programs such as ACAP should be
further investigated. This study was limited by a small sample size. Although three of the
four measures remained above the minimum competency level, all scores declined in
spite of my efforts in the six month time period. The decline in scores would appear
these professionals are incompetent to perform these procedures. To a patient it is a scary
thought that a supposed frequently used procedure may be performed by a professional
who is barely making the minimum competency level. Further research and
interventions need to be conducted to assure continuing competency.

References for Professional Journal

1. Weiss R. Medical errors blamed for many deaths; as many as 98,000 a year in U.S.
2. Safe Patient Project. To Err is Human-To Delay is Deadly. Consumer Health
3. Citizen Advocacy Center. Maintaining and Improving Health Professional
4. Henderson J. Practices and Requirements of Renewal Programs in Professional
   Licensure and Certification. National Organization for Competency
   Assurance 2008; 2010 (June/23).
   Utilizing simulation technology for competency skills assessment and a comparison
   of traditional methods of training to simulation-based training. Respir
   Care 2007; 52(3): 263-270.

Recertification of respiratory therapists' intubation skills one year after initial training: an analysis of skill retention and retraining. Respir Care 2001;46(3):234-237.
1. Weiss R. Medical errors blamed for many deaths; as many as 98,000 a year in U.S. linked to mistakes. Washington Post1999;A:1.

2. Safe Patient Project. To Err is Human-To Delay is Deadly. Consumer Health Report;2010(June/23):3.


10. National Council of State Board of Nursing. Meeting the Ongoing Challenge of Continuing Competency. ;2010(June/23).


19. Crawford SW, Colt HG. Virtual reality and written assessments are of potential value to determine knowledge and skill in flexible bronchoscopy. Respiration 2004;71(3):269-275.

Appendix A: Recruitment Letter
TO: OSUMC & East Respiratory Therapists

FROM: Brittany Locklear, BS, RRT
AMP Graduate Student

SUBJECT: Skills Day Research Project

I am working on a research project evaluating skills day in the Respiratory Therapy Department, and I am asking you to participate in this study because you completed skills day 2010. The results of this study may improve future RT competency assurance programs.

Participation in this research study is voluntary, and you may withdraw at any time. If you volunteer, you will receive a $5.00 Starbucks gift card! If you complete the study, you will be entered into a raffle for a $50 VISA gift card. If you choose not to participate, there will be no effect on your job status at OSUMC.

If you choose to volunteer:

- Reply to this email and indicate your last four digits of primary phone number
- Your total estimated participation time will be 60 minutes during the period of January - March, 2011.
- In March, you will repeat a small portion of the skills day experience

Your participation will remain confidential and in no way affect your employment or skills day results.

To protect your privacy, all data will be recorded anonymously and analyzed in aggregate. Your privacy will be protected by using only the last four digits of your primary phone number.

I value your contribution and thank you in advance for your participation. If you have any questions about this project, please contact me at Brittany.Locklear@osumc.edu or Sarah Varekojis at varekojis.16@osu.edu.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

CONSENT

- I have read this email and I am aware that I am being asked to participate in a research study.
- I voluntarily agree to participate in this study.
- Replying to this email implies my consent to participate

Please provide the last four of your primary phone number as your signature in the reply email.

Last four digits of primary phone number  _______  _______  _______  _______
Appendix B: Reminder Recruitment Letter
Medical Center

TO: OSUMC & East Respiratory Therapists

FROM: Brittany Locklear, BS, RRT
AMP Graduate Student

SUBJECT: Skills Day Research Project

This is a friendly reminder. I need your valuable experience and knowledge in order to complete this research study. Thank you, if you have already volunteered, we now have ____ volunteers.

REMINDER:

I am working on a research project evaluating skills day in the Respiratory Therapy Department, and I am asking you to participate in this study because you completed skills day 2010. The results of this study may improve future RT competency assurance programs.

Participation in this research study is voluntary, and you may withdraw at any time. If you volunteer, you will receive a $5.00 Starbucks gift card. If you complete the study, you will be entered into a raffle for a $50 VISA gift card. If you choose not to participate, there will be no effect on your job status at OSUMC.

If you choose to volunteer:

- Return this letter to the box located in the respiratory therapy department and indicate your last four digits of primary phone number
- Your total estimated participation time will be 60 minutes during the period of January-March, 2011.
- In March you will repeat a small portion of the skills day experience

Your participation will remain confidential and in no way affect your employment or skills day results. To protect your privacy, all data will be recorded anonymously and analyzed in aggregate. Your privacy will be protected by using only the last four digits of your primary phone number.

I value your contribution and thank you in advance for your participation. If you have any questions about this project, please contact me at Brittany.Locklear@osumc.edu or Sarah Varekojis at varekojis.16@osu.edu.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-0251.

CONSENT

- I have read this email and I am aware that I am being asked to participate in a research study.
- I voluntarily agree to participate in this study.
- Replying to this email implies my consent to participate

Please provide the last four of your primary phone number as your signature in the reply email.

Last four digits of primary phone number _______ _______ _______ _______
Appendix C: BAL Performance Check Off Sheet
Skill's Day Results
September 2010
Non Bronchoscopic Bronchoalveolar Lavage (Non-bronch BAL)

Total Score / 100%
(Must have ≥ 80% to pass assessment)

Name: ___________________ Date of Skill's Assessment: ________________

<table>
<thead>
<tr>
<th>BAL Station</th>
<th>Possible Points</th>
<th>Passed</th>
<th>Passed but poorly</th>
<th>Unable to demonstrate</th>
<th>Comments</th>
<th>Follow-up demonstration completed</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathered and assembled appropriate equipment.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Placed patient on 100% oxygen.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suctioned patient with closed suction system.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attached elbow airway adapter.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced BAL cath in patient's airway.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q (Asked by Facilitator) You are advancing the catheter and meet resistance. How would you determine if you are in the wedge position or at the carina? A The catheter would be close to 40cm or beyond.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once at wedged position, cath was pulled back 3cm and inner cath was advanced.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrated administering 20ml saline.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q (Asked by Facilitator) What if no sample is obtained with 1st saline syringe? A Repeat lavage with 2nd 20ml saline syringe.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed cath and syringe attached together.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removed syringe and inject into Lukens trap.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labeled specimen with printed BAL requisition.</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D: Tracheostomy Tube Change Check Off Form
**Medical Center**

**Skills Day September 2010**

**Tracheostomy Change**

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
</table>

**Score /10**

- Initial Score __%__
- Final Score __%__

<table>
<thead>
<tr>
<th>Procedure, Tracheostomy Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Gathering and assembled appropriate equipment</td>
</tr>
<tr>
<td>• Test the Tracheostomy Cuff</td>
</tr>
<tr>
<td>• Prepare New Tracheostomy Tube</td>
</tr>
</tbody>
</table>
  - Remove inner cannula and insert obturator |
  - Lubricate Tracheostomy |
| Q (Asked by Facilitator) |
  What are two potential risk factors in changing a Tracheostomy tube? |
  A: Loss of airway, Haemorrhage, Creation of false tract, Tube insertion into false tract, Hypoxia, Cardiovascular instability, Bronchospasm, Aspiration, Pneumothorax |
| • Demonstrate Tracheostomy Insertion |
  - Explain the procedure to the Patient |
  - Perfuse cuff and remove old Tracheostomy |
  - Insert the new tube using the obturator |
  - Inflated cuff |
| • Patient assessment post Tracheostomy Change |
  - Check Patients breathing, Listen for air exchange |
| Q (Asked by Facilitator) |
  What do you do if you have failed in reinserting the trach. |
  A: Stay calm, call for help, remain with the patient |
| Q (Asked by Facilitator) |
  After the procedure is done, what do you do with the second Tracheostomy Tube Package? |
  A: Tape the package to the wall at patient bedside |

**Check Cuff Pressure**
Appendix E: 180 Day Cognitive Assessment
1. Respiratory Therapy may re-insert a tracheostomy tube in an established, permanent tracheostomy stoma, if it becomes displaced or dislodged.
   A. True
   B. False

2. What are the indications for a routine tracheostomy tube change?
   A. Chronic need for artificial airway
   B. Replacement of broken or poorly functioning tracheostomy tube
   C. Change of tracheostomy tube type
   D. Downsizing the tracheostomy tube
   E. All of the above

3. What are the risks in changing a tracheostomy tube?
   A. Loss of airway
   B. Creation of a false tract
   C. Hemorrhage
   D. All the above
   E. None of the above

4. In what situation will Respiratory Therapy NOT perform a tracheostomy tube change?
   A. A tracheostomy tube that is 24 hours old
   B. A tracheostomy tube that has been in place for 24 days
   C. A tracheostomy tube that is a Shiley Brand
   D. None of the above
   E. All of the above

5. How many tracheostomy tubes of the same size and type do you bring to the patient's bedside prior to changing out the patient's tracheostomy?
   A. One
   B. Two
   C. Three
11. A sample amount of 2 to 3 ml obtained during a non-bronchoscopic BAL is considered adequate enough to be sent to the lab for evaluation?
   A. True
   B. False

12. Which of the following clinical indications make a patient eligible for a BAL?
   1. Increased patient temperature (febrile)
   2. Increased WBC
   3. New infiltrate on CXR
   4. Change in the amount, color or consistency of sputum.
   A. 2 and 3
   B. 1 and 4
   C. 1, 2, and 4
   D. All the above

13. A physician wants you to perform a BAL on a patient with an INR = 1.4 and a platelet count of 30,000. What are the other pre-screening criteria would you consider to perform a BAL on this patient?
   1. Does the patient have a cough and gag reflex?
   2. Is the patient producing blood in the sputum?
   3. The patient is afebrile?
   4. Has the patient had lung surgery?
   A. 1 and 2
   B. 2, 3 and 4
   C. 2 and 4
   D. All the above

14. When gathering equipment/supplies for a non-bronchoscopic BAL, which of the following items will you need?
   A. Two 30ml syringes filled with 20ml of sterile saline
   B. Sterile gloves
   C. 250ml bottle of sterile water
   D. a and b only
   E. All of the above

15. Once the BAL catheter is in the “wedge” position your next action would be to do which of the following?
   A. Inject 20ml of sterile water
   B. Pull catheter back 1 cm
   C. Pull catheter back 3 cm
   D. Increase the FIO2 to 100%
1. Respiratory Therapy may re-insert a tracheostomy tube in established, permanent tracheostomy stoma, if it becomes displaced or dislodged.
   A. True
   B. False

2. What are the indications for a routine tracheostomy tube change?
   A. Chronic need for artificial airway
   B. Replacement of broken or poorly functioning tracheostomy tube
   C. Change of tracheostomy tube type
   D. Downsizing the tracheostomy tube
   E. All of the above

3. What are the risks in changing a tracheostomy tube.
   A. Loss of airway
   B. Creation of a false tract
   C. Hemorrhage
   D. All the above
   E. None of the above

4. In what situation will Respiratory Therapy NOT perform a tracheostomy tube change?
   A. A tracheostomy tube that is 24 hours old
   B. A tracheostomy tube that has been in place for 24 days
   C. A tracheostomy tube that is a Shirley Brand
   D. None of the above
   E. All of the above

5. How many tracheostomy tubes of the same size and type. Do you bring to the patients bedside prior to changing out the patients tracheostomy
   A. One
   B. Two
   C. Three

11. A sample amount of 2 to 3 ml obtained during a non-bronchoscopic BAL is considered adequate enough to be sent to the lab for evaluation?
   A. True
   B. False

12. Which of the following clinical indications make a patient eligible for a BAL?
   1. Increased patient temperature (febrile)
   2. Increased WBC
   3. New infiltrate on CXR
   4. Change in the amount, color or consistency of sputum.
   A. 2 and 3
   B. 1 and 4
   C. 1, 2, and 4
   D. All the above
13. A physician wants you to perform a BAL on a patient with an INR = 1.4 and a platelet count of 30,000. What are the other pre-screening criteria would you consider to perform a BAL on this patient?

1. Does the patient have a cough and gag reflex?
2. Is the patient producing blood in the sputum?
3. The patient is afebrile?
4. Has the patient had lung surgery?

A. 1 and 2
B. 2, 3 and 4
C. 2 and 4
D. All the above

14. When gathering equipment/supplies for a non-bronchoscopic BAL, which of the following items will you need?

A. Two 30ml syringes filled with 20ml of sterile saline
B. Sterile gloves
C. 250ml bottle of sterile water
D. a and b only
E. All of the above

15. Once the BAL catheter is in the “wedge” position your next action would be to do which of the following?

A. Inject 20ml of sterile water
B. Pull catheter back 1cm
C. Pull catheter back 3 cm
D. Increase the FIO2 to 100%