Development of Suction Regulator Protocols and Evaluation of Clinicians’ Knowledge

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Dr. Pamela O’Neal, RN, PhD

University of Alabama Huntsville
College of Nursing Honors Program
Spring 2009
Honors Senior Project
Approval

Form 3 – Submit with completed thesis. All signatures must be obtained.

Name of candidate: Molly Riley Bask

Department: College of Nursing

Degree: BSN

Full title of project: Development of Suction Regulator Protocols and Evaluation of Clinicians' Knowledge

Approved by:

[Signature] Project Advisor 4/9/09

[Signature] Department Chair 4/9/09

[Signature] Honors Program Director for Honors Council 15 April 11, 2009
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Abstract

Suction systems are used daily in all areas of the hospital, especially in critical care, to remove secretions in the mouth, upper airway, and endotracheal tubes (tubes placed in the trachea) of patients. Secretion removal, especially in sedated or comatose patients, is critically important since these secretions can block the airway, affecting optimal movement of air and contribute to the development of pneumonia. Pneumonia in the critically ill patient occurs frequently and often results in a high mortality rate. Therefore, it is imperative that practitioners know the correct techniques and guidelines when using suction equipment. This study sought to identify if there was a difference between suggested suctioning specifications and clinician’s actual practices. An In-Service was offered to all Huntsville Hospital employees on current findings related to suction regulators. A survey was given to participants both before and after the In-Service in order to see if any changes in knowledge occurred. There was also a free form discussion and open question format discussion about specific practices of the clinicians in attendance. The results show that there is in fact a large disconnect between suggested suctioning guidelines and actual practice, in addition to a wide variance in techniques of individual practitioners.
Introduction

In order to provide safe, effective patient care, professional nurses must develop policies and use procedures that are based on current scientific evidence. While many nurses embrace this fact and are educated to implement such procedures, research suggests many are not putting what they've learned into practice. Endotracheal suctioning is a prime example of this trend. An invasive but imperative intervention in caring for patients with artificial airways, suctioning technique can alter the infectious outcome for intubated patients. Preventing nosocomial infection and promoting patient safety relies not only on the clinician’s expertise, but also on the effectiveness of their suctioning practices, the accuracy of the machine, and the relative relationship between the secretions and the optimal suction pressure.

Literature Review

Ventilator Associated Pneumonia; a Costly Issue

Pathogens of various types exist everywhere on hospital surfaces: doorknobs, equipment gauges, and other medical devices, all within close proximal distance to the patient. Improper technique or handling of suctioning equipment or improper hand hygiene allows for the easy transmission of these pathogens to the patient. Intubation with an endotracheal tube (ETT) significantly increases the risk of infection with bacteria such as the gram negative *Pseudomonas aeruginosa* and *Staphylococcus aureus*. These pathogens may ultimately lead to ventilator associated pneumonia (VAP) which is currently the most common infectious complication among patients admitted to Intensive Care Units (ICUs) (Cason, Tyner, Saunders, and Broome, 2007). The ETT provides the direct entry of pathogens into the lower respiratory tract and subglottic secretions pooling or leaking around the ETT further increases the risk for developing VAP. Impaired mucociliary clearance and limitation of sinus drainage due to the ETT allows for
a biofilm to form on the lumen of the tube, encouraging the colonization of pathogens. Normally, coughing is an effective way the body rids itself of secretions, however with an endotracheal tube in place, the epiglottis cannot properly close and oropharyngeal secretions pool just above the endotracheal tube cuff (DePew and McCarthy, 2007). Research suggests that most suctioning equipment is colonized with a VAP pathogen within 24 hours of use (Sole, Byers, Ludy, Zhang, Banta, and Brummel, 2002).

In a study completed in 2003, out of ninety-nine critically ill patients with percutaneous tracheotomy (an endotracheal tube not surgically inserted), eighteen patients acquired pneumonia within seven days after admission. Those patients developed the infectious complication even with the administration of prophylactic antibiotic therapy forty-eight hours prior to the insertion of the endotracheal tube. *Pseudomonas aeruginosa* was found in eight of the patients and the remaining ten were colonized with Gram-negative bacilli (Rello, Lorente, Diaz, Bodi, Boque, & Sandiumenge, 2003). Rello and colleagues (2003) also found that the estimated cost of treating VAP was $40,000 per case; excluding pharmacological intervention (Rello et al., 2003). While endotracheal suctioning is an important nursing intervention, the risk for VAP is dependent upon three major factors: the clinicians’ knowledge and adherence to evidence base practice in preventing the spread of VAP organisms, the ability of the system to adequately remove secretions with optimal pressures, and the reliability and accuracy of the endotracheal suctioning system itself.

*Suctioning Pressure*

Given its role in preventing complications in intubated patients, there is a surprising gap between suggested guidelines for suctioning and actual suctioning practice. Research suggests that nurses are not suctioning at safe pressures. Twenty-eight nurses were selected from a large
teaching hospital in England (Day, Farnell, Haynes, Wainwright, and Wilson-Barnett, 2002). They were observed using non-participant observation. Each nurse was interviewed and questioned about suctioning practices and completed a knowledge-based questionnaire. During suctioning, twenty six nurses were observed using suctioning pressures of 150-200 mm Hg, and five were observed suctioning with pressures from 263-300 mm Hg. These suctioning pressures far exceeded the recommended 80-150mmHg (Day et al., 2002).

Kelleher and Andrews (2008) investigated endotracheal suction (ETS) practices of ICU nurses in two Intensive Care Units in Ireland: General Intensive Care Unit (GICU) and the Cardiac Intensive Care Unit (CICU). The study examined nurses practices prior to, during, and post ETS and their compliance with current research recommendations. The results indicated that nurses vary in their ETS practices, do not adhere to recommendations, and provide sub-standard care. This study showed discrepancies between respiratory assessment techniques, hyperoxygenation, infection control practices, patient reassurance, and the level of negative pressure used to clear secretions. As far as suctioning was concerned, both groups complied with evidenced-based recommendations and guidelines in relation to suctioning time and application of pressure; however, both groups exceeded the recommended pressure of 80-150mmHg (Kelleher and Andrews, 2008).

Flow and Vacuum

The rate at which air, fluid, or secretions are removed is referred to as "flow rate."

Clinicians strive to achieve the optimal flow rate with the least amount of vacuum or pull on the mucosal lining of the airway, lungs or stomach. Within a vacuum, and specifically within the ETT, secretions optimally move from an area of higher pressure within the patient, to an area of lower pressure in the suctioning apparatus (Carroll, 2008). As catheters remove secretions from
the body, the degree of open flow changes constantly, based on the fill of the catheter and the substance being removed (Carroll, 2008). It is recommended that negative pressures should be between 80 and 150mm hg to preserve the integrity of the tissues in contact with the vacuum. While there are guidelines for the vacuum rate, it is really up to the clinician to set the rate. The rate depends upon where the suction is applied (stomach, trachea, pleural space), the age and size of the patient and the risk of damage to tissue lining being suctioned (Carroll, 2008). In order to set the vacuum rate, a closed system must be established with the clinician occluding the suction tubing. If the system is not occluded properly, the clinician may dial in an incorrect setting resulting in dangerous pressure levels when suctioning the patient (Carroll, 2008). Incorrect suctioning may result in irreversible tissue necrosis to the trachea and the lungs which only elevates the risk for pathogen colonization (Stenqvist, Lindgren, Karason, Sondergard, and Lundin, 2007).

**Viscosity of Secretions**

As mentioned earlier, a major risk factor for ventilator associated pneumonia (VAP) is the pooling of up to 100-150ml of secretions in a 24-hour period. O’ Neal, et al in 2007, showed that proper management of secretion viscosity may help to delay the onset of VAP. The researchers performed a study where subglottic secretions were collected from eleven patients in a respiratory Intensive Care Unit (ICU) in the south. They used a French Hi-Lo Evac ETT placed in a simulated trachea. The mean age of patients was sixty two (four males and seven female) with the most common admitting diagnosis being respiratory arrest. The study showed that while there is a recommended range of applied vacuum pressure when performing endotracheal suctioning, suctioning pressure and removal of secretions also varies according to secretion viscosity. The suction pressure that allowed for the most effective secretion removal and highest
mean secretion recovery was 30mmHg. Higher viscosity secretions were easier to evacuate than lower viscosity ones with 30mmHg of pressure. The current recommended medical practice of pressure is 20mmHg; well below what was found to be maximally effective (O'Neal, Munro, Grap, and Rausch, 2007).

**Calibration Policy**

While it is crucial that clinicians practice according to evidence-based guidelines, it is also imperative that clinicians have reliable equipment that is user-friendly and can be trusted to be accurate. At the present time, there appears to be no standard policy which mandates the calibration of endotracheal suction equipment on a routine schedule. Intensive care units, cardiac floors, general patient populations and their families are reliant upon individual clinicians' knowledge and implementation of that knowledge to provide safe and effective care. The Ohio Medical Group, a large suction equipment manufacturer, has published a suggested checklist regarding care of suction equipment in their equipment manual. It states that the equipment should be thoroughly cleaned and sterilized after each use, carefully inspected with special regard to filters, the performance be analyzed, and the equipment adjusted and repaired if necessary (Ohio medical group). None of the published literature mandates calibration specifics for suctioning equipment. This study evaluated the current state of knowledge of clinicians' understanding in regards to recommended suction procedure and current hospital calibration protocol of suction regulators. Since clinicians' expertise is the front line of defense against infectious processes, health care providers need to trust that the readings they are taught to rely on are accurate. Without correct readings suctioning is simply a best guess practice and patient safety cannot be left to assumptions.
Methods

A survey study was conducted. University institutional review board and hospital review committee approval were obtained before beginning the study. An in-service titled “Best Practices for Suction Protocol” was advertised over the hospital’s intranet email system, through posters at the hospital, and personal solicitation outside of the in-service. It was open to all staff and continuing education credit was offered to those in attendance. It was held on hospital grounds in a classroom setting and lasted approximately an hour. The main source of information was Powerpoints and lecture with time available for discussion as well. A survey was given to participants before the in-service began and the same survey was repeated after the in-service was concluded.

Results

Four participants attended the in-service, all female. There were two registered nurses, one nursing tech, and an employee from administration. They all completed both the entrance and exit surveys. Experience varied from 5 years to 30 years in practice. No one was able to correctly identify the recommended pressures of 80 – 150 mm Hg for negative pressure. Participants were also asked open ended questions such as, “Tell me about how you use the suction regulator?” and “what do you do if you don’t feel suction right away?”. The responses to this were similar from all participants and stated that they usually did not select a set pressure from the gauge when suctioning a patient, but rather “turned it all the way on.” When the clinician felt that there was not enough suction, they agreed that they “turned it up as far as it could go.” The exit surveys showed moderate improvement in clinicians’ knowledge with three out of the four identifying the correct parameters for recommended suctioning, but all four failing to identify
correct procedure when no suction was felt or the machine was not properly working. The administrative employee in attendance had been instrumental in drafting the hospital’s policy on suctioning and voiced her frustration that it was too difficult to understand, not compliant with the limited suggested guidelines available for suctioning and requested assistance in re-writing it for better clarification.

Limitations

The most glaring limitation of the study was the size. Only four participants attended the in-service, and subsequently completed the survey. The class was offered only one day, at two different times so it subsequently limited the amount and type of professionals who could attend. Only one hospital was included in this study so the results are extremely limited.

Discussion/Implications for Practice

Though the size of respondents was small, the results were telling. The fact that none of the participants were able to correctly identify not only the recommended guidelines for suctioning, but also their hospital’s guidelines pertaining to suctioning is an ominous sign. For the most part these clinicians were not knowledgeable about what the equipment does, how the suction is controlled, and the impact on the patient. Classes should be instituted to educate relevant personnel on the basic variables such as bleed up time, the amount of time it takes the equipment to reach the dialed in pressure, so that clinicians at the bedside will show patience with the gauge reaching optimal pressure rather than simply adjusting to full volume. Part of the reason most clinicians are not knowledgeable about suction guidelines is that there has been little research done in this area. Guidelines need to be scientifically investigated and determined for
specific situations so that practitioners can feel confident that their practice conforms to best practice recommendations. Identifying broken or malfunctioning equipment is imperative. The most common problems should be explained and a set protocol for submitting broken equipment for repair needs to be implemented along with a general maintenance protocol for calibrating the regulators.

Acknowledgements

A great deal of thanks to Dr. Pamela O’Neal, Dr. Lynx McCellan, Dr. Bernard Vogler, UAHuntsville College of Nursing, UAHuntsville Internal Review Board, Medical Equipment Management and Huntsville Hospital Review Committee. This was funded and supported by the UAHuntsville Office of the President and Senate Finance Committee.
References


The Ohio Medical Group. (2007). Enhancing the safety of medical suction through innovative technology. (Form No. SOT 645). Middleton, CT: Patricia Carroll.


APPENDIX A: Internal Review Board Application, UAHuntsville
June 17, 2008
Dr. Pamela O’Neal
College of Nursing
University of Alabama in Huntsville
Huntsville, AL 35899

Dear Dr. O’Neal,

As chair of the IRB Human Subjects Committee, I have reviewed your two proposals, *Inline Compared to Dialed-in Suction Pressure* and *Study of Knowledge of Suction Procedures*, and have found both meets the necessary criteria for exemption from review according to 45 CFR 46. I have granted these proposals exemptions, and you may commence your research. Please note that these exemptions are good for one year from the date on this letter. If data collection continues past this period, a renewal application must be filed with the IRB.

Contact me if you have any questions.

Sincerely,

Dr. William Wilkerson,
Chair, UHSC
Instrumentation (if applicable):

### Suction Practices and Procedures: Pre test

By completing this evaluation, I consent to participating in this study and recognize that the information will be presented in an aggregated format only. I understand I will remain anonymous.

<table>
<thead>
<tr>
<th>1 License Type</th>
<th>LPN</th>
<th>RN</th>
<th>RT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Education</td>
<td>ASN</td>
<td>BSN</td>
<td>MSN</td>
<td>PhD</td>
</tr>
<tr>
<td>3 Years in nursing</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
</tr>
<tr>
<td>4 Age</td>
<td>20-30</td>
<td>31-40</td>
<td>41-50</td>
<td>51-60</td>
</tr>
<tr>
<td>5 Unit Type</td>
<td>Medical</td>
<td>Surgical</td>
<td>ICU</td>
<td>ER</td>
</tr>
<tr>
<td>6 How often do you use suction equipment</td>
<td>Never</td>
<td>Once a month</td>
<td>Once a week</td>
<td>Daily</td>
</tr>
<tr>
<td>7 Does your agency have a suction protocol?</td>
<td>Yes</td>
<td>No</td>
<td>Unsure</td>
<td></td>
</tr>
<tr>
<td>8 Are you familiar with the suction protocol?</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 How do you know if the suction manometer is not working correctly?</td>
<td>If no suction, then assume it is broken</td>
<td>Listen for suction pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 What do you do if the suction manometer is not working correctly?</td>
<td>Do nothing</td>
<td>Notify biomed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 What suction pressure do you most frequently use when suctioning through the ETT?</td>
<td>20-80</td>
<td>80-120</td>
<td>120-180</td>
<td>greater than 180</td>
</tr>
</tbody>
</table>

### Suction Practices and Procedures: Post test

By completing this evaluation, I consent to participating in this study and recognize that the information will be presented in an aggregated format only. I understand I will remain anonymous.

<table>
<thead>
<tr>
<th>1 License Type</th>
<th>LPN</th>
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<td>31-40</td>
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<tr>
<td>5 Unit Type</td>
<td>Medical</td>
<td>Surgical</td>
<td>ICU</td>
<td>ER</td>
</tr>
<tr>
<td>6 How often do you use suction equipment</td>
<td>Never</td>
<td>Once a month</td>
<td>Once a week</td>
<td>Daily</td>
</tr>
<tr>
<td>7 Does your agency have a suction protocol?</td>
<td>Yes</td>
<td>No</td>
<td>Unsure</td>
<td></td>
</tr>
<tr>
<td>8 Are you familiar with the suction protocol?</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 How do you know if the suction manometer is not working correctly?</td>
<td>If no suction, then assume it is broken</td>
<td>Listen for suction pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 What do you do if the suction manometer is not working correctly?</td>
<td>Do nothing</td>
<td>Notify biomed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 What is the recommended suction pressure suctioning through the ETT?</td>
<td>20-80</td>
<td>80-120</td>
<td>120-180</td>
<td>greater than 180</td>
</tr>
</tbody>
</table>

**Duration of Study:** May 27, 2008 – August 5, 2008 (10 weeks)

- **a. Total amount of time with each subject:** approx. 40 min.
- **b. Time to complete study:** approx. 350 hours

Updated: 5/01
**Benefit(s) of the Study:** Suction systems are used daily in critical care areas in hospitals to remove secretions in the mouth and upper airways as well as in endotracheal tubes (tubes placed in the trachea). Secretion removal, especially in sedated or comatose patients is critically important since these secretions can block the airway affecting optimal movement of air and can also mobilize to the lower airways and contribute to the development of pneumonia. Pneumonia in the critically ill patient occurs frequently and results in a high mortality rate. Therefore it is imperative that suction equipment works effectively to provide optimal care to critically ill patients. A benefit of this study will be the inservice intervention to teach nurses the appropriate suction practice and protocols to ensure optimal suction pressures.

**Possible Risks to Subject(s) and Precautions Taken to Avoid Risks:** There are risks involved in all research studies. The level of risk is judged to be minimal for this study.

**Confidentiality/Anonymity:** The records of this study will remain confidential. In any sort of report that might be published, any information that would make it possible to identify participants will not be included. Research records will be kept in a locked file, and access will be limited to the researchers, the university review board responsible for protecting human participants and regulatory agencies.

**Documentation of Informed Consent by Subject(s) Attached?** Yes ___ No ___ X ___

Implied consent is indicated on the survey.

Signature: Signature: Lynn Curry and Molly Back

Supervising Faculty Signature (if student): Dr. Pam O’Neal

Updated: 5/01
APPENDIX B: Internal Review Committee, Huntsville Hospital
June 10, 2008

Ms. Lynn Curry  
Ms. Molly Back  
UAH School of Nursing  
University of Alabama-Huntsville  
202 Nursing Building  
Huntsville, AL 35899

RE: Request for Institutional Review Committee Exemption of Study  
Knowledge of Suction Procedures

Dear Ms. Curry and Ms. Back:

Thank you for forwarding the application for Institutional Review Committee exemption to me for your proposed nursing study. Dr. John Cox, Chair has reviewed your information and agreed that this study does qualify for exemption.

If you have any questions or I can be of further service, please feel free to call me at 265-6990.

Sincerely,

[Signature]

Allison E. Greene, Division Assistant/  
Institutional Review Committee Coordinator

cc: Karol Jones, Chief Nursing Officer
PROCEDURES FOR REQUESTING AN IRC EXEMPTION:
To apply for exemption from IRC review, the Investigator must complete one copy of the exemption application on the following page and return it to the IRC office. There are no deadlines for submission of an exemption application.

- If a questionnaire, survey or test is to be used, attach one copy to the application.
- If external funding has been sought, a copy of the funding application must accompany the submission.
- If the Investigator will be obtaining pathological or diagnostic specimens, a release form or letter is required from the Chairman of the Department responsible for providing the specimens. The specimen release form or letter of approval should be attached to the IRC exemption application form.
- Students, Fellows and Residents must include their Faculty Advisor/Course Instructor's name, phone # and e-mail address as the contact and the advisor or instructor must sign the application, too.

Federal regulations specify that certain research activities cannot be exempt. The following is a list of those activities:

- Human in-vitro fertilization;
- Review of records if the information gathered from those records is recorded in such a way that it can be linked back to the subject either directly or indirectly through the use of a code;
- Surveys or interviews given to minors;
- Any procedure that may cause a subject either physical or psychological discomfort or is perceived as harassment above and beyond what the person would experience in daily life;
- Deception;
- Observation of minors if the investigator participates in the activities being observed unless there is a federal statute covering the activity.

Questions of interpretation regarding the exemption application may be directed to the IRC office at 265-6990. The completed application form (one copy) should be mailed or delivered to the Institutional Review Committee Coordinator located in the Medical Staff Office, Huntsville Hospital Main, 101 Sivley Road, Huntsville, AL 35801.

The exempt review procedure may not be used where identification of the participants and/or their responses would reasonably place them at risk of criminal or civil liability or be damaging to the subject's financial standing, employability, insurability, reputation, or be stigmatizing, unless reasonable and appropriate protections will be implemented so that risks related to invasion of privacy and breach of confidentiality are no greater than minimal.

The exempt review procedure may not be used for classified research involving human participants.

EXEMPTED REVIEW FOR RESEARCH INVOLVING CHILDREN
Exempted review category 2 (survey or Interview procedures) cannot be applied to research proposals involving children as participants. In addition, category 2 is applicable to research involving children only where the Investigator does not participate in the activities being observed. Children are defined for this purpose as persons under 19 years of age.
HUNTSVILLE HOSPITAL
INSTITUTIONAL REVIEW COMMITTEE EXEMPTION REVIEW APPLICATION

(PLEASE TYPE)
Title of Project: Knowledge of Suction Procedures
Principal Investigator: Molly Back and Lynn Curry
Investigator's Signature: Molly Back, Lynn Curry
Today's Date: 5/27/08
E-Mail: Moser321@aol.com, Lynnandnate@aol.com
Address: College of Nursing, University of Alabama in Huntsville, 202 Nursing Building, Huntsville, AL 35899
Phone: 256-519-2349 Fax: (256) 824-6026
Source of Funds: None
Fax: 256-824-6026
Address: College of Nursing, University of Alabama in Huntsville, 202 Nursing Building, Huntsville, AL 35899
Advisor's Signature: Pamela O'Neal, PhD, RN
(As contact for Student, Fellowship or Resident research project)

Mark the category or categories below which describe your research:

☐ 1. Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (I) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

☒ 2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation. Attach questionnaire(s) and/or surveys.

☐ 3. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under category (2), if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter. Attach to this application a copy of any questionnaire or survey to be used.

☐ 4. Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the Investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. Attach a specimen release form if applicable. (Specimens must be preexisting.)

☐ 5. Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (I) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.
Purpose of Study: The purpose of this study is to identify current knowledge about suction procedures and practices, provide an intervention and reassess understanding.

Hypotheses: The null hypotheses states there is no difference between knowledge about suction practices and procedures before and after an inservice related to suction protocols.

Description of Subjects: Nurses will be asked to participate in an inservice about suction procedures.

How Subjects Will Be Selected: A convenience sample of nurses will be obtained based on when the nurse manager of each floor identifies the most convenient time to provide an inservice. This inservice will occur prior to removing and calibrating suction manometers.

Description of Procedure: In collaboration with the Biomedical Engineering Department at Huntsville Hospital (HH), suction guidelines and protocols will be reviewed. An inservice will be developed and approved by the education department at HH. Continuing education units will be obtained to provide nurses an incentive to attend the inservice that will discuss patient safety issues surrounding suctioning practices and procedures. General demographics will be obtained and a short survey will be completed prior to the inservice. Another survey will be provided after the inservice to assess knowledge of suction practices and procedures. All data will be presented in an aggregate format. Implied consent will be obtained by the nurse completing the survey.

Duration of Study: June 1, 2008 – August 5, 2008 (10 weeks)
   a. Total amount of time with each subject: approx. 40 min.
   b. Time to complete study: approx. 350 hours

Benefit(s) of the Study: Suction systems are used daily in critical care areas in hospitals to remove secretions in the mouth and upper airways as well as in endotracheal tubes (tubes placed in the trachea). Secretion removal, especially in sedated or comatose patients is critically important since these secretions can block the airway affecting optimal movement of air and can also mobilize to the lower airways and contribute to the development of pneumonia. Pneumonia in the critically ill patient occurs frequently and results in a high mortality rate. Therefore it is imperative that suction equipment works effectively to provide optimal care to critically ill patients. A benefit of this study will be the inservice intervention to teach nurses the appropriate suction practice and protocols to ensure optimal suction pressures.

Possible Risks to Subject(s) and Precautions Taken to Avoid Risks: There are risks involved in all research studies. The level of risk is judged to be minimal for this study.

Confidentiality/Anonymity: The records of this study will remain confidential. In any sort of report that might be published, any information that would make it possible to identify participants will not be included. Research records will be kept in a locked file, and access will be limited to the researchers, the university review board responsible for protecting human participants and regulatory agencies.
APPENDIX C: Continuing Education Application for In-Service
CONTINUING EDUCATION ACTIVITY APPLICATION

Type of Credit

- Nursing ABN (Alabama Board of Nursing)
- Nursing ASNA/ANCC (must complete entire application)
- Social Work
- Radiology
- Dietitian
- Pharmacy
- Respiratory Therapy
- NAHUC (RN not required. Need pages 3, 5, 6, 7, 8)

Responsible Organization/Department Information

Course Planner(s) (Name, title, and department and phone number & must include 1 RN):
- Molly Riley Back, Nursing student, UAH (519-2349)
- Lynn Curry, Nursing Student, UAH (551-7137)
- Dr. Pamela O'Neal, R.N., PhD, UAH (824-6669)

Responsible Organization/Department: University of Alabama Huntsville College of Nursing

Contact Person: Molly Back Phone # 256-519-2349

Unit/Department: College of Nursing e-mail: Moser321@aol.com

Activity Information

- New
- Renewal
- Old Course# _____________

Delivery Method:
- LIVE Classroom workshop seminar/conference teleconference satellite web cast
- SELF-STUDY Print or Poster internet intranet video/cc/dvd

Title: Best Practices for Suction Protocol

Date(s): July – September 2008 Time: Duration: 1 hour per workshop

For ANCC applications only: Amount of pharmacy hours in content: _____________

Location: TBA

Frequency: (monthly, weekly, etc.) Estimated Attendance Size: Will Collaborate with Nurse Managers

Series: Yes No If yes, please list series subtitles and dates on a separate sheet.

Target Audience: Critical Care Therapists

Conferences. Please attach a draft of the proposed activity agenda including the exact times provided for each presentation/demonstration and attach a copy of the proposed brochure/advertisement. DO NOT PRINT UNTIL PROOF IS APPROVED.

Evaluation. How will this activity be evaluated?

- Written evaluation based on objectives
- Pre-post test
- Participant critique
- Follow-up survey
- Change in referral patterns

Huntsville Hospital Employees Only? Yes No

CE Office Use Only

Date received: ________________________________ By: ________________________________

Approved Number of hours: __________________ CE #: ________________________________
Needs Assessment for Nursing Continuing Education


Nurse Planner: Molly Back and Lynn Curry, Students Dr. Pamela O’Neal, R.N., PhD

Date: TBA

Attach documentation (i.e. sample of formal survey, copy of articles, etc.) to support your needs assessment.

Problem Identification

Place a check beside each of the sources below, which helped identify a need for the activity. Indicate the three most frequently used sources. Attach copies/samples of sources when available.

- Continuing review of changes in quality of care as revealed by medical audit
- Patient care evaluations and interviews
- Ongoing census of diagnosis made by physicians on staff
- Periodic surveys of staff interests
- Summary of patient-problem logs kept by staff
- Requests from previous program evaluations
- New technique, equipment, or medical issue
- Request from a specific committee, council, or board
- Formal and informal request from members of staff
- Peer or colleague discussions
- Review of Board Exam requirements
- Quality assurance and improvement data
- Research findings (state source). See attached
- Literature review (state source). See attached
- Formal tests to determine physician competence
- Advice from authorities in the field
- Data from outside sources (list sources)
- Other:

Need Statement / Overall Goal:

To evaluate, review, and teach current policies and practices related to endotracheal suctioning in ventilated patients with staff.

Content

Place a check beside one or more of the following content for activity.

- Clinical technology, procedures, and nursing implications.
- Specialty areas of nursing practice.
- Nursing practices related to care of the patient, including but not limited to counseling, patient teaching, infection control, and safety factors.
- Administration, management, and supervision in health care delivery.
- Social, legal, and ethical aspects of nursing.
- Nursing education.
- Nursing research, theory, and practice issues.
- Quality improvement and management, accrediting standards, and processes.
1. Objectives:
   - List the learning objectives that are expected as a result of attending this program.
   - Objectives must be specific, measurable, and time limited.
   - Use action verbs as listed below:

   **Knowledge**
   - Define, describe, label, list, match, name, outline, reproduce, select, state, record, name, recall

   **Comprehension**
   - Discuss, identify defend, distinguish, estimate, explain, generalize, give examples, infer, paraphrase, predict, summarize

   **Application**
   - Interpret, apply, demonstrate, differentiate explain use, illustrate, develop, relate, employ, generalize

   **Analysis**
   - Distinguish, analyze, differentiate, detect, question, test, solve, examine, contrast, categorize, deduce, compare, and calculate

   **Synthesis**
   - Compose, plan, propose, design, formulate, construct, create, prepare, manage, set up, produce, modify

   **Evaluation**
   - Judge, appraise, evaluate, rate, compare, assess, validate, measure, revise, estimate, critique

2. Content Outline: Outline the content to be presented per objective.

3. Time: State the amount of time it will take to cover each objective. Contact hours are determined (by Corporate University) in a logical and defensible manner, consistent with the objectives, content, teaching-learning strategies, and target audience. The minimal number of contact hours awarded is one (1). Welcome, introductions, breaks, and viewing of exhibits may not be included. Evaluations may be included.

   For ANCC applications Only: Please fill identify the pharmacy content by including the word pharmacy in the Time column.

4. Faculty: List the name(s) of the person that will be teaching each objective. Each presenter must complete a biographical form or attach a current CV. They must also complete a Disclosure Statement only if applying for ANSA/ANCC credit.

5. Teaching Method: Indicate the method of teaching that will be used for each objective (i.e. lecture, video, demonstration, test, etc.)

6. Evaluation: Indicate how learning objectives will be measured (i.e., written evaluation, test, or demonstration).

**EXAMPLE:**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Content Outline</th>
<th>Time</th>
<th>Faculty</th>
<th>Teaching Method</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Discuss an effective interview.</td>
<td>A. Analyzing the job. B. Developing behavioral questions. C. Preparing the interview guide.</td>
<td>30 minutes</td>
<td>Dr. Fred Jones</td>
<td>Powerpoint Handouts Lecture</td>
<td>Written</td>
</tr>
<tr>
<td>Objectives</td>
<td>Content Outline</td>
<td>Time</td>
<td>Faculty</td>
<td>Teaching Method</td>
<td>Evaluation</td>
</tr>
<tr>
<td>------------</td>
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<td>------</td>
<td>---------</td>
<td>-----------------</td>
<td>------------</td>
</tr>
<tr>
<td>1. By the end of the workshop, staff will be able to identify and explain the parts of a suction manometer.</td>
<td>A. Basic part identification B. Explaining functions C. Troubleshooting</td>
<td>15 min.</td>
<td>Molly Back Lynn Curry</td>
<td>Lecture, Demonstration</td>
<td>Demonstration</td>
</tr>
<tr>
<td>2. By the end of the workshop, staff will be able to understand and define clinical terms related to endotracheal suctioning.</td>
<td>A. Define vacuum B. Define suction C. Understand how negative pressure is controlled and limited</td>
<td>15 min.</td>
<td>Molly Back Lynn Curry</td>
<td>Lecture</td>
<td>Demonstration</td>
</tr>
<tr>
<td>3. By the end of the workshop, staff will be able to identify current Huntsville Hospital and evidence based practices regarding endotracheal suctioning.</td>
<td>A. Examining personal suctioning practices B. Identifying HH policy C. Discussing current literature and evidence based practices.</td>
<td>15 min.</td>
<td>Molly Back Lynn Curry</td>
<td>Lecture, Poster, Handouts</td>
<td>Written</td>
</tr>
<tr>
<td>4. By the end of the workshop, staff will be able to discuss the consequences to using incorrect procedures to suction ventilated patients.</td>
<td>A. Ventilator Associated Pneumonia B. Financial Consequences C. Standards of Care</td>
<td>15 min.</td>
<td>Molly Back Lynn Curry</td>
<td>Lecture, Poster</td>
<td>Discussion</td>
</tr>
<tr>
<td>5. A.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX D: Survey of Nursing Knowledge
### Suction Practices and Procedures: Pre test

By completing this evaluation, I consent to participating in this study and recognize that the information will be presented in an aggregated format only. I understand I will remain anonymous.

**Please circle most appropriate answer**

<table>
<thead>
<tr>
<th>1. License Type</th>
<th>LPN</th>
<th>RN</th>
<th>RT</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Education</td>
<td>ASN</td>
<td>BSN</td>
<td>MSN</td>
<td>PhD</td>
</tr>
<tr>
<td>3. Years in nursing</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
</tr>
<tr>
<td>4. Age</td>
<td>20-30</td>
<td>31-40</td>
<td>41-50</td>
<td>51-60</td>
</tr>
<tr>
<td>5. Unit Type</td>
<td>Medical</td>
<td>Surgical</td>
<td>ICU</td>
<td>ER</td>
</tr>
<tr>
<td>6. How often do you use suction equipment</td>
<td>Never</td>
<td>Once a month</td>
<td>Once a week</td>
<td>Daily</td>
</tr>
<tr>
<td>7. Does your agency have a suction protocol?</td>
<td>Yes</td>
<td>No</td>
<td>Unsure</td>
<td></td>
</tr>
<tr>
<td>8. Are you familiar with the suction protocol?</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. How do you know if the suction manometer is not working correctly?</td>
<td>Assume it works correctly</td>
<td>If no suction, then assume it is broken</td>
<td>Listen for suction</td>
<td>Check inline suction pressure</td>
</tr>
<tr>
<td>10. What do you do if the suction manometer is not working correctly?</td>
<td>Do nothing</td>
<td>Notify biomedical</td>
<td>Equipment to biomedical</td>
<td></td>
</tr>
<tr>
<td>11. What suction pressure do you most frequently use when suctioning through the ETT?</td>
<td>20-80</td>
<td>90-120</td>
<td>120-180</td>
<td>greater than 180</td>
</tr>
</tbody>
</table>

### Suction Practices and Procedures: Post test

By completing this evaluation, I consent to participating in this study and recognize that the information will be presented in an aggregated format only. I understand I will remain anonymous.

**Please circle most appropriate answer**

<table>
<thead>
<tr>
<th>1. License Type</th>
<th>LPN</th>
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<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
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<td>BSN</td>
<td>MSN</td>
<td>PhD</td>
</tr>
<tr>
<td>3. Years in nursing</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
</tr>
<tr>
<td>4. Age</td>
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<td>31-40</td>
<td>41-50</td>
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<td>5. Unit Type</td>
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<td>ER</td>
</tr>
<tr>
<td>6. How often do you use suction equipment</td>
<td>Never</td>
<td>Once a month</td>
<td>Once a week</td>
<td>Daily</td>
</tr>
<tr>
<td>7. Does your agency have a suction protocol?</td>
<td>Yes</td>
<td>No</td>
<td>Unsure</td>
<td></td>
</tr>
<tr>
<td>8. Are you familiar with the suction protocol?</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. How do you know if the suction manometer is not working correctly?</td>
<td>Never check, assume it</td>
<td>Occlude the end and if no suction, then assume it is broken</td>
<td>Listen for suction</td>
<td>Check inline suction pressure</td>
</tr>
<tr>
<td>10. What do you do if the suction manometer is not working correctly?</td>
<td>Do nothing</td>
<td>Notify biomedical</td>
<td>Equipment to biomedical</td>
<td></td>
</tr>
<tr>
<td>11. What is the recommended suction pressure suctioning through ETT?</td>
<td>20-80</td>
<td>90-120</td>
<td>120-180</td>
<td>greater than 180</td>
</tr>
</tbody>
</table>
APPENDIX E: Educational In-Service
Best Practices for Suction Protocol

UAHuntsville College of Nursing
Molly Back
Lynn Curry
Dr. Pamela O'Neal

Objective #1

Understand and define clinical terms related to endotracheal suctioning

Vacuum vs. Flow

- **Vacuum**: enclosed empty space; negative pressure
- **Flow**: How fast air or fluid is removed
  - Three major factors affecting flow rate:
    - Amount of negative pressure set on the regulator
    - The resistance of the suction system
    - Viscosity of the material being aspirated

Objective #2

Recognize and explain the parts of a suction manometer

Guideline:
- Use the least amount of negative pressure that will accomplish the clinical objective
- The higher number on the regulator scale, the greater the negative pressure
Objective #3

- Cleaning the machine
- Gauge Accuracy
- Flow
- Timing
  - On/Off
  - Bleed Up/Down

Identify current hospital and evidence based policies and practices regarding endotracheal suctioning

Objective #3

- Personal suction practices?
- Huntsville Hospital Policy?

Objective #4

Discuss the importance of using correct procedures to suction ventilated patients

Objective #4

- The least amount of suctioning (negative pressure) will do damage
- According to a study conducted in 2003, the estimated cost of treating Ventilator Associated Pneumonia was $40,000 per case; excluding pharmacological intervention
1. You should understand and define clinical terms related to endotracheal suctioning
2. You should recognize and explain the parts of a suction manometer
3. You should be able to identify current hospital and evidence-based policies and practices regarding endotracheal suctioning
4. You should be able to discuss the consequences to using incorrect procedures to suction ventilated patients

References