Airway management is an important aspect of care for patients who require mechanical ventilation. This management includes maintenance of the artificial airway, endotracheal suctioning, clearance of oral and nasal secretions by suctioning, oral care, and management of equipment. Endotracheal suctioning practices have changed in the past several years, with many institutions using closed-system suctioning (CSS) to reduce hypoxemia and other complications associated with suctioning. Because CSS is designed to clear secretions from only the lower part of the airway, frequent oropharyngeal suctioning is important before repositioning an endotracheal tube and the importance it plays in ventilator-associated pneumonia.

Notice to CE enrollees:
A closed-book, multiple-choice examination following this article tests your understanding of the following objectives:

1. Describe the reasons why frequent oropharyngeal suctioning is important before repositioning an endotracheal tube
2. Identify the contributing factors related to ventilator-associated pneumonia
3. Describe the different methods of oral care and the importance it plays in ventilator-associated pneumonia
Airway management practices, including closed-system suctioning, affect patients’ outcomes and are the combined responsibility of nurses and respiratory therapists.

Background and Significance

Patients receiving mechanical ventilation are at highest risk of developing pneumonia. Ventilator-associated pneumonia (VAP) is a parenchymal lung infection that occurs more than 48 hours after initiation of mechanical ventilation.7 VAP develops in about 25% of patients, with reported occurrences ranging from 8% to 65%.8-14 The Centers for Disease Control and Prevention report median VAP rates of 4.2 to 16.3 cases per 1000 ventilator days in adult critical care units.15 Risk factors for VAP include intubation and certain conditions, such as trauma and burns.10,14,16 VAP increases hospital length of stay by 16 to 17 days and increases costs by almost $30,000 per case.14,17 When VAP occurs, the likelihood of death increases 2- to 4-fold.13,17

VAP is caused by aspiration of oropharyngeal and/or gastrointestinal secretions, direct inoculation, and inhalation of bacteria.6 The endotracheal tube bypasses normal defense mechanisms and contributes to aspiration of secretions. Microaspiration of bacteria in oropharyngeal secretions is the most common cause of VAP and is associated with dental plaque, invasive devices, and respiratory care equipment.4,11,16,18

Airway management practices may contribute to VAP.39 Knowledge of institutional policies will help identify gaps in practice, and knowledge of staff practices will determine adherence to institutional policies and published recommendations. In this article, we describe similarities and differences in practices of nurses and respiratory therapists and discuss the importance of establishing collaborative policies and procedures to improve patients’ outcomes.

Purposes

This study was intended to describe current policies and procedures for STAMP and to compare reported airway management practices of nurses and respiratory therapists. Specific purposes were as follows:

• to compare policies and procedures at institutions regarding use of CSS catheters and airway management,
• to compare VAP rates and common organisms across sites,
• to describe current practices of nurses and respiratory therapists for CSS and airway management of intubated patients, and
• to determine if suctioning and airway management practices differ between nurses and respiratory therapists.

Methods

We used survey methods to conduct a descriptive, comparative, multisite study. A goal was to enroll 30 sites that could recruit 1200 staff members to complete the STAMP: Individual Survey (960 nurses and 240 respiratory therapists). Sample size was estimated to achieve 80% power based on a small effect and .05 level of significance achieved in the pilot study (proportion comparison statistics). The institutional review board at the University of Central Florida approved the study.

A national survey was used to collect data on institutional policies and on individual practices related to airway management among nurses and respiratory therapists.

Sampling

Using network sampling, we recruited sites from throughout the United States to participate. Sites were recruited via electronic mail messages to colleagues, as well as postings to the Society of Critical Care Medicine Advanced Practice Nursing listserv. We asked persons who received the “call for participation” to forward the request to other colleagues who might be interested in the study. The criterion for sites...
to participate was that CSS be used on more than 50% of intubated patients. Staff participants were the nurses and respiratory therapists who care for intubated adult patients and regularly use CSS for endotracheal suctioning.

**Instruments**

We used 2 instruments to collect data: STAMP: Institutional Policies and Data, consisting of 45 multiple-choice and fill-in questions; and STAMP: Individual Survey for nurses and respiratory therapists, consisting of 32 multiple-choice questions and 1 fill-in question printed on a scannable form. All instruments were coded to maintain anonymity and confidentiality of responses. Before this study, a pilot study was conducted at 4 sites with 132 nurses and respiratory therapists responding. Content validity for both instruments was established by a panel of 3 persons with expertise in nursing, respiratory care, and survey methods. Test-retest reliability was .82.3

**Procedures**

Sites were recruited in May and June 2001. Site coordinators received a detailed operations manual and were responsible for obtaining approvals; completing the STAMP: Institutional Policies and Data instrument; and distributing and collecting STAMP: Individual Surveys from nurses and respiratory therapists. Envelopes were provided for each survey so that confidentiality of responses could be maintained. Once approval was obtained, the site coordinators collected data during a 2- to 3-week period. Data collection was completed in October 2001.

**Results**

**Description of Sample**

Thirty sites were recruited to participate. Of these, 3 sites withdrew because of time constraints, resulting in 27 sites. All geographical areas were represented; however, most sites (70%) were located in northeastern and southeastern states. The number of beds in the institutions ranged from 84 to 960, with a median of 500. Personnel resources available to provide expertise in the care of intubated patients included clinical nurse specialists (74%), unit-based educators (52%), and respiratory therapy educators (52%).

The response rate for staff members was 55%. Usable responses on the Individual Survey are reported for 1665 staff members: 1186 nurses (71%) and 479 respiratory therapists (29%). Table 1 provides a summary of demographic information for the staff participants.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td></td>
</tr>
<tr>
<td>Registered nurse</td>
<td>71</td>
</tr>
<tr>
<td>Respiratory therapist</td>
<td>29</td>
</tr>
<tr>
<td>Female</td>
<td>80</td>
</tr>
<tr>
<td>Bachelor’s degree or higher</td>
<td>54</td>
</tr>
<tr>
<td>≥6 years experience with patients</td>
<td>61</td>
</tr>
<tr>
<td>receiving mechanical ventilation</td>
<td></td>
</tr>
<tr>
<td>Nurses certified as CCRN or CCNS</td>
<td>17</td>
</tr>
</tbody>
</table>

CCRN indicates certified critical care registered nurse; CCNS, certified critical care clinical nurse specialist.

**Institutional Policies and Procedures**

**Related to Airway Management**

**Responsibility:** Responsibility for writing airway management policies varied. At most sites, nurses wrote policies related to oral care, respiratory therapists wrote the policies related to endotracheal tube management, and collaborative policies were written for endotracheal suctioning. Five sites (19%) had separate policies written by nursing and respiratory care staff.

**Policies and Procedures.** Table 2 summarizes the percentage of sites that had written policies on specific practices. Most sites had policies that addressed changing the CSS, use of gloves, and procedures for management of endotracheal cuffs. Less than half of the sites had policies for oral care, oral and nasal suctioning, suctioning above the endotracheal tube cuff before repositioning the tube, and changing bite blocks or oral airways. Instillation of isotonic sodium chloride solution is recommended for thick secretions at 74% of the sites.

**Equipment.** CSS devices are used on all intubated patients at 59% of the facilities. At the other sites, CSS is used if specific criteria are met: high positive end-expiratory pressure (15%), patient’s condition unstable without mechanical ventilation (15%), need for frequent endotracheal suctioning (11%), intubation longer than 24 hours (11%), or infection (7%).

- Most sites had policies for endotracheal cuff management and closed-system suctioning. Although not supported by previous studies, most policies included instillation of isotonic sodium chloride solution for thick secretions.
- Practices concerning oral care procedures, including oral suctioning, vary widely.
The CSS catheters are changed every 24 to 48 hours at 63% of sites. The other sites change the CSS every 72 hours, “as needed,” or weekly. A respiratory therapist is responsible for changing the CSS device at nearly all sites (93%).

Most sites (82%) use a single suction tubing and collection canister for both CSS and oral suctioning. The single tubing is connected as needed to either the CSS or the oral suctioning device. The remaining sites use designated equipment for CSS and oral suctioning via a Y-connector setup to 1 canister, or separate canisters and tubings for each procedure. The suction tubing is changed “only as needed” at the majority (59%) of sites. Tonsil suction devices that are reused for variable periods are used for oral suctioning at 89% of sites.

Endotracheal Tube Management. Most policies specify that respiratory therapists are to measure and record endotracheal tube cuff pressures every 8 to 12 hours (81%). The method for determining optimal cuff pressures varied. Nearly half (48%) recommend the minimal leak technique for maintaining endotracheal cuff pressures. Twelve sites (44%) specify a minimum cuff pressure of 15 to 25 cm H2O. Policies at 48% of sites recommend that oral endotracheal tubes be repositioned every 24 to 48 hours to avoid pressure damage from securing the oral tubes.

Oral Care. More than half of hospitals do not have specific policies for oral care of intubated patients; however, a variety of products are available. Oral swabs are available at all sites, and more than half have mouth care kits with oral swabs and cleansing solution. Only 10 sites (37%) reported that toothbrushes and toothpaste are available. Other products include mouthwash (41%), suction swabs (30%), and chlorhexidine mouth rinse (15%, by prescription).

VAP Rates and Organisms

Only 14 sites (52%) reported VAP rates. Many sites stated that their institution did not track VAP rates. The mean VAP rate was 6.7 (range, 0.84-20) cases per 1000 ventilator days. At most sites, VAP is diagnosed by using the clinical criteria of the Centers for Disease Control and Prevention. The top 5 organisms responsible for VAP were *Pseudomonas aeruginosa*, *Enterobacter* species, methicillin-resistant *S aureus*, methicillin-sensitive *S aureus*, and *Klebsiella pneumoniae*.

Practices of Nurses and Respiratory Therapists

Staff members were asked how often they performed several CSS and airway management activities. Response options included “always,” “most of the time,” “half of the time,” “rarely,” and “never.” Data were recoded into 3 categories to facilitate data analysis: “majority of time,” “half of the time,” and “not very often.” Chi-square statistics were computed to compare practices between nurses and respiratory therapists. When significant differences in practices were found (*P* ≤ .05), the 95% CIs for the difference of the percentages between nurses and respiratory therapists were calculated to determine who performs the stated procedures more often.
Table 3 gives the percentage of staff members who perform the stated activities the majority of time. Respiratory therapists instill isotonic sodium chloride solution, rinse the CSS device after suctioning, and suction above the endotracheal tube cuff when repositioning the tube more often than nurses do. Nurses suction the mouth more often after CSS than respiratory therapists do. Use of gloves is common; 89% of staff wear gloves the majority of the time when performing CSS.

Table 4 summarizes additional information related to suctioning and airway management practices of staff members. Nurses perform oral suctioning, oral care with swabs, and tooth brushing more often than respiratory therapists do. Many nurses did not know how often endotracheal cuff pressures were measured (38%) or the method for maintaining cuff pressures (46%).

Staff members were also asked their opinion of the effectiveness of CSS devices. The majority of staff members (79%) stated that CSS is the same as or better than traditional open suctioning.

Factors Influencing Practice
Staff members were asked what factors most influenced their CSS and airway management practices. They were instructed to mark all options that were relevant (Table 5). The majority of respiratory therapists stated that their practice is most influenced by their basic educational program. Practice of nurses is influenced most by preceptors and knowledge obtained in the basic educational preparation. Significant differences were noted between the disciplines on several factors by \( \chi^2 \) statistics.

Discussion

Policies

Policies for STAMP varied within and between institutions. Several sites reported that both nursing and respiratory therapy wrote separate policies for many items related to STAMP. This factor could lead to a disparity in practice. Many items were not included in written policies, such as oral care and suctioning. We found similar responses in our pilot study. Nurses and respiratory therapists reported a variety of practices and did not always follow institutional policies and procedures.

Closed Suctioning Equipment

Most sites change the CSS devices every 24 to 48 hours. In a recent study, changing the catheters on an as-needed basis significantly reduced costs and did not affect the incidence of nosocomial pneumonia. The CSS becomes colonized as soon as it is used for endotracheal suctioning, but no differences in rates of VAP between open suctioning and CSS have been found. In one study, rates of VAP were reduced with CSS.

A single suction tubing and canister is used for both CSS and oral suctioning at most sites. This practice causes a break in the “closed” system when equipment is used for oral suctioning. Possibly cross-contamination from the oral suction device to the CSS device occurs. Dual tubings with a Y-connector are available from CSS manufacturers and are used at some sites; their effect on reducing infection is not known.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Nurses</th>
<th>Respiratory therapists</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear gloves for oral suctioning</td>
<td>97</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>Wear gloves for oral care</td>
<td>96</td>
<td>97</td>
<td>96</td>
</tr>
<tr>
<td>Wear gloves for closed-system suctioning</td>
<td>89</td>
<td>89</td>
<td>89</td>
</tr>
<tr>
<td>Establish hyperoxygenation via ventilator before closed-system suctioning</td>
<td>81</td>
<td>85</td>
<td>82</td>
</tr>
<tr>
<td>Rinse closed-system suctioning equipment after use*</td>
<td>70</td>
<td>92</td>
<td>76</td>
</tr>
<tr>
<td>Suction mouth above endotracheal cuff before repositioning the endotracheal tube*</td>
<td>69</td>
<td>78</td>
<td>72</td>
</tr>
<tr>
<td>Suction mouth immediately after closed-system suctioning*</td>
<td>71</td>
<td>52</td>
<td>66</td>
</tr>
<tr>
<td>Instill isotonic sodium chloride solution before closed-system suctioning*</td>
<td>26</td>
<td>51</td>
<td>33</td>
</tr>
<tr>
<td>Establish hyperinflation via ventilator before closed-system suctioning</td>
<td>13</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>Disconnect closed-system suctioning and perform open suctioning</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

*P ≤ .05; \( \chi^2 \) analysis.
Table 4  Comparison of percentages of nurses and respiratory therapists who perform selected airway management practices

<table>
<thead>
<tr>
<th>Practice</th>
<th>Nurses</th>
<th>Respiratory therapists</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suction oral secretions</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every 4 hours</td>
<td>75</td>
<td>32</td>
<td>62</td>
</tr>
<tr>
<td>Every 8-12 hours</td>
<td>7</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>Only as needed</td>
<td>18</td>
<td>45</td>
<td>26</td>
</tr>
<tr>
<td><strong>Suction nose of orally intubated patients</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every 4 hours</td>
<td>9</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Every 8-12 hours</td>
<td>9</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Only as needed</td>
<td>65</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Rarely or not at all</td>
<td>17</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td><strong>Brush teeth of intubated patients</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every 4 hours</td>
<td>5</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Every 8-12 hours</td>
<td>34</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>Only as needed</td>
<td>20</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Rarely or not at all</td>
<td>41</td>
<td>86</td>
<td>53</td>
</tr>
<tr>
<td><strong>Use oral swabs for mouth care</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every 4 hours</td>
<td>72</td>
<td>4</td>
<td>53</td>
</tr>
<tr>
<td>Every 8-12 hours</td>
<td>24</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>Only as needed</td>
<td>3</td>
<td>38</td>
<td>13</td>
</tr>
<tr>
<td>Rarely or not at all</td>
<td>1</td>
<td>41</td>
<td>12</td>
</tr>
<tr>
<td><strong>Rinsing tonsil suction device (Yankauer)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not usually rinse</td>
<td>6</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Rinse with sterile sodium chloride solution if visible mucus</td>
<td>14</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Rinse with sterile sodium chloride solution after each use</td>
<td>33</td>
<td>49</td>
<td>37</td>
</tr>
<tr>
<td>Rinse with tap water after each use</td>
<td>36</td>
<td>16</td>
<td>30</td>
</tr>
<tr>
<td>Not applicable; use disposable devices</td>
<td>11</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td><strong>Frequency of changing tonsil suction device</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every 24 hours</td>
<td>45</td>
<td>25</td>
<td>39</td>
</tr>
<tr>
<td>Every 48 hours</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Every 72 hours</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Only as needed</td>
<td>40</td>
<td>61</td>
<td>36</td>
</tr>
<tr>
<td>Not applicable</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td><strong>Where tonsil suction device is stored</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In original package on shelf or taped to ventilator, shelf, or wall</td>
<td>71</td>
<td>77</td>
<td>73</td>
</tr>
<tr>
<td>Looped around side rail, ventilator, or suction regulator (uncovered)</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Uncovered on shelf or table</td>
<td>5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td><strong>Frequency of changing bite block or oral airway</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every 24 hours</td>
<td>20</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Every 48 hours</td>
<td>5</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Only as needed</td>
<td>46</td>
<td>62</td>
<td>51</td>
</tr>
<tr>
<td>Do not know</td>
<td>29</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td><strong>Frequency of measuring and recording endotracheal cuff pressures</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every 4 hours (every 2 hours at 1 site)</td>
<td>18</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Every 8 hours</td>
<td>20</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>Every 12 hours</td>
<td>16</td>
<td>45</td>
<td>24</td>
</tr>
<tr>
<td>Only as needed</td>
<td>8</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Do not know</td>
<td>38</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td><strong>Minimum endotracheal cuff pressure</strong>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 cm H2O</td>
<td>7</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>20 cm H2O</td>
<td>15</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>25 cm H2O</td>
<td>1</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Varies; minimal leak</td>
<td>31</td>
<td>47</td>
<td>36</td>
</tr>
<tr>
<td>Do not know</td>
<td>46</td>
<td>1</td>
<td>33</td>
</tr>
</tbody>
</table>

*P < .05; χ² analysis.
VAP Rates and Organisms

The National Nosocomial Infection Surveillance System of the Centers for Disease Control and Prevention compiles VAP rates from hospitals all over the United States. The mean VAP rate reported by that system is 10.6 episodes per 1000 ventilator days. The sites in this study reported lower rates: 6.7 per 1000 ventilator days. The top 5 organisms for VAP reported by the sites are similar to those reported in the literature.15

CSS Policies and Practices

Results of a recent study1 show that many institutions did not have policies for CSS. In the STAMP study, most institutions had policies for changing the CSS devices, hyperoxygenation before suctioning, rinsing the CSS device after use, and use of gloves. Although use of CSS lessens suction-induced hypoxemia, it is important that hyperoxygenation be included in CSS procedures, depending on the assessment of the patient.22,27-29

Most respondents reported establishing hyperoxygenation before CSS the majority of the time. Findings are higher than those reported in other studies1,3 and may be attributed to the higher number of institutions that include hyperoxygenation in their policies. Most staff members rinse the CSS catheter after use; however, respiratory therapists perform this practice more often than nurses. One possible reason for this difference is that respiratory therapists instill isotonic sodium chloride solution during suctioning more often than nurses do, so a vial is attached to the instillation/rinsing port of the CSS, which facilitates rinsing. Rinsing the CSS device may also be emphasized more in respiratory therapy programs.

One third of sites include hyperinflation in CSS procedures, and 15% of staff members report that they establish hyperinflation during CSS. This percentage is lower than previously reported.13 It is not known if hyperinflation is needed with CSS.1

Similar to the results of our pilot study,3 only 4% of the respondents regularly disconnect the CSS device and suction via traditional open suctioning. These findings are lower than previously reported1 and may be related to overall satisfaction with the effectiveness of CSS. Traditional suctioning is not advocated because it disrupts the closed system, potentially increasing the risk for infection. Open suctioning also negates the beneficial effects of CSS, such as prevention of hypoxemia and maintenance of positive end-expiratory pressure.

Instillation of Isotonic Sodium Chloride Solution

Most sites (74%) have policies that include instillation of isotonic sodium chloride solution for thick secretions. This finding mirrors that of our pilot study.3 Respiratory therapists were twice as likely as nurses to report instillation of sodium chloride solution the majority of the time (51% vs 26%). Schwenker et al30 reported that 64% of nurses in a large teaching hospital rarely instill isotonic sodium chloride solution before suctioning, whereas 71% of respiratory therapists often do. Other researchers have reported similar findings.3,31,32 Adverse effects of such instillation have been reported (primarily in nursing journals), along with recommendations to avoid this practice.31-33 Despite these published reports, staff continue to instill sodium chloride solution. One reason for the finding may be that most staff members (83%) do not base their practice on published reports. In addition, instillation of sodium chloride solution for thick secretions is still recommended in textbooks, and many nurses and respiratory therapists think that such instillation is needed as a clinical intervention for thick secretions.39 A controlled clinical trial related to effectiveness of instillation of sodium chloride solution and its adverse effects is warranted because many of the studies lack controls and have a small number of subjects.

Oral Care

Less than half (48%) of the sites had written policies for oral care of intubated patients. None of the 4 sites in our pilot study had oral care policies.3 Current critical care nursing manuals40-42 advocate oral care every 2 hours to every shift (8-12 hours) to prevent overgrowth of normal flora.

Most nurses (72%) stated that they perform mouth care every 4 hours with oral swabs. However, only 39% of nurses brush patients’ teeth on a routine basis, less than that reported in our pilot study (58%).4 In another recent study,5 67% of patients had not had oral care within the past 4 hours. Fewer respiratory thera-

Table 5 Percentages of nurses and respiratory therapists indicating factors that influenced their suctioning and airway management practices

<table>
<thead>
<tr>
<th>Factor</th>
<th>Nurses</th>
<th>Respiratory therapists</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic educational program*</td>
<td>49</td>
<td>69</td>
<td>55</td>
</tr>
<tr>
<td>Preceptors and coworkers*</td>
<td>52</td>
<td>32</td>
<td>46</td>
</tr>
<tr>
<td>Policies and procedures</td>
<td>43</td>
<td>40</td>
<td>42</td>
</tr>
<tr>
<td>Continuing education*</td>
<td>29</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td>Journal articles*</td>
<td>18</td>
<td>15</td>
<td>17</td>
</tr>
</tbody>
</table>

*P < .05; χ² analysis.
pists participate in oral care; only 21% of respiratory therapists use swabs on a regular basis, and 6% reported that they brush patients’ teeth. Oral care is taught in beginning nursing courses, but it may not be emphasized as an important component of airway management for patients receiving mechanical ventilation. Oral care is considered a nursing responsibility by most disciplines, accounting for the differences in practice between nurses and respiratory therapists.

Oral swabs are used for mouth care more often than brushing teeth is used. Swabbing may be effective for quick cleansing or moistening the mouth, but it does not substitute for brushing teeth. Swabbing takes much less time than brushing teeth, which may be a reason for this finding. Another reason may be the lack of available equipment to brush patients’ teeth. Only 37% of sites stated that toothbrushes were available for patients, and 1 of these sites stated that toothbrushes came from volunteer services rather than being readily available in unit supplies.

The American Association for Critical-Care Nurses’ Protocols for Practice recommend oral care via swabbing, brushing teeth, and suctioning oral secretions “several times a day” to prevent plaque and periodontal disease. Munro and Grap18 reported that plaque increased during a 7-day period after intubation and proposed a relationship between plaque and VAP. In recent studies,43,44 VAP was reduced by oral decontamination with topical agents. Because oral hygiene may play a role in oral colonization and VAP, oral suctioning when the CSS device is used, and staff members do not routinely suction patients’ oropharyngeal secretions, the volume of secretions that may be aspirated increases.

Oral suctioning is an integral part of the suctioning process between nurses and respiratory therapists. Most sites had written policies for how endotracheal tube cuffs are managed and the frequency for measuring cuff pressures. Respiratory therapists followed institutional policies related to endotracheal cuff management. Frequency of measuring endotracheal cuff pressures varied from every 2 hours to every 12 hours, and the most common response (45% of respiratory therapists) was every 12 hours. In our pilot study, endotracheal cuff pressures were recorded every 8 hours.2 Current respiratory therapy and critical care resources recommend that clinicians monitor endotracheal cuff pressures every 8 to 12 hours and as needed.46-50 However, in a recent study,51 a decrease in cuff pressures occurred within a 4-hour period. More frequent monitoring may be needed to detect leaks of endotracheal tube cuffs and assist in maintaining adequate cuff pressures.

Management of Endotracheal Tube Cuffs

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Many nurses did not know how often cuff pressures are measured (38%) or how endotracheal cuff pressures are maintained (46%). These findings were also noted during the pilot study.1 Endotracheal cuff management is often considered a respiratory therapy procedure, so content related to endotracheal cuff management may not be addressed in nursing texts and courses.

Nearly half of respiratory therapists stated that they manage endotracheal cuffs by using a minimal leak technique, whereas the others maintain the cuff at a minimum pressure ranging from 15 to 25 cm H2O. The goal is to keep the cuff pressures below the tracheal mucosal perfusion pressure, which is estimated to range between 20 and 25 mm Hg, or between 24 and 30 cm H2O.52 Underinflation facilitates aspiration of subglottic and oropharyngeal secretions into the lower airway, increasing the risk of VAP.53 Rello et al54

Oral Suctioning

Microaspiration is a risk factor for VAP.4 In addition to bypassing normal defenses, the endotracheal tube may also damage the larynx, increasing the risk for aspiration.45 By decreasing the amount of secretions, suctioning bacterial-laden oral and subglottic secretions may help prevent VAP. Policies related to frequency of oral suctioning and to suctioning above the endotracheal tube before repositioning the tube had been written at only half of the sites.

Oral suctioning is an integral part of the suctioning process when traditional open suctioning is done with single-use suction catheters. The advent of CSS techniques has changed the way oral suctioning is done. Additional equipment is needed to carry out oral suctioning when the CSS device is used, and staff members must recognize the need for oral suctioning. In our study, respiratory therapists were less likely than nurses to suction oral secretions, perhaps because oral suctioning is not an integral part of CSS, or because nurses performed more oral care. If staff members do not routinely suction patients’ oropharyngeal secretions, the volume of secretions that may be aspirated increases.

Oral suctioning with CSS is addressed in only a few articles and text chapters.41,46 Oral suctioning is considered “ongoing monitoring” rather than a part of suctioning procedures,6 and this procedure is not addressed in respiratory therapy texts.39,47 Product instructions from the leading CSS manufacturers do not mention the need for oral suctioning. However, companies market suction tubing and supplies for oral suctioning that can be used along with CSS. Suction catheters designed for subglottic aspiration of secretions also are available.
found that patients with endotracheal cuff pressures less than 20 cm H₂O had a 2.5-fold increase in VAP rates. Only 41% of respiratory therapists stated that they keep the pressure at 20 cm H₂O or greater. Eleven percent of respiratory therapists stated that they keep cuff pressures at 15 cm H₂O, a level that might increase the risk of VAP. These findings are similar to what we noted in our pilot study.¹

Seventy-two percent of all staff members stated that they suction above the endotracheal cuff before repositioning an oral endotracheal tube the majority of the time. In our pilot study,¹ only 50% of the staff reported regularly suctioning above the endotracheal cuff. Suctioning above the endotracheal cuff before repositioning an oral endotracheal tube reduces the volume of secretions that may be aspirated, and this procedure should be emphasized in policies and practices.

Equipment

Most hospitals had policies related to frequency of changing suction tubing and the oral suction device (Yankauer). These numbers are higher than previously reported.¹ However, policies for rinsing and storing the Yankauer and for changing oral airways or bite blocks were not usually written. Staff members report variable practices for changing Yankauer devices, ranging from every 24 hours (39%) to only as needed (36%). Nine percent use disposable suction swabs.

Most staff members change bite blocks only as needed. Oral airways should be removed every 24 hours or as needed to allow for complete oral hygiene and inspection of the oral cavity.⁴

In a recent study,² Yankauer devices harbored potentially pathogenic bacteria within 24 hours; however, it is not known if these bacteria contribute to VAP. More than half (53%) of staff members rinse the Yankauer devices with sterile sodium chloride solution, a practice supported by the Centers for Disease Control and Prevention.⁴ However, 30% of staff members rinse the devices with tap water, a practice that has been associated with outbreaks of bacteria,³ and 6% do not rinse the devices at all. Most staff members store the Yankauer device on a shelf in its original package. Similarly, in a recent observational study,¹ 66% of Yankauer devices were found on the shelf, and the majority of devices were not covered.

Perception of the Effectiveness of CSS

Seventy-nine percent of staff stated that CSS was the same as or better than traditional open suctioning, similar to what we found in our pilot study.¹ Because CSS was used on the majority of patients, most likely staff members are comfortable using this type of suctioning system. These reports of high satisfaction are higher than those cited by Blackwood¹ and Blackwood and Webb,⁵ who reported ineffective removal of secretions 45% of the time with CSS because of thick secretions. Those studies¹,⁵ were done in Ireland, where practices related to rinsing the CSS and/or using humidification may be different.

Implications

Factors influencing airway management practices varied and differed between nurses and respiratory therapists. A person’s basic educational program is a strong influence on practice. Therefore, it is important that faculty members include research-based information when instructing on management of patients receiving mechanical ventilation and suctioning practices. Staff members also stated that their practices are influenced by their hospital’s policies and procedures; therefore, it is important that advanced practice nurses and other resource personnel write the policies and base them on current evidence. Because most staff members do not routinely base their practice on journal articles they have read, those who write the policies must translate published research findings into clinical practice.

Institutions are encouraged to evaluate existing policies and procedures and to develop comprehensive policies and procedures for CSS and airway management practices. Both nursing and respiratory care departments should collaborate to write policies and procedures. Policies related to CSS and airway management must include steps for performing procedures, oral suctioning, protocols for oral care for intubated patients, and equipment management. Management of endotracheal tubes, including measurements of cuff pressure, suctioning above the cuff when repositioning the tube, and changing bite blocks or oral airways, must be addressed. A comprehensive strategy to communicate changes in policies and procedures to both nurses and respiratory therapists is important.

Collaborative practice teams are needed to address suctioning and airway management practices. Such teams can identify best practices and strategies for disseminating information and evaluating effectiveness of practice changes.

Comprehensive airway management protocols that reduce the compartmentalization of care are needed. Our findings indicate that nurses manage oral care, whereas respiratory therapists manage the endotracheal tube. This division of responsibilities can result in a lack of awareness of policies, different methods for performing airway management, failure to perform important activities (eg, oral suctioning) as often as needed, and the possibility that each disci-
practices vary widely and do not always reflect res-
bated patients. Outcomes of research should be used to evaluate stan-
practices for suctioning and airway management.

Whether measurement and management of endotra-
chlear cuff pressures every 8 to 12 hours sufficient to
prevent aspiration and V AP?

Are measurement and management of endotra-
chlear cuff pressures every 8 to 12 hours sufficient to
prevent aspiration and V AP?

What frequency and which products for oral care
are best used to decrease VAP?

Should oral suctioning equipment be separated
from the CSS equipment (eg, Y-connector setups), how
often should it be changed, and does it relate to VAP?

Does the use of a disposable oral suction swab
system decrease the incidence of VAP?

Does the implementation of VAP “best practice”
guidelines decrease the incidence of VAP?

Does the implementation of oral care guidelines
decrease the incidence of VAP?

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Commentary by Mary Jo Grap (see shaded boxes).

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**Conclusion**

Policies on suctioning and airway management practices vary widely and do not always reflect research-based practices. Routine care such as oral care and suctioning is often not addressed. Textbooks and polices do not reflect current evidence. Collaborative, research-based practice guidelines must be developed to ensure best practices for intubated patients.

**These data suggest that practice does not consistently reflect the most recent evidence, especially related to timing of changes of closed-system suctioning catheters, use of isotonic sodium chloride solution, management of endotracheal cuff pressures, and oral care frequency and procedures.**

**Use of research findings and collaboration between nurses and respiratory therapists is essential for optimal and consistent airway management.**
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