Aspiration pneumonia is a pulmonary infectious process that results from the inhalation of oropharyngeal or gastric contents into the lungs (Shigemitsu & Afshar, 2007). Pulmonary aspiration is a focal cause of serious illness and death among patients in hospitals and nursing homes, and is associated with significantly higher hospital costs (Marik, 2011). Because this disease is preventable, efforts to minimize its occurrence have surfaced in institutions across the United States. The recommended preventive measures are two-fold: identify high-risk patients and implement evidence-based practices to prevent occurrences. Another key element of the process is timing. The early identification of high-risk patients is a critical element affecting patient outcome (Yokoe et al., 2008).

The purpose of this article is to describe an intervention model for the prevention of aspiration pneumonia implemented at an urban teaching hospital in the northeastern United States. This included the development, implementation, and evaluation of an assessment tool and development of an aspiration pneumonia prevention protocol.

Background

Literature Review

Aspiration pneumonia, a pulmonary infectious process, is associated with significantly higher morbidity and mortality rates, accompanied by high health care costs. As a result, aspiration pneumonia preventive efforts are a national priority. The development of an intervention model for the prevention of aspiration pneumonia in high-risk medical-surgical inpatients at an urban teaching hospital is described. The intervention model consists of the implementation and evaluation of a risk assessment tool and development of an aspiration pneumonia prevention protocol.

Aspiration pneumonia is associated with significantly high morbidity and mortality rates, accompanied by high health care costs. As a result, aspiration pneumonia preventive efforts are a national priority. The development of an intervention model for the prevention of aspiration pneumonia in high-risk medical-surgical inpatients at an urban teaching hospital is described. The intervention model consists of the implementation and evaluation of a risk assessment tool and development of an aspiration pneumonia prevention protocol.

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ration without symptoms, also may occur and is even more difficult to detect (Eisenstadt, 2010; Marik, 2011). Aspiration of substances, such as food, tube-feeding formula, saliva, or vomitus, into the respiratory tract can lead to aspiration pneumonia (Shigemitsu & Afshar, 2007).

Dysphagia, defined as impairment of any part of the swallowing process, increases the risk of aspiration. Dysphagia and aspiration are associated with the development of aspiration pneumonia (Metheny et al., 2006). The ability to swallow solid food and liquids depends on the interplay of some 50 pairs of muscles in the head and neck. While some changes in swallowing are related to aging, dysphagia often is associated with or caused by neurologic impairment, which can interfere with the proper function of these muscle groups and in turn interfere with the closure of the larynx when food or liquid reaches the back of the tongue (National Institute of Neurological Disorders and Stroke [NINDS], 2010). These substances then can enter the trachea and lungs.

Older adults, especially those with neurologic conditions such as stroke, Parkinson's disease, dementia, and multiple sclerosis, are at risk for dysphagia and aspiration (NINDS, 2010). Patients who have decreased alertness because of medications, medical conditions, or a combination of these conditions may have slowed gag and swallowing reflexes and therefore may be less able to respond to regurgitation and vomiting. Also, because chewing prepares food for swallowing, the absence of teeth or the presence of poorly fitted dentures increases the risk of aspiration. Poor oral hygiene promotes the growth of pathogenic organisms in the mouth, thereby increasing the risk of aspiration pneumonia (Marik, 2011; Pace & McCullough, 2010).

Reports of the prevalence of dysphagia vary with study population, diagnosis, and treatment. Dysphagia in older adults is increasingly common, with more than 10% of adults over age 50 reporting some degree of swallowing dysfunction (Andrews, Fraser, Heddle, Hebbard, & Checklin, 2008). In nursing homes, 50%-75% of residents have dysphagia; of this population, half will aspirate and one-third will develop pneumonia (Eisenstadt, 2010). "Dysphagia is clinically present in 42% to 67% of patients within the first 3 days of stroke, and the incidence of aspiration within the first 5 days ranges from 19.5% to 42%" (Trapl et al., 2007, p. 2948). As a result of these statistics, the early identification of conditions and co-morbidities which contribute to dysphagia became the main component in the authors' aspiration risk assessment tool, and a point of interest for the protocol.

Aspiration pneumonia represents a significant proportion of all pneumonia cases. It is a common cause of respiratory illness and death in elders and debilitated patients, and usually affects older hospitalized adult patients who have one or more major aspiration risk factors (Altman, 2011; Paintal & Kuschner, 2007). Major risk factors include increased age, stroke, altered mental status, poor oral hygiene, and gastroesophageal reflux disease (Shigemitsu & Afshar, 2007).

In 1981, due to the high morbidity and mortality associated with health care-associated pneumonia, the CDC published the first guidelines for the prevention and control of aspiration pneumonia. Since release of the guidelines, several revisions and expansions have been made. The most recent revision provides detailed recommendations for the prevention of health care-associated bacterial pneumonia (CDC, 2004). Numerous acute care hospitals have adopted the guidelines in hope of eradicating or minimizing nosocomial pneumonia rates.

Early screening for the detection of aspiration risk factors is a vital element for the prevention of pneumonia. Screening can occur via various methods, such as at the patient's bedside (simple preliminary exams or formal bedside swallowing assessments), under videofluoroscope, or through fiberoptic endoscopic examination (Bours, Speyer, Lemmens, Limburg, & Wit, 2009). The type of screening depends on the patient's individualized treatment plan. Screening for dysphagia under videofluoroscope has been considered the gold standard for assessing swallowing ability (Bours et al., 2009). However, limitations or contraindications to this invasive procedure may necessitate a less-invasive bedside screening approach. In addition, waiting times for invasive procedures can be long, and patients can benefit from prevention strategies that are implemented far earlier.

Trapl and co-authors (2007) suggested most screening tools are complex and biased toward fluid swallowing. They developed a simple, stepped bedside screen, the Gugging Swallowing Screen (GUSS). The GUSS allowed a graded rating with separate evaluations for nonfluid and fluid nutrition, beginning with nonfluid textures. The GUSS aimed to decrease the risk of aspiration during the test to a minimum, while allowing the severity of aspiration risk to be assessed. The validity of the GUSS was established by fiberoptic endoscope. It is deemed to be a quick, reliable method to identify patients with stroke, dysphagia, and aspiration risk at the bedside.

Cichero, Heaton, and Bassett (2009) developed another approach to screen patients with dysphagia or those at risk of aspiration on admission to an acute hospital. The prospective, quasi-experimental trial was conducted to investigate the utilization of a tool that consisted of a two-phase question screen, a water swallow test, and a swallowing management plan. Results suggested the dysphagia screening tool is a quick, robust tool for triaging individuals with dysphagia.

While the procedures described in these studies allow identification of many risk factors associated with an aspiration risk, common risk factors such as dysphagia can be identified early through proper screening methods. This early identification further leads to the implementation of preventive measures to reduce occurrences. It thus was the driving force for this program.
Model (QHOM) served as the organizing framework for the intervention model to be described in this article (Mitchell, Ferketich, & Jennings, 1998). The model is ideal for this project because it provides a framework for studying the quality of health care and describes relationships among interventions, patient characteristics, health care system characteristics, and patient outcomes. The early identification of patients at high risk for developing aspiration pneumonia can lead to implementation of an aspiration protocol. Placement of the protocol allows execution of appropriate interventions to minimize potential for developing an aspiration occurrence. This process should lead to improved patient and hospital outcomes.

Needs Assessment

Identification of a need for an intervention model became evident after the third quarter 2007, when the number of pneumonia cases in the medical-surgical settings increased from none in the previous two quarters to three cases in the preceding two quarters. In 2007, three pneumonia cases were documented, compared to 10 cases for calendar year 2008. This represented a 70% increase in total annual cases (see Figure 1). Data indicated an increase in aspiration occurrences in the medical-surgical setting. These occurrences further led to longer hospital stays, as patients were intubated routinely and transferred to the intensive care unit. Infections occurred randomly in multiple medical surgical units.

Program Plan

Planning

A sub-committee was formed under the auspices of the hospital’s existing Ventilator-Associated Pneumonia Committee. The Aspiration Precaution Committee was comprised of an interdisciplinary group which included representatives from nursing, pharmacy, infection prevention, medicine, nutrition, performance improvement, and speech therapy. Staff from Nursing Education served as team leaders.

The primary responsibility of the committee was to develop an assessment tool which would promote the easy identification of non-ventilated patients at high risk for aspiration, and to develop an intervention model to facilitate utilization of the tool. As a result, the Aspiration Pneumonia Risk Assessment Screening Tool and Aspiration Precaution Protocol (see Figures 2 & 4) were crafted. These tools, which were developed after an extensive literature review, were major components of the intervention model. While the purpose of the assessment tool was to identify patients at risk for aspiration, the resulting protocol was designed to promote the implementation of strategies to reduce identified risks. During development, the tool was revised and reformatted several times due to feedback received from the committee members before its pilot implementation.

Model Implementation

After the committee finalized the three-phase intervention model, the tool was piloted on a neurosurgery/orthopedic medical-surgical unit. The choice of this unit for the pilot was based on the unit's high-risk patient population. The intervention model commenced in first quarter 2009 and was piloted over 4 months (see Figure 3). Implementation of the model occurred over three phases. Phase One consisted of one-on-one training for proper feeding methods provided by a hospital-based speech therapist. All patient-care technicians (nursing assistants) on the trial unit, and a number of adults from the hospital's volunteer program, attended the training. Participants were trained on proper feeding and positioning.
Advanced Practice

FIGURE 2.
Aspiration Pneumonia Risk Assessment Tool

<table>
<thead>
<tr>
<th>Risk Assessment: Check all that apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEUROLOGIC:</td>
</tr>
<tr>
<td>□ Decreased level of consciousness</td>
</tr>
<tr>
<td>□ Diagnosis of history of stroke with residual</td>
</tr>
<tr>
<td>□ Neurodegenerative disease (ALS, Parkinson's)</td>
</tr>
<tr>
<td>GASTROINTESTINAL:</td>
</tr>
<tr>
<td>□ Unable to perform oral hygiene</td>
</tr>
<tr>
<td>□ Full assist with meals (requires help eating)</td>
</tr>
<tr>
<td>□ Presence of a nasal, gastric, or feeding tube</td>
</tr>
<tr>
<td>RESPIRATORY</td>
</tr>
<tr>
<td>□ Tracheostomy</td>
</tr>
<tr>
<td>□ NONE OF THE ABOVE APPLY Initials:</td>
</tr>
</tbody>
</table>

If ONE or more indicators are checked:
- Initiate Aspiration Precaution Protocol
- Complete Functional Assessment

<table>
<thead>
<tr>
<th>Functional Assessment: Check all that apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Difficulty maintaining sustained level of alertness</td>
</tr>
<tr>
<td>□ Shortness of breath or oxygen desaturation during or after oral intake</td>
</tr>
<tr>
<td>□ Difficulty chewing or sealing lips around cup, straw, or utensil</td>
</tr>
<tr>
<td>□ Gagging or coughing during oral intake</td>
</tr>
<tr>
<td>□ Voice changes/wet sounding voice during oral intake</td>
</tr>
<tr>
<td>□ NONE OF THE ABOVE APPLY Initials:</td>
</tr>
</tbody>
</table>

If ONE or more indicators are checked:
- Maintain Aspiration Precaution Protocol
- Remove all foods and liquids
- Initiate NPO status
- Consult Speech Pathology

Date: _______ Initials: _______

FIGURE 3.
Pneumonia Infections on the Trial Medical-Surgical Unit After Intervention

Techniques, and identification of patients who demonstrated signs of dysphagia and/or aspiration. This training, aligned with the Aspiration Precaution Protocol, suggests a patient who is placed on the protocol be assisted and monitored closely during meals.

Phase Two included education about the program objectives, background and overview of the program, and proper utilization of the new Risk Assessment Screening Tool and Aspiration Protocol. Education was provided by the clinical nurse educator to all unit professional staff. With the intent of expanding the program after the trial completion, education was expanded to include all medical-surgical registered nurses and patient care technicians. Phase Three of the intervention model involved the development and revision of patient education material for distribution to patients and families during program implementation.

During the trial period, all patients received an aspiration risk assessment on admission to the unit. If a patient was identified as at high risk, as noted by the indicators on the Risk Assessment Screening Tool, the nurse would initiate the Aspiration Precaution Protocol and complete the second part of the screening tool (the Functional Assessment) (see Figure 2). The
Aspiration Precaution Protocol

- Aspiration Precaution Protocol Implemented: [Date]

- RN Signature: ____________________________

- "Aspiration Precautions" should be documented on the patient's Kardex/report sheet and communicated during hand-off communication.

- Place "SWALLOWING PRECAUTIONS" sign above the patient's bed.

- Maintain HOB at 45 degrees or higher at all times, unless otherwise contraindicated. (If patient's head of bed is flat, maintain tube feedings off.)

- Maintain HOB at 90 degrees when eating or drinking. If eating, patient must be assisted with all meals and observed closely during meals.

- Maintain operating suction readily available.

- Provide oral care each shift.

- If NPO, place NPO sign over bed.

- Provide patient and/or family with education regarding aspiration precautions, and educational hand-outs.

- If patient suspected to have aspirated, notify physician immediately and initiate speech pathology consult.

Functional Assessment provided a more in-depth evaluation of any identified risk factors. If a patient demonstrated one or more criteria on the Functional Assessment (e.g., pockets food while eating), the nurse would maintain the Aspiration Precaution Protocol and initiate an NPO status (nothing by mouth) and a speech pathologist consultation.

**Evaluation**

A formative evaluation of the intervention model was performed during the trial period. Nursing staff was asked to provide feedback regarding ease, usability, and accuracy of the newly developed Risk Assessment Tool in addition to other components of the intervention model. Verbal feedback was provided to the clinical nurse educator in meetings and through interviews. As part of the evaluation period, weekly audits were performed to determine adherence to the model. Data collected included compliance in regards to use of tool, and appropriate utilization of the tool.

Early audits indicated a high percentage of patient placements on the Aspiration Precaution Protocol. During the first 2 months, while only 31 patients met diagnostic criteria for placement on Aspiration Precautions, 49 patients were placed on precautions. During the evaluation, the need for an ongoing assessment in addition to the admission screening was identified. Patients who were not deemed at high risk upon admission to the unit potentially could develop new risk factors based on their diagnosis (e.g., postoperative status). To capture this patient population, staff conducted daily surveillance to determine ongoing risks for aspiration. This information was relayed to the charge nurse and documented on a daily log.

**Discussion**

Utilization of the QHOM as the organizing framework during the model’s implementation allowed for process restructuring. Nurses were able to identify the significance of having all model components addressed and implemented. For example, allowing nurses to provide feedback regarding the Risk Assessment Tool led to a vital revision of the tool. When performing the risk assessment, nurses identified the need to have a concrete way of documenting implementation of the Aspiration Precaution Protocol on patients who met the criteria, and if warranted, that a speech pathology consult was placed. The nursing staff suggested initialing the form when initiating the Aspiration Precaution Protocol and a speech pathology consultation.

The main challenge of the intervention model has been achieving consistency and compliance with feeding assistance for patients placed on the Aspiration Precaution Protocol. This is primarily due to lack of personnel resources. As part of the Aspiration Precaution Protocol, patients are required to have assistance with all meals and be monitored closely. Because team leaders knew this component would prove challenging due to issues associated with staffing and high patient-nurse ratios, part of the intervention model consisted of utilization of the hospital’s volunteers to assist with this process. Unfortunately, the number of patients needing assistance may exceed personnel available to help.

In spite of these challenges, the development of this intervention model proved to be successful on various levels. The multidisciplinary collaboration and the formative evaluation, which allowed for feedback during the trial, were two keys to its success. Since implementation of the model on the trial unit, no cases of non-ventilator-related aspiration pneumonia have occurred. As a result of these outcomes, the model was extended to all medical-surgical areas. Other positive outcomes of this project include increased awareness of aspiration risk factors among nurses and patient care technicians, increased patient and family education regarding the pulmonary infectious process, and improved collaboration among disciplines.

**Implications for Practice**

With vast supporting evidence that sustains the detrimental effects of aspiration pneumonia to both the patient and the health care organization, efforts to prevent occurrences are warranted. For this project, an evidenced-based screening tool and care protocol were developed to identify patients at high risk for aspir-
ration and implement appropriate preventative interventions. The decision to focus efforts on screening was made as a direct result of supporting evidence that suggested early detection of aspiration risk factors as a vital element in the prevention of aspiration pneumonia.

Protocols, clinical pathways, and screening tools are examples of processes which have improved standardization for the identification, assessment, and treatment of hospitalized patients with dysphagia (Altman, 2011). An example of a highly recognized successful screening tool which has been utilized widely in nursing is the Morse Falls Scale (Harrington et al., 2010). This tool allows for the rapid assessment of a patient's likelihood of falling, and offers prevention strategies targeted to the risk identified. Many other recognized treatment flowcharts are utilized to support best practice standards by providing evidenced-based interventions in the management and/or prevention of patient disease. Health care leaders need to focus efforts on preventative measures as a necessity of effective practice.

**REFERENCES**


