The Dangers of Obstructive Sleep Apnea and Post-Surgical Care

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Introduction

According to the American Sleep Apnea Association (2011),

"Sleep apnea is an involuntary cessation of breathing that occurs while the patient is asleep…people with untreated sleep apnea stop breathing repeatedly during their sleep, sometimes hundreds of times during the night and often for a minute or longer. In most cases the sleeper is unaware of these breath stoppages because they don't trigger a full awakening… left untreated, sleep apnea can have serious and life-shortening consequences: high blood pressure, heart disease, stroke, automobile accidents caused by falling asleep at the wheel, diabetes, depression, and other ailments."

In a study by Ramachandran et. al, (2010) the researchers found that,

"Obstructive sleep apnea is a prevalent condition in patients presenting for surgery. It is estimated that up to 24% of middle-aged males and 9% of middle-aged females may have OSA, over 80% of whom are undiagnosed. Few patients undergo preoperative polysomnography or have OSA treatment plans such as continuous positive airway pressure (CPAP), bi-level positive airway pressure (BiPAP), surgery for OSA, or tracheotomy."

In 2005 reports of complications relating to lack of treatment for undiagnosed obstructive sleep apnea (OSA) began to rise at hospitals throughout the nation. It was found that these patients who had OSA and were not properly treated after forms of surgery that required anesthesia were dying due to respiratory failure. The medication was too strong for the respiratory system to handle in addition to the strains being placed upon it because of the undiagnosed OSA. More specifically, the larger amounts of anesthesia that was being given to patients during the recovery

period, did not allow enough signals to the brain in order to wake the patients up for them to be able to start breathing again. (W. Cale, personal communication, February 28th, 2012)

Experts in the field of sleep medicine, specifically Dr. William Cale at the Rockingham Memorial Hospital Center for Sleep Medicine, began to take notice of this rapidly increasing problem. Patient death is a concern for any hospital system and it is natural that a needs analysis be conducted to try and find the root cause of the problem. Steps have been taken by doctors across the country in order to create a system to identify patients who pose a high risk of sleep apnea. If these patients are successfully identified, then proper treatment and monitoring post-surgery can occur to prevent unnecessary deaths. In particular, Dr. William Cale and his team aim to educate the necessary members of the surgical staff on the dangers of undiagnosed OSA, the use of a "stop-bang" form to identify high risk patients, and the proper treatment and monitoring of OSA patients before and after surgery. Dr. Cale's team has assumed that the surgical teams within Rockingham Memorial Hospital are not fully aware of this potentially deadly problem and are therefore unable to take necessary precautions. The team's ultimate goal is to begin the process of creating awareness throughout the hospital staff so that no further deaths occur due to complications resulting from undiagnosed OSA.

Literature Review

The importance of screening patients for OSA before surgery

OSA is not an uncommon problem in hospital settings. As stated before, "it is estimated that up to 24% of middle-aged males and 9% of middle-aged females may have OSA, over 80% of whom are undiagnosed" (Ramachandran et. al, 2010). It can be a daunting challenge for hospitals to take the necessary precautions to avoid OSA complications when over 80% of

individuals who have OSA are undiagnosed. This problem is especially significant when attempting to identify patients before surgery. It is important to implement screening so that resources can be corrected allocated before, during, and after surgery to ensure the safety of these patients. Gali et. al, (2007) state that,

"Death and cardiorespiratory complications have been associated with OSA during the postoperative period, and some have advocated intensive monitoring be used for most patients with OSA. In a retrospective study, patients undergoing hip and knee replacements with OSA were found to have a 24% incidence of complications compared with 9% of those without OSA, including cardiac events, complications requiring transfer to and ICU, and respiratory events requiring support such as continuous positive airway pressure or intubation" (p.585).

Gali et. al (2007) proposed a study that aimed to successfully identify OSA patients prior to having surgery so that necessary precautions could take place post-surgery to avoid any complications resulting from OSA. They first chose to use the Flemons et. al formula for identifying patients high-risk and low-risk of OSA. This tool gives a sleep apnea clinical score (SACS) and any values of 15 or higher indicates a likelihood of OSA (positive predictive value of 73%). The researchers chose to implement this tool in the post anesthesia care unit (PACU) of a hospital. Their goal was to determine whether combining preoperative evaluation with PACU observations of the same patients would predict oxygen desaturations within the first 24 to 48 hours after surgery. In particular, the researchers chose to measure whether patients had any of the following events post-surgery: bradypnea (< 8 respirations/minute), apnea (complete cessation of breathing for > 9 seconds), desaturations of < 90% while being measured on pulse oximeter, or pain-sedation mismatch (high pain score with a high sedation score). These events were to be recorded by the PACU nurses at 30, 60, and 90 minute intervals. Also, an oxygen

desaturation index (ODI) was calculated for each patient. ODI was defined as, "the number of desaturations per hour of recording, and a desaturation was defined as a decrease in saturation of 4% or greater for 10 seconds or more" (p.584). Therefore, a higher ODI meant that patients were losing at least 4% of their oxygen volume for at least 10 seconds. It can be implied that this is due to OSA. Using the SACS and PACU results, patients were grouped into three separate categories. Group 1 patients were at a low risk of OSA (SACS < 15). Group 2 patients were at a high risk of OSA (SACS > 15). Group 3 patients had a high risk of OSA (SACS > 15) and had recurring PACU events. The researchers also collected data on whether any of the groups of patients experienced unplanned intensive care unit (ICU) admissions. These admissions included, "patients who were not sent directly to the ICU from the PACU, but, instead were those who, at the discretion of the treating physician, required ICU admission at other times in the hospitalization" (p. 584). The researchers screened a total of 2206 patients and of these, 1923 had low SACS, 251 had high SACS, and 22 were excluded due to missing information. They found that the frequency of unplanned ICU admission for patients with low SACS was 0.5% compared with 8.8% for those with high SACS and that this result was significantly different ($p < 0.001$). Also, the researchers found that the percentage of patients with ODI > 10 following PACU discharge differed significantly across the three groups. Group 1 had an ODI > 10 of 12%, Group 2 had 37%, and Group 3 had 57%. The incidence of ODI > 10 was significantly higher for groups 2 and 3 compared with group 1 ($p = 0.017$ and $p = 0.001$). This meant that those patients identified as high risk (Group 2) and high risk with PACU events (Group 3) had greater than 10 events where the level of oxygen in their bodies dropped more than 4% for at least 10 seconds.

There are several important conclusions that can be drawn from the research done Gali et. al (2007). First of all, their research points to the fact that a simple screening tool can positively predict ICU admissions for patients who are at high risk of OSA. Patients with a high SACS had an 8.8% unplanned ICU admission compared to 0.5% for low-risk patients. This is important in a hospital setting because it would open up the opportunity for hospitals to allocate more resources to the ICU based on the expected influx of patients resulting from this implemented screening. More importantly though, was the result that patients who were identified as high-risk and high-risk with PACU events had significantly more events involving oxygen desaturation most likely resulting from their undiagnosed OSA. This is a major safety concern for hospital staff and would require closer monitoring and a different selection of post anesthesia care for these patients. The researchers discuss the different effects that analgesics have on patients depending upon their risk of OSA. They state that, "fewer patients with a high SACS and who had postoperative regional analgesia had recurrent PACU events, as compared with those patients who had high SACS but no postoperative regional analgesia" (p. 587).

Possible methods for preventing postoperative OSA complications

Obstructive sleep apnea (OSA) is a prevalent condition that increases the risk for a patient to stop breathing especially when combined with anesthesia for surgery. Scholars estimate that "24% of middle-aged males and 9% of middle-aged females have OSA, which 80% of these cases are undiagnosed" (Ramachandran et. al., 2010, p. 414). With a large percentage of OSA patients being undiagnosed, there have been several cases of perioperative morbidity as a result of respiratory compromise. Several screening tools have been developed to help doctors know when a patient may be at high risk for having undiagnosed OSA. However, these screening tools cannot predict which patients will have postoperative respiratory complications. There has

been little research on practical techniques for managing postoperative OSA patients. Ramachandran suggests that the first 24 hours after surgery are high risk for the patient to develop respiratory complications and there is a substantial increase during this time for patients with a high risk of OSA. Due to complex post-operative requirements for high risk OSA patients, "respiratory therapist (RT) could substantially improve the patients' clinical management in the immediate postoperative period" (Ramachandran et. al., 2010, p. 414). Ramachandran and his team developed an automated alert system to notify the RT of high risk OSA patients.

Ramachandran and his team conducted an observational study of all adult patients going in for surgery at the University Hospital in Ann Arbor, Michigan. Exclusions included individuals under eighteen and incomplete documentation. The team collected documentation of preoperative, intraoperative, and postoperative data. Although the data analysis is retrospective, the data collection done by medical staff was done prospectively.

In 2007, the department implemented an automated notification system to notify the Respiratory Therapist (RT) of patients with diagnosed OSA or screened for high risk of OSA. Initially the RT was notified before the patient went into surgery so that they could meet with the patient, inspect their CPAP machine, and go over the settings. This was changed, and the RT was alerted when the patient was assigned a bed after the surgery. The RT arrives before the patient gets there in order to inspect the CPAP/BiPAP machine and consult with the anesthesiologist about the need for mechanical veneration or oxygen.

Ramachandran's team noted that the hospital in Michigan that they were working with reported 7,422 surgeries in their electronic record. Of those, 766 (10% of all surgeries) were documented or suspected of having OSA. 228 (or 30% of the 766) of the patients required

postoperative CPAP/BiPAP machines. Of the 228 patients that needed CPAP/BiPAP machines, 177 used them at their home, and 147 brought the machines on the day of the surgery (i.e. 30 people who use the machine at home did not bring their machine in). In addition to the 30 patients who did not bring their machines, 51 patients were put on CPAP/BiPAP resulting in the hospital's machines being used 81 times during the study period. This resulted in an average of 7.4 automated alerts per day with a range of 2-18 patient visits per day. There is no written protocol for instituting CPAP/BiPAP so local standards were used and this included using the patients' home CPAP/BiPAP settings. If a patient did not take a sleep study, and therefore did not have a CPAP/BiPAP setting, they were treated as Intensive Care Unit (ICU) patients. After two months of the study, the researchers switched from the preoperative model to the postoperative model. In the preoperative model, the RT was having difficulty meeting with all the patients and not all the information was available before the surgery. In the postoperative model, the RT could better plan out their day and more efficiently review each patient's details prior to their arrival in post-surgery care. Between 2001 and June 2007, 36 patients had complications and were found unresponsive. 5 of those patients died due to acute respiratory complications. Since June 2007, when the alert system started, there have been no cases of sudden-onset acute respiratory complications.

This was an observational study not designed to look for an outcome, but instead it showed the need for automated alerts to the RT so that they could assist with the patients' postoperative recovery. The immediate postoperative care period presents challenges for the respiratory system especially in patients with OSA. It is imperative for interdisciplinary communication between the anesthesiologist and the RT to occur as the care unit transitions from one-on-one monitoring to the lower levels of monitoring. An interesting finding in this study

involves the use of CPAP/ BiPAP machines on patients who were not previously diagnosed with OSA. This further shows how the RT presence can help the patients in post-surgery care.

First, this study was limited in the fact that it was not designed to identify differences in postoperative outcomes but instead to develop and explore the system of perioperative care in patients at the highest risk of OSA. Second, the study did not collect data on CPAP adherence; deeply sedated patients are treated by other methods that require the attendance of the RT. Finally, there were no cases of sudden onset acute respiratory compromise after the implementation of the perioperative RT system and the hospital-wide opioid policy. Ramachandran (2010) states that, "the finding of improved outcomes is unlikely to be related to one aspect of the change in management, but, rather, it reflects the success of a multimodal multidisciplinary approach to the complex clinical requirements of high-risk patients" (p. 418).

Methods

Audience characteristics

The team presented an informational session about OSA and proper screening and treatment to an audience of 20 at Rockingham Memorial Hospital on Thursday, March 22nd. The team originally planned for an audience that would consist of Monitor Technicians, who are responsible for monitoring vital information about patients during their recovery period. This includes such things as heart rate and breathing, among other crucial information. This is an entry-level job at RMH and requires an associate degree and very little experience in the field. The team estimated that the ages of these technicians would range from 18 to 65. Because this position requires very little experience, it is hard to say whether participants would have prior

knowledge of OSA at all. However, the team anticipated that the technicians would have little to no prior knowledge of OSA. Therefore, it was surprising to find out that the entire audience consisted of 18 nurses, 1 specialty clinic practice manager, and 1 orthopedic surgeon. 18 were women and 2 were men. Their ages ranged from early 20s up to about 60 years of age. These audience members were actually very knowledgeable about OSA prior to the presentation. The team created an evaluation tool that was given to all audience members after the presentation. The tool was based on a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) and asked various questions pertaining to knowledge about the material and how it was presented. The audience had a mean score of 4.4 (Agree) to the question of "Before this presentation, I was aware of OSA and some of its dangers." After the presentation, the audience members had a mean score of 4.8 (Strongly Agree) to the question of, "This presentation added to my knowledge of OSA and its dangers." The team used an unpaired t-test to determine that the difference between these means was significantly different; meaning that audience members did learn some information about the material, even though they came into the presentation with a lot of prior knowledge.

Application of instruction

The instructional module that Dr. Cale's team created was a 51-slide Powerpoint presentation that was presented to the aforementioned audience. Dr. Cale, who was the Subject Matter Expert (SME) for the team, had outlined the material that he felt was the most important to convey to the members of the clinical team. The presentation started with background about OSA and its dangers. This information was then made relevant to employees in a hospital setting. Dr. Cale then decided to present the STOP-BANG screening tool in order to identify high risk OSA patients and proper protocol for ensuring their safety before, during, and after

surgery. He presented step-by-step processes that the surgical and nursing teams could followed and ensured that the information could be used in actual workplace settings. His team was mainly charged with designing the most effective way to get the material to the learners in order to ensure that transfer of learning occurred. This process involved the correct ordering of the information using Keller's ARCS model of instruction, selecting and implementing proper slide layouts for maximum visual acuity and aesthetics, and editing the material in order to make it understandable to a wide range of audiences including those outside of the medical field. This process required the team to conduct a large amount of their own outside research in order to fully understand the vocabulary and key concepts that would need to be conveyed to the audience in a simplified manner. The field of Sleep Medicine has multiple acronyms that are common place for those who have spent some time in a workplace setting that deals with Sleep Medicine to some degree. However, to those who do not possess such experience, it was essential that some terms be explicitly defined and time given to allow audience members to ask questions in order to ensure their full understanding. The presentation itself lasted the entire allotted one hour time frame; however, members of the audience were very proactive in their learning and offered many personal stories and experiences that enhanced the creation of shared meaning among the group. Finally, the team created an 11 question survey in order to analyze several variables including audience knowledge before and after the presentation, how well the presentation was designed and implemented, and the team's success in following each step of Keller's ARCS model.

Discussion

Overall, the presentation went extremely well. Dr. Cale was an excellent presenter and was very engaging and humorous throughout the entire presentation. The team received

comments on the evaluations that included statements such as, “Dr. Cale presented material well” and, “He clearly wants to work with the nurses to improve patient outcomes.” Based on the evaluation scores, it was apparent that the team did an excellent job of following Keller’s model and keeping the audience motivated. The team included plenty of graphics on the slides and made sure that there was not an overwhelming amount of information on any one slide. The team cited all of the studies and outside research that Dr. Cale used and made sure that the vocabulary was in terms that could be easily understood to those outside of the medical field. However, the team did find a few things that needed to be changed. There were a few spelling mistakes that went overlooked throughout the revision process. The team also made the assumption that audience members understood all of the acronyms and specific terminology related to Sleep Medicine. Unfortunately, audience members did have to ask for clarification several times throughout the presentation. The team plans to make a few revisions to the presentation and offer a fully finalized version back to Dr. Cale so that he may use it to spread awareness about OSA throughout the medical community. Dr. Cale would eventually like to educate the entire RMH system and then move to outlying hospital systems in Virginia. The main challenges that the team faced involved the short time frame that was allotted in order to put this presentation together. Also, much of the material that Dr. Cale presented to the team was very complex and hard for everyone to understand without first doing their own outside research. The team wanted to ensure that other audience members would be able to make sense of the information without having to do the same research.

Learning Theories

Keller’s ARCS model of instruction

While not necessarily a theory of learning, Keller's ARCS model of instruction does offer a framework that creates the motivation for learning to take place. The team can argue that designing the presentation using Keller's ARCS model, that learners were more motivated, and therefore, likely to transfer more knowledge compared to a presentation design that was not based in any instructional theory. "[Keller] assumes that students' motives (or values), together with their expectancies (efficacy and outcome expectations), will influence the degree of attention and effort they will supply to a learning task" (Driscoll, 2005, p. 332). Keller's model suggests that presentations begin with attention grabbing information, move to relevant information for the audience members, allow participants the chance to be confident in that they are learning the material, and gain satisfaction from being able to walk away with new knowledge or skills that can be used in a workplace setting. The presentation began with material that was meant to gain the attention of the audience. The team included alarming health facts about OSA, real-life medical costs of OSA, and case studies that demonstrated actual complications resulting from undiagnosed OSA. The team evaluated this aspect of Keller's model by using, "I was fully engaged throughout the entire presentation" which received a mean score of 4.8 (Strongly Agree). There were then several slides entitled, "Why you need to care…" that were meant to offer relevant information to the nurses who were the majority of the audience. This aspect was evaluated by using the question, "I found the examples and information relevant to my position" which received a mean score of 4.7 (Strongly Agree). The team then showed the audience members the STOP-BANG screening tool for potential OSA patients in order for the nurses to feel confident that they are able to use this information about OSA to make positive changes in their workplace. The team measured this aspect using the question, "I believe that I am capable of using the information that was presented" which

received a mean score of 4.8 (Strongly Agree). Finally, the team gave the nurses exact instructions and a step-by-step process to follow throughout all stages of perioperative care so that they would be satisfied with their new knowledge and skills. The team measured this last aspect of Keller's model by using the question, "I feel as though I have gained a useful skill that can be used in my workplace setting" which received a mean score of 4.6 (Strongly Agree).

Ausubel's meaningful reception learning

Ausubel's theory of learning resides in his beliefs about how most of the information that people learn is portrayed. He believed that there were two distinct ways of learning; reception and discovery. Reception learning is the only type that is meaningful for this discussion and it is defined as, "in reception learning, Ausubel (1961) stated that, 'the entire content of what is to be learned is presented to the learner in its final form' (p. 16). The learner is therefore required to internalize the information in a form that will be available for later use" (Driscoll, 2005, p. 115). Also, Ausubel believed that three conditions were important for reception learning to become "meaningful." First, the learner must be willing to employ a meaningful learning set (using internal, cognitive operations such as attention and chunking) to any learning task. Second, the learner must view the information that is presented to be relevant to his or her current situation. Finally, the learner must, in some way, be able to relate what he or she already knows to the new material that is being presented.

Ausubel's theory of meaningful learning intertwines with the ideas present in Keller's ARCS model and this can be seen when analyzing the presentation that Dr. Cale and his team created. Most importantly is the overlapping idea that the information must be relevant to the

learner in order for maximum learning to be achieved. This is present in Ausubel's conditions for "meaningful" learning and also in the second step of Keller's ARCS model (Relevance). The team took notice of this fact and ensured that the audience members would find the information relevant to their current positions. As stated above, it is obvious that this goal was achieved based on the results of the post-presentation survey ("I found the examples and information relevant to my position" received a mean score of 4.7 (Strongly Agree)). Next, the "meaningful" condition of having learners employ a meaningful learning set to the learning task overlaps with the first step of Keller's ARCS model (Attention). The presentation included material that was meant to grab the audience's attention in order to ensure that they were fully engaged throughout the entire presentation. Again, it is apparent that the team achieved this goal through analysis of the results of the post-presentation survey ("I was fully engaged throughout the entire presentation" received a mean score of 4.8 (Strongly Agree)). The last condition for Ausubel's "meaningful" reception learning of ensuring that material relates to knowledge that the audience already possess is similar to the third step of Keller's ARCS model (Confidence). It was obvious that the audience was very knowledgeable about OSA and its dangers (The audience had a mean score of 4.4 (Agree) to the question of "Before this presentation, I was aware of OSA and some of its dangers") and they brought with them a wide range of experiences within a variety of medical settings. Therefore, the team made sure to present the STOP-BANG protocol and all other material in a manner that allowed the clinical audience members to feel confident in applying this tool in their own workplace settings and to draw on their previous knowledge about OSA. The team also achieved this goal based on the results of their post-presentation evaluation ("I believe that I am capable of using the information that was presented" received a mean score of 4.8 (Strongly Agree)).

By simply basing the presentation on Keller's ARCS model of instruction, the team was able to meet all the conditions necessary for meaningful reception learning laid forth by Ausubel. Learners are able to draw from previously stored knowledge and use this to make meaningful connections to the new material that is being presented. If the material is made relevant to the learners, then these connections alone may be enough to allow the transfer of knowledge to occur. However, if the audience is fully engaged throughout the entire presentation then an even greater amount of transfer can be assumed to take place. These conditions for "meaningful" learning, all met through the team's design decisions based on Keller's ARCS model, creates an environment that fosters learning. This idea is further demonstrated in work done by Novak (1980) where he attempted to explain how different learning theories can be applied to a variety of classroom settings for a very young audience. His discussion about Ausubel's meaningful reception learning highlight the importance of applying previously stored knowledge to the new material that is being presented. He argued that, "by the age of two or three, all normal children have performed an incredible feat; they have discovered the meanings of 1,000 or more verbal symbols and can begin to ask questions to acquire the meanings of new concepts by reception learning" (p. 283). Novak's argument is for the fact that even very young children (who are often assumed have no prior knowledge) do actually possess a vast amount of previously acquired knowledge and are able to make meaningful connections. Therefore, it can be argued that a well-designed and delivered presentation to a group of highly skilled and knowledgeable clinical staff members can certainly have "meaningful" learning.

Elaboration Theory

The concept of elaboration theory first started with Ausubel. In 1963, Ausubel created common practice for textbook writers by compartmentalizing ideas into chapters. This approach

created confusion because students could not draw links from what they already knew and incorporate it into the new information. To help combat this problem, Ausubel suggested using comparative organizers. These organizers compared and contrasted new and existing information to help learners create links between the two. To help facilitate this learning, Ausubel suggested that instructors should start with the most general information and progressively elaborate on the ideas. "Ausubel called this process progressive differentiation, but Reilugth adopted this as elaboration in his Elaboration Theory" (Driscoll, 2005, p. 144). Driscoll (2005) describes Elaboration Theory as, "progressively more detail is to be elaborated in each level of the instruction (from the most general, inclusive content to the most specific) until the desired level of detail is reached" (p. 144).

There is a paradigm shift to learner-centered from teacher-centered instruction (Learning Theories Knowledgebase, 2012) causing "new needs for ways to sequence instruction" (Reigeluth, 1999). Learning Theories Knowledgebase (2012) describes the Elaboration Theory as an instructional design method that sequence content to help learners achieve learning goals. This theory involves three major approaches: Conceptual Elaboration Sequence, Theoretical Elaboration Sequence, and Simplifying Conditions Sequence. Conceptual Elaboration sequencing is used when the learners need to know many related concepts. Theoretical Elaboration sequencing is used when the learner needs to know many related principles. Simplifying Conditions sequencing is used when the learner needs to know a task that is of moderate complexity. The simplest and most inclusive concept, principle, or task should be presented first then expanded on to include more specific detailed concepts, principles or tasks (Learning Theories Knowledgebase).

The content development team applied the principles of elaboration theory into their design sequencing of the presentation. The sequencing of the presentation can be loosely categorized into seven sections. Although these are not formal "sections", each section of the presentation shows how the information was sequenced to begin with general information and then elaborated on, rather than discussing each individual slide. The seven sections are: What OSA is (first 6 slides), Why OSA is a problem (Slides 7-16), RMH looking into OSA (Slides 17-26), Screening tools (Slides 27-36), What RMH wants to do (Slides37-40), Strategies to help patients (Slides 41-50), and Questions/Discussion (Slide 51).

The beginning of the presentation started with alarming health facts, real life medical costs of OSA, and case studies that demonstrated actual consequences of undiagnosed OSA. While these conditions satisfied the first step in Keller's model to gain attention, it also served as a general big picture and a starting point that could be elaborated and built upon throughout the presentation. These first few slides articulated what was happening and provided a framework that can be expanded upon to articulate why the problem is happening, and how to fix this problem throughout the remainder of the presentation.

The next section of slides built upon what OSA is and expanded on this to show the learners why OSA is a problem for medical professionals. OSA is a health risk for many people under normal circumstances and is largely undiagnosed; these risks are increased when accompanied with anesthesia. The presentation showed several accounts of fatalities related to OSA in surgery patients. In addition to the fatalities, there were several large lawsuits that cost several hospitals a lot of money. The Joint Commission Accreditation of Healthcare Organizations (JCAHO) realized this as a problem and initiated a goal for hospitals to reduce the risk of post-operative complications for patients with sleep apnea. JCAHO was going to start a

nationwide campaign in order to ensure that the companies were adhering to this goal and had programs in place; however, they did not follow through with this because the problem was too large. It is likely they will proceed with this campaign in the near future, once the medical community has a chance to make necessary changes.

The following section pertained to how RMH was combating the problem of OSA. In an attempt to reduce patient complications and be compliant for a possible JCAHO audit, doctors at RMH have formed a task force. The task force has been researching this condition and looking at other hospitals' best practices in order to try to find ways to mitigate the effects of OSA in post-surgery patients.

Based on this information, the next section of the presentation covered various screening tools. The RMH task force found that several other hospitals were using screening tools to identify patients who had OSA or who were at high risk for having OSA. The screening tools helped to identify patients who had undiagnosed OSA so that they could be monitored more carefully in the recovery room.

The next section provides meaningful context to the previous section. This section describes a study that was done at a hospital in Michigan where screening tools and an alert system were put into place. In the years before the study took place, the hospitals recorded five fatalities resulting from OSA in post-surgery patients. After the implementation of screening tool and alert system the hospital did not record any fatalities. Showing this study helps to make meaningful context for the learners, showing that the screening tools and implementations make a difference and that there is a valid reason for doing so.

After displaying the information about screening tools and showing that they can be beneficial, the next section describes what the doctors at RMH want to do to help mitigate the effects of respiratory conditions in OSA patients post-surgery. A policy is being developed to screen surgery patients before surgery so that the surgeons, anesthesiologist, and the monitor technicians know if the patient has OSA or is at high risk for having OSA so appropriate measures can be taken. If the patient has OSA or is at high risk for having OSA, then there are different precautions that are taken compared to a patient that does not have the condition. This section elaborates on what these precautions are and offers strategies for the medical staff to help ensure the health and safety of the patient.

The final section allowed for questions in order to clarify any details that the participants may not have understood during the course of the presentation. While this section does not elaborate on any of the previous sections, it does help to ensure that all participants achieved the desired level of understanding by helping them with the small details.

The content development team organized and sequenced the content of this presentation using the Elaboration Theory. They began the presentation with the most general information and added more detail throughout the presentation. Each section built upon the information of the section preceding it until the end of the presentation when the desired level of detail was reached.

Situated cognition

Situated Cognition, as defined by Clancey (1997), claims that, "every human thought is adapted to the environment, that is, situated, because what people perceive, how they conceive of their activity, and what they physically do develop together" (p. 1-2)."Moreover, what people

perceive, think, and do develops in a fundamentally social context" (Driscoll, 2005, p. 157). Situated Cognition emphasizes the fact that learning does not simply occur in an isolated vacuum but instead is influenced by many different domains such as the environment, social contexts, and physical activities. Learners are seen as active participants and not static structures that new information can be automatically transferred to. Dr. Cale and his team were very aware of this fact when designing and implementing their presentation. Information was presented in a fashion that was similar to the environment that the nurses and other medical team members would be present in throughout their workdays. For example, the nurses were given a step-by-step process that they could use in order to identify which patients had or were at high risk for OSA and take the necessary precautions for their pre and post-surgical care. The team took into account the fact that most of the learning that occurs in the nursing field is done through hands-on application and practical experience. A slide was created that the nurses could use as a reference guide for proper monitoring of identified high risk OSA patients. Also, Dr. Cale took the opportunity to present several case studies related to the material based on his own personal experiences within the field of Sleep Medicine. The audience was also encouraged to present their own experiences relating to OSA and its treatment. This opportunity was taken full advantage of and the presentation actually lasted 30 more minutes that was allotted because the discussions were so rich and contributed to shared meaning making amongst the group. Several nurses were actually patients of Dr. Cale's and were able to share their own experiences relating to some of the material. It was apparent that the social aspect of Situated Cognition played well into the amount of learning that the group members achieved. Also, it was very helpful that the team directly related the material to RMH and specific departments and team members that would be present throughout the entire process. For example, the audience members were aware of the responsibilities of the

anesthesiologists and respiratory therapists who would be working alongside them in a team effort to provide the best care to the identified and high-risk patients. Therefore, the information was seen as relevant for the audience members to apply to their individual work environments. Griffin & Griffin (1996) describe the learning that takes place during Situated Cognition, "…as a learner begins a new job, joins a new social group, or moves into a new neighborhood, the learner gradually begins to exhibit culturally appropriate behavior, jargon, and mannerisms to act in accordance with cultural norms" (p. 294). Dr. Cale and his team aimed to begin this new cultural shift for the awareness of OSA and its proper treatment for nurses practicing at RMH. The presentation included specific vocabulary that would be important during this process and also the new behaviors and attitudes that must be present in order for a complete shift to occur. It was obvious, based on the results of the post-presentation survey that the audience members had indeed increased their knowledge base (After the presentation, the audience members had a mean score of 4.8 ((Strongly Agree)) to the question of, "This presentation added to my knowledge of OSA and its dangers."). The team does hope that this fact points to the beginning of a cultural shift throughout the RMH nursing team.

Andragogy

Malcolm Knowles Theory of Andragogy looks specifically at adult learners and how they learn. Andragogy differs from pedagogy because adult learners are more self-directed and expected to take and are expected to take responsibility for the decisions they make. The Theory of Andragogy assumes that adults: need to know why they need to learn something, need to learn experientially, approach learning as problem-solving, and learn best when the topic is of immediate value (www.instructionaldesign.org, 2012).

The design team took Malcolm Knowles' theory of Andragogy into consideration when designing the presentation. One of the points of Andragogy is that adult learners need to know why they need to know something. The beginning of the presentation showed facts about OSA and why is an important to medical profession. One reason knowing about OSA is for the safety of patients. Patients with OSA weather diagnosed or undiagnosed can suffer significant adverse health effects. These problems are greatly increased when coupled with anesthesia because the anesthesia can suppress and already struggling respiratory system. Diagnosed and undiagnosed OSA has been linked to many deaths as a result of improper care in post-surgery patients. For most medical professionals patient safety should be a good reason to learn about OSA. If this was not a good enough reason, the presentation also showed the Joint Accreditation Commission of Hospital Organizations (JACHO) standards. JACHO realized the health risk of OSA in surgery patients and issued a goal to hospitals and were going to check how well they were doing. The scope was too large and too soon for hospitals to comply but more than likely JACHO will do audits in the future to check for hospital compliance. So if the person's job may be on the line is a pretty good reason to learn the information and use it so they do not lose their job.

Even though this was a presentation and did not give learner the best opportunity for experiential learning there were several opportunities for questions and discussions. Several of the nurses who were at the presentation had experience with patients who had OSA. These nurses shared their experience and asked question about what they could have done in those situations in the future. This gave the participants the opportunity to learn from past experiences and the experiences of others. Although this is not exactly experiential learning, it was as close as the design team could get to experiential learning with the resources provided.

Another aspect of Andragogy is learners learn best when the material is of immediate value. Towards the end of the presentation strategies were laid out on how the medical staff should properly care for diagnosed and suspected OSA patients post-surgery to help ensure their safety. The hospital already uses some screening tools and the information from the presentation could be immediately applied. The design team tried to only include necessary information that the professionals would need to know, and not include superfluous information that is not directly applicable to their job or necessary to increasing their understanding of the topic. While the design team was working on the presentation an unnamed individual suffered respiratory complications attributed to undiagnosed OSA while on anesthesia. This incident was almost fatal and the design team's subject matter expert (SME) was able to communicate to the doctors on scene how to save the patient's life. If the presentation was a few weeks earlier and this patients medical care providers were in attendance this particular incident may have been avoided.

Malcolm Knowles' theory of andragogy lays out ideas on ways to help educate adult learners. The design team took these ideas into consideration along with other theories and tried to blend them to create the best possible instructions for the learners. The design team showed the learners why the material was relevant, tried to create an aspect of experiential learning, and presented the content so it could be immediately and directly applied to the learner's job. After the presentation a survey was distributed to gain feedback. The participants checked only agree and strongly agree for the questions: the material being useful skill that can be applied to the workplace setting, the information was presented in a clear manner, and the presentation was a valuable use of the participant's time. The results of the survey helped to reaffirm the uses of Malcolm Knowles' theory of andragogy were successfully implemented in the presentation.

Conclusion

Learning theories play an integral part in all phases of instructional design. Trainers must analyze the needs of the learners and which learning theories could be most effective in order to achieve specific learning goals. These theories must also be present when making important design and development decisions. Effective instruction must be based in sound theoretical framework. According to Doak (1996), "Designing quality [patient] instruction that is purposeful and cogent requires the integration of strategies that support theoretical concepts based on social-behavioral science and instructional technology theories because they provide a predictable framework for successful interventions, and offer a systematic process to analyze success or failure." Dr. Cale and his team utilized the principals involved in several learning theories, including meaningful reception learning, elaboration theory, situated cognition, and andragogy, in order to achieve their goal of increasing the audience's awareness of OSA and how to properly identify and treat these patients.

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Appendix A

RMH Screening for OSA: Is Your Patient at Risk for Sleep Apnea

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Mean Scores
Before this presentation, I was aware of OSA and some of its dangers	**8**	**9**	**1**			**4.4**
This presentation added to my knowledge of OSA and its dangers	**14**	**4**				**4.8**
I knew how to properly manage OSA patients before this presentation	**2**	**4**	**8**	**4**		**3.2**
I understand the correct process for the management of OSA patients	**3**	**10**	**4**			**3.9**
This presentation was a valuable use of my time	**13**	**5**				**4.7**
The information was presented in a clear manner	**15**	**3**				**4.8**
The information was presented in a way that enhanced my learning	**15**	**2**	**1**			**4.8**
I was fully engaged throughout the entire presentation	**14**	**4**				**4.8**
I found the examples and information	**13**	**4**	**1**			**4.7**

1 did not answer

relevant to my position						
I believe that I am capable of using the information that was presented	**15**	**2**	**1**			**4.8**
I feel as though I have gained a useful skill that can be used in my workplace setting	**11**	**7**				**4.6**

Comments:

*Dr. Cale is a good speaker/ teacher.

Presented material well

He clearly wants to work with the nurses to improve patient outcomes.

*Dr. Cale gave an excellent seminar on OSA.

*Very Good. Thank You!