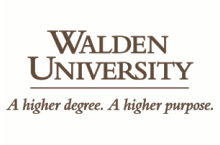

2018

Practice Guidelines for Continuous Pulse Oximetry Monitoring for Obstructive Sleep Apnea Patients

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This is to certify that the doctoral study by

Bridgette Smart

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2018

Abstract

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by

Bridgette Smart

MS, Walden University, 2015

BS, Clayton State University, 2012

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

As the rate of obesity has increased in the United States to include approximately 40% of the adult population, there has been a corresponding rise in the number of patients with obstructive sleep apnea (OSA). The OSA population is at risk for adverse perioperative respiratory depression. Continuous pulse oximetry monitoring is indicated for these patients upon discharge from the recovery room into other treatment settings and when cared for by telemetry or by trained hospital staff in the patient's room. The practice question was whether an evidence-based practice guideline could be developed to help ensure safe postoperative monitoring of patients with OSA on the medical-surgical units. Guided by the Iowa model as the framework, a 13-member team from respiratory, anesthesiology, and technology departments participated in the guideline development. Three members of the 13-member interdisciplinary team evaluated the guideline using the AGREE II tool with the highest level of agreement on 6 of 6 domains; 100% of the team members agreed to move the developed guideline to the relevant hospital quality improvement committees. Availability of an evidence-based practice guideline for hospital nursing staff on general medical units has the potential to ensure safe management of patients with OSA while achieving cost savings when higher level of care settings may be unavailable for the growing number of patients with OSA. If safely implemented, these guidelines could be adapted in other healthcare facilities to ensure optimal health outcomes for patients with OSA.

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Section 1: Nature of the Project

Introduction

Obstructive sleep apnea (OSA), characterized by recurrent upper airway resistance, collapse, or obstruction during sleep, is a chronic condition and among the most prevalent breathing disorders (Chung, 2008), affecting approximately 20 million Americans (National Sleep Foundation, 2018). Currently, 24% of men and 9% of women are impacted by OSA, and the numbers are increasing (Aurora et al., 2015). Decreased airflow often leads to interrupted sleep and is manifested in snoring, apneas (stops in breathing), and waking up. Serious health consequences associated with OSA include: (a) congestive heart failure, (b) hypertension, (c) stroke, (d) heart disease, (e) atrial fibrillation and (f) deep vein thrombosis (Lockhart et al., 2013). OSA also coexists with chronic obstructive pulmonary disease (Karkoulias et al., 2013). OSA is also associated with diminished lifestyles in the individual—for example excessive daytime sleepiness, morning headache, poor concentration, reduced quality of life, memory impairment, and cognitive dysfunction. In addition, lack of sleep can result in considerable harm to others as well as the individual, in the form of a greater potential for automobile and industrial accidents (Helvig, 2014). Over time, the effects of OSA can contribute to patient mortality and morbidity (Williams et al., 2017).

This quality improvement project was requested by an acute care facility with a high incidence of patients at significant risk for adverse perioperative respiratory depression, meaning that these patients are at risk for breathing issues after their surgery. It is important for their recovery that such patients be well-managed in both preoperative

and postoperative settings, and the American Society of Anesthesiology has emphasized the need for this population to have continuous pulse oximetry monitoring when discharged from the recovery room (American Society of Anesthesiology Task Force, 2006). However, the volume of patients other than those with OSA seeking medical care in the facility, and the comparably greater severity of their presenting issues, have impeded the ability to serve the at-risk OSA population with intensive care unit (ICU)/step-down monitoring in the postoperative setting.

The purpose of this evidence-based improvement project, and the solution proposed in the study, is to develop practice guidelines and a protocol for at-risk OSA patients to continue to be treated effectively on a medical/surgical unit through remote telemetry with pulse oximetry. The positive social change is the potential for improved safety and health outcomes of postoperative patients with OSA.

Practice Problem

Patients with OSA are at an increased risk of developing respiratory complications after receiving anesthesia (de Lacy et al., 2014) and are at a high risk of developing other complications that lead to unanticipated admission to the ICU such as hypoxaemia and cardiac arrhythmias (Kadam et al., 2015). Therefore, postoperative care for patients with OSA is important such as monitoring them continuously with pulse oximetry after surgery to measure their oxygen saturation (Suzuki et al., 2008). When there is no specific area for observation, patients with OSA may be admitted to the ICU/step-down units or have a prolonged recovery in the postanesthesia care unit (PACU). However, patients who do not require major interventions do not need this level

of care, which means admission to the ICU may be unnecessary (Gouchan et al., 2016), limiting the ability to admit other critical patients. The most severely injured patients, such as those suffering from blunt traumas, acute respiratory failure, massive transfusions, and compartment syndromes, should have preferential access to the ICU to ensure optimal survival (Duane et al., 2008).

The facility for this quality improvement project is a Level I trauma center serving as the primary stroke and burn treatment units for two large counties, in addition to caring for patients suffering sepsis, myocardial infarcts, hyperglycemia, hypertension and pneumonia, among other illnesses and disorders. The volume of high need patients in the ICUs/step-down units and PACU means that these areas often have no open beds. Given the challenge of the number of patients and severity of their conditions at the facility, finding alternative treatment modalities for patients with OSA is an area that calls for exploration. When nurses are trained and educated to identify the signs of complications and have the proper equipment for monitoring, OSA can be properly monitored in the medical-surgical unit. This will allow the ICU/step-down units and PACU to be able to accommodate higher need critically ill and/or trauma injured patients.

The practice problem is that the OSA population requires continuous remote pulse oximetry monitoring in a postoperative setting, but the hospital is limited in its capacity to serve these at-risk patients with ICU/step-down monitoring. Remote pulse oximetry monitoring consists of a sensor of technology device that is placed in the bed or room of the OSA patient and transmit signals to a central station for monitoring (de Lacy et al., 2014). Thus, there needs to be a solution in which patients can be monitored on the

medical-surgical unit with remote pulse oximetry. The development and implementation of a hospital guideline and protocol that accomplishes this objective can become the new standard of care.

Purpose

The purpose of this project was to develop practice guidelines and a protocol for the care of postoperative at-risk OSA patients who require remote telemetry monitoring with pulse oximetry in a treatment setting. The practice question that guided this study was "Can an evidence-based practice guideline be developed to safely monitor patients with OSA postoperatively on the medical-surgical units?" The guidelines developed in the project reflect the input of the professionals forming the care network, including respiratory therapists, the education director, medical-surgical nursing directors, the vice president of patient services, the PACU director, anesthesiologists, surgeons, and surgical residents (the team members), who will evaluate the guidelines before they were finalized. This project can address a gap in practice with a recognition that postoperative patients with OSA often have respiratory distress, but the system at the facility currently does not allow for remote pulse oximetry monitoring on the medical-surgical floors. Remote monitoring is currently done at the hospital but can only be completed with a doctor's order. The protocol in this project can allow the nursing staff to care for this population and improve their health outcomes with an intervention that also helps to control the costs of treatment in postoperative intensive care units.

The Nature of the Project

This doctoral project was focused on the development of a practice guideline for patients with OSA to receive proper care on a medical-surgical unit through continuous pulse oximetry. The Iowa model, which guides the translation of research findings into clinical practice (Brown, 2014), was the approach used to develop the guideline. In this approach, problem-focused or knowledge-focused triggers precipitate the retrieval of data that help to identify the practice problem or offer evidence of how the problem might best be addressed (Brown, 2014). The first step in the Iowa model highlights the identification of the clinical problem (i.e., the focus problem trigger) that prompts the need for a solution. In response to this trigger, data are retrieved and reviewed to identify prior existing research (Brown, 2014). In the absence of pertinent findings, a new investigation may be warranted. For this project, the identified clinical problem was the need for postoperative patients with OSA to be monitored in treatment settings other than the PACU/ICU.

The practice guidelines were developed and reviewed collaboratively with the team members listed earlier. The coordinated the work of the team is to produce the final recommended guidelines. The approach started with searching multiple databases to identify pertinent existing research in the form of peer-reviewed articles, medical guidelines, and a review of other hospitals' policies and practice guidelines. This research was then distributed to the team members. As the domains that constitute the Appraisal of Guidelines Research and Evaluation (AGREE II) model are good predictors of the outcomes of the implementations of guidelines (Brouwers et al., 2010), this approach

provided the framework for the evaluation of the evidence and development of the clinical practice guidelines. This process is consistent with the role of the DNP in inter-professional teams as DNP leadership is vital to the ability of nurses to translate evidence into practice, and thus improve the lives of patients in the hospital setting and the larger community (American Association of Colleges of Nursing, 2006).

Significance

Studies that this evidence-based project is based on indicated that patients with OSA should be monitored postoperatively for respiration distress and desaturation. As most respiratory distress and other complications occur within 4 hours after surgery (Rotenberg et al., 2011), researchers have recommended monitoring and observing OSA patients for several hours postoperatively with pulse oximetry monitoring. A medical-surgical unit is an appropriate setting where these functions can be performed by nurses, which is the proposed change in this project. Unless the patient has a high acuity level, postoperative care does not need to be done in the ICU.

The development of practice guidelines for remote telemetry monitoring of postoperative patients with OSA on a medical/surgical nursing unit has the potential to decrease ICU/PACU overcrowding and allow these units to be used for more critically ill patients as well as reduce costs, as less nurse overtime will be required in the ICU/PACU units. The stakeholders who may be impacted include nurses, anesthesiologists, PACU staff, medical-surgical directors and staff, the vice president of patient care services, respiratory therapists, and the telecommunication manager. Implementation of the practice guideline can enhance the nursing process in the treatment and care of patients

with OSA on the medical-surgical unit. The guideline will strengthen OSA patient care as well as increase nursing knowledge and scope of practice.

The potential transferability of the current project is that the practice can be implemented wherever patients with OSA are treated in a hospital. Thus, the hospital surgical teams and the ICU/step-down units will be able to treat patients whose high acuity needs can more properly be met in that environment, rather than patients with OSA whose needs can be met by trained staff in other treatment settings. Another potential impact is that saturation in the PACU and ICU may be less likely. The protocol may also help reduce prolonged hospital stays.

Summary

This quality improvement project was designed to lead an interprofessional team in the development of a practice guideline for the care of postoperative OSA patients on a medical/surgical nursing unit. It addresses the practice gap that exists on medical-surgical floors that allows for safe management on lower acuity units, thus freeing beds in the ICU for patients in greater need of enhanced levels of care. The next section includes a review of the theories and models used and their relevance to nursing practice.

Section 2: Background and Context

Introduction

Patients with OSA require continuous remote pulse oximetry monitoring in a postoperative setting, but the hospital that was the focus of this project lacks the capacity to care for them in ICU/step down units. A solution is needed so patients with OSA can be monitored through remote pulse oximetry on the medical-surgical unit. A hospital guideline and protocol for the implementation of remote pulse oximetry monitoring may provide the new standard of care. The purpose of this evidence-based practice improvement project was to develop practice guidelines and a protocol for the at-risk OSA population who require remote telemetry monitoring with pulse oximetry in a postoperative setting. The practice question was "Can an evidence-based practice guideline be developed o safely monitor patients with OSA postoperatively on medical-surgical units?"

Concepts, Models, and Theories

This quality improvement project is based on the Iowa framework that encompasses three goals: (a) improvements in patient care and outcomes, (b) enhancement of nursing care, and (c) reduction in healthcare costs (Taylor-Piliae, 1999). The model is evidence based, facilitating the translation of evidence into clinical practice (Titler, 1994), and serves as a guide in implementing practice change (Kowal, 2010). It is also nurse driven and centered on providing high-quality care and measurable positive patient outcomes in clinical settings and at the organizational level (Doody & Doody, 2011).

The steps of the Iowa model include: (a) identifying the problem, (b) forming a team, (c) analyzing the relevant literature, (d) implementing practice change, and (e) disseminating the findings (Kowal, 2010). The increasing number of at-risk OSA patients who require pulse oximetry monitoring in a postoperative setting was the practice-focused trigger identified by using the Iowa model. The team that will develop the practice guideline has begun collaboration. The issue of patients with OSA being cared for postoperatively in the ICU/PACU and step-down floor was identified by one of the senior anesthesiologists in the hospital. The perioperative team attempted to resolve the situation but were unable to reach a conclusion. The medical-surgical directors believed that this patient population could not be treated for overnight observation in units and cited the medical-surgical nurses' lack of proper training as an impediment to patient safety given the level of care the patients need. The suggestion was made that staff-wide education could resolve that objection. The issue was then escalated to the vice president of patient care services.

Many patients with OSA have comorbidities, the most prevalent of which are obesity, coronary artery disease, hypertension, and esophageal reflux; these comorbidities often require surgical procedures (Mickelson, 2007). The OSA patient population needs proper management and supervision due to the high risk of anesthetic and postoperative respiratory complications. Because of the volume of patients with OSA who need surgical intervention—numbers that are increasing primarily due to rising rates of obesity in the counties served—continuous pulse oximetry monitoring on a medical-surgical floor is needed, especially because most complications occur after the patient is

transferred to the medical-surgical floor (Helvig et al., 2014). When a designated area is located to provide overnight observation for this population, ICU/PACU and step-down unit accommodations can become available to patients whose needs can be met with the level of care in these units.

Practice Guidelines

The Institute of Medicine (2011) defines clinical practice guidelines as recommendations to improve patient care based on evidence and a review of the advantages and disadvantages of other care options. Practice guidelines are generated in the current study's hospital setting so that nursing, medical, and technical staff members conduct their professional responsibilities in accordance with the standards that are most likely to provide safe and effective patient care.

Prior to the implementation of any new guideline, the Quality Care Committee conducts an internal review process. Once that is concluded, a pilot phase is generally instituted to ascertain the effectiveness of the practice guideline prior to widespread adoption. A multidisciplinary team approach was indicated in the present study, as OSA patient care involves different specialties. The guideline highlights the following: (a) discussion of nursing procedures; (b) proper use of technological equipment, (e.g., CPAP/BiPAP); (c) parameters for inspiratory pressure (IPAP) and expiratory pressure (EPAP); and (d) observations to recognize respiratory distress. In addition, the recommended guidelines will need to include the cost of implementation, including the costs of (a) new equipment, (b) nursing staff education, (c) information technology modifications, and (d) additional monitoring staff.

Relevance to Nursing Practice

Prior to surgery, an assessment for OSA is conducted by nurses. This is crucial as research has demonstrated that the condition is undiagnosed in 80% of preoperative patients who have OSA (Seet et al., 2015). A questionnaire, with the acronym STOP-BANG, was developed as a fast and simple tool to screen patients in the perioperative setting for OSA (Tan et al., 2016). STOP-BANG is an 8-point instrument (Seet et al., 2015), with each question requiring a yes or no answer (Tan et al., 2016). Components include: snoring, tired, observe, pressure, body mass index, age, neck size, and gender. Once the patients are identified through use of this validated tool, extra-precautionary care for the OSA population is undertaken to decrease respiratory complications. Patients are currently provided such care in the ICU/PACU and step-down floors by nurses.

The new guidelines being developed is focused on providing nursing care on a medical-surgical unit. Once the unit is identified and the proper equipment is installed, the nursing staff will undergo skill development in accordance with evidence-based practice guidelines. Evidence-based practices, which form the framework for nursing practice and is used for research and clinical decision making, is the driving force for many quality improvement initiatives and the standardization of healthcare practices and policies (Brower & Nemec, 2017) across most hospital and clinical settings.

The advancement in nursing practice is through the guidance of evidence-based practices in improved patient care. The education and training of nurses in caring for patients with OSA using evidence-based practice guidelines will allow them to demonstrate confidence, enhance patient care and improve the practice outcome.

Incorporating up-to-date research evidence into their nursing practice with the goals of better patient outcomes and delivering their best care (Doody & Doody, 2011) is consistent with the role of nurses as patient advocates.

Local Background and Context

The facility, located in a populous metropolitan area, is one of the largest designated Level 1 trauma centers in the country. This institution, which was named a top 10 hospital by U.S News & World Report (Miller, 2011), renders high-quality health services to city residents and those in the surrounding area. Many patients are members of underserved population groups. It is also a leading progressive medical education, research, and training center.

The facility offers comprehensive medical care, including a stroke and neuro science center, a baby-friendly designated center, a burn center, a cardiac center, and a sickle cell unit. Approximately 14,000 surgeries have been performed at the facility from its founding through October 2017. Of the 484 beds available, 316 (65.3%) are available on the medical-surgical unit and 168 (34.7%) are ICU/step-down beds. Given the greater availability of beds on the medical-surgical unit, being able to observe OSA patients with a high level of care on this unit would be a desired outcome so that ICU/step-down units could be reserved for higher acuity patients, e.g., those with strokes, myocardial infarctions, traumas, and sepsis.

The mission of the facility is to improve the health of the community by providing quality comprehensive healthcare in a compassionate, culturally competent manner. It is committed to upholding this standard with the underserved population in the region. The

organization and the team developing a guideline for the OSA population have a shared goal in promoting the health and well-being of these patients. The objective of the organization is to ensure that postoperative patients requiring monitoring outside of the ICU/step-down areas have safe and effective care on the medical-surgical units. Monitoring postoperative OSA patients with remote pulse oximetry on a medical-surgical unit by properly trained staff members would meet this objective.

An organization is fluid and dynamic in nature, influencing and in turn being shaped by events. It is also responsible for reinforcing and perpetuating organizational characteristics, i.e., maintaining patterns of continuity (Buchanan et al., 2013). The purpose of this initiative was for inter-professional team members to develop a practice guideline for patients with OSA that will enable continuity of care.

There is a high prevalence of patients with OSA in this facility. Identification of this population through the ICD10 diagnosis code revealed that in 2016, 120 females and 113 males with OSA were treated in the emergency room, 293 females and 363 males were treated as in-patients, and 2,066 females and 1,696 males were treated as out-patients. One effect of the significant numbers of OSA patients is evidenced by the increased cost of nursing staff overtime (Williams et al., 2017).

Role of the DNP Student

My role as a DNP student is to lead in the development of the practice guideline. This is consistent with DNP Essential III (American Association of Colleges of Nursing, 2006), in which a gap in practice is to be addressed with an intervention that promotes safe, timely effective, efficient, and patient-centered care. The DNP candidate acts as a

consultant in the production of this collaborative knowledge project. The tasks involved will consist of a) researching the OSA patient population, b) forming the team, c) collaborating with other team members to develop a practice guideline, and d) identifying the equipment and technology that may be necessary to meet the required level of care in the medical-surgical unit. The practice guideline incorporating the above components will then be presented to the hospital Quality Care Committee. My motivation is to ensure that patients with OSA may be treated effectively on a medical-surgical unit without risking the respiratory complications that could lead to adverse events and to develop a protocol for hospital-wide usage. If there are biases, they arise from my personal interest in implementing practices in the organization that offer the highest level of care without expending unnecessary resources.

Role of the Project Team

The project team consists of the author and facility professionals who manage a specialized area or department involved with the treatment of patients with OSA, including the vice president of patient care services (preceptor), medical personnel, respiratory therapists, medical-surgical directors, the education director, and the clinical engineering Director. The medical personnel were asked to furnish supporting information for the monitoring of patients in the medial surgical area. The medical-surgical director provided data on the OSA population seeking treatment at the hospital on both an inpatient and outpatient basis. The respiratory therapists were instrumental in providing information as to the care of patients requiring oxygen monitoring. In addition, input was sought from the anesthesiologist who first identified the problem trigger, i.e.,

patients with OSA being in the PACU/ICU and the step-down unit for a prolonged time, and the PACU director. As a function of her practicum experience, the author of the current study has had consultations with technology providers, such as Philips, to ascertain whether their products are indicated for monitoring hospital patients.

Summary

The purpose of the guideline development is to ensure that patients with OSA receive postoperative high-level care on a medical-surgical unit rather than the ICU/step-down unit. This process utilizes both the IOWA model for nursing practice improvement and the AGREE II frame-work for guideline development. Section three will provide information on the sources of evidence that are to form the foundation of the practice guideline and the process of achieving consensus among team members.

Section 3: Collection and Analysis of Evidence

Introduction

An increasing number of at-risk OSA patients require continuous pulse oximetry monitoring in a postoperative setting, but the hospital of focus in this project lacks the capacity to serve them in ICU/step-down areas as well as the acutely ill due to overcrowding. A multidisciplinary practice guideline is needed so that patients with OSA can be monitored on a medical-surgical unit using remote pulse oximetry without compromising their safety. The purpose of the project was to lead an interprofessional team in the development of a practice guideline for the safe care of postoperative patients with OSA on a medical/surgical unit with recommendations for administration. Section 3 will provide information on the sources of evidence that were used and the process of achieving consensus on the practice guideline.

Practice-Focused Question

The practice question is "Can an evidence-based practice guideline be developed to safely monitor postoperative OSA patients on medical-surgical units?" The purpose of this evidence-based practice improvement project was to develop practice guidelines and a protocol for the at-risk OSA population who require remote telemetry monitoring with pulse oximetry in a postoperative setting. Patients with OSA do not have a designated unit in the hospital and the facility lacks the capacity to observe these patients after surgery in the ICU and step-down units. There currently is no protocol for the care of such patients on the medical-surgical floor. The practice question is whether

postoperative patients with OSA can be safely monitored on a medical-surgical unit using this new protocol.

An interprofessional team was formed to include the appropriate stakeholders, such as respiratory therapists, PACU director, medical-surgical managers, anesthesiologists, the vice president of patient services, senior vice president of chief acute care surgery, director of education, technology manager, and a medical resident. Several meetings were held giving the stakeholders the opportunity to review the developing guideline in accordance with the AGREE II instrument (2013), and offer their input as to management, strategies, and setting parameters in the operation and flow of care.

Sources of Evidence

Searches performed with databases such as CINAHL and MEDLINE Simultaneous Search, ProQuest Nursing, and Allied Health Research revealed several evidence-based peer-review articles and guidelines highlighting the effectiveness of monitoring OSA patients with pulse oximetry following surgery to prevent death and oxygen desaturation. The Agency for Health Research and Quality National Guideline Clearinghouse was also searched. Team members representing the respiratory therapy and anesthesia departments distributed several articles for the working group to review. In further preparation, the experiences of other Level 1 trauma centers were examined, and their guidelines and protocols were analyzed. This was done through personal contacts of the working group members and through a listserve for the Association of Academic Health Centers.

Postoperative management is highly important for patients with OSA who often risk respiratory compromise primarily due to the potential loss of airway (Suzuki et al., 2008). The American Society of Anesthesiology recommended that prior to surgery anesthesiologists work with surgeons to develop a protocol for the management of patients who have been, or are likely to be, diagnosed with OSA (Practice Guidelines, 2014). Additionally, the American Society of Anesthesiology task force recommended that patients with OSA receive continuous oxygen monitoring to reduce the likelihood of perioperative complications. They also suggested that supplemental oxygen continuously be administered to OSA patients at increased risk of desaturation until they demonstrate an ability to return to their baseline oxygen saturation while breathing room air (Practice Guidelines, 2014).

The overall premise for developing a new evidence-based practice guideline is to ensure that postoperative patients with OSA can be safely monitored with continuous pulse oximetry on a medical-surgical floor. By providing for the education and training of nursing staff, the guideline proposed in the current study will facilitate the highest level of care for this population. The intended result of the practice guidelines is that optimal outcomes in the management of patients with OSA on a medical-surgical unit with continuous pulse oximetry monitoring will be achieved.

Analysis and Synthesis

The project team members disseminated the articles and guidelines they identified as germane to the project to other group members. The group then met formally to review all the literature provided by the author of the current study and other group members and

to discuss the development process for the practice guideline. Based upon this input, the author developed the first draft of the guideline with the objective of providing practice parameters and protocols for the safe postoperative monitoring of patients with OSA on a medical/surgical unit using remote monitoring.

The working group was multi-disciplinary, reflecting the medical complexity of the target population and served as the expert panel to review the proposed guidelines using the AGREE II approach to assess the quality of the guideline and revise them if necessary. Such revisions were based upon expert opinion regarding the rigor, evidence-base, and potential to implement the guideline safely. Once the guidelines are deemed satisfactory, they will then be submitted to the various departmental review committees (anesthesia, surgery, nursing quality, and administration) and to the Quality Care Committee for final approval in preparation for implementation.

Summary

The volume of patients with obstructive sleep apnea has risen in proportion with increased obesity rates, and this population has a higher risk for adverse perioperative respiratory depression. According to the American Society of Anesthesiology, as discussed above, hospitalized patients who are at-risk for respiratory compromise from OSA should have continuous pulse oximetry monitoring when discharged from the recovery room. Continuous monitoring should be provided in the critical care area and step-down unit, through telemetry, or by appropriately trained hospital staff in the patient's room (Chung, 2008). The practice problem is that the capacity to serve the volume of patients who are at-risk for OSA in the ICU/step-down postoperative setting is

limited. This quality improvement project will develop a practice guideline to monitor this population remotely on a medical/surgical unit.

Section 4: Findings and Recommendations

Introduction

The practice problem was focused on OSA patients who are at increased risk of developing respiratory issues after surgery. This population does not have a designated area assigned in the facility and are observed in the ICU, PACU and step-down units. This project addresses the following gap in practice: this facility does not allow for remote pulse oximetry monitoring on the medical-surgical floors, though respiratory distress can occur in postoperative patients with OSA. The practice-focused question is "Can an evidence-based practice guideline be developed to monitor patients with OSA postoperatively on the medical-surgical units?" The purpose of this doctoral project was to develop a practice guideline for patients with OSA to receive proper care on a medical-surgical unit through continuous pulse oximetry.

Findings and Implications

The literature search involved several different articles found in CINAHL, ProQuest Nursing, MEDLINE Simultaneous Search, and Allied Health Research on OSA patients, management, and the propensity to develop respiratory distress postoperatively. Professional organization guidelines were used to develop the project, including the American Society of Anesthesiology. See Table 1 for a highlight of the three most important sources.

Table 1

Review of Articles

Title and Source	Review Process
de Lacy, J., Miller-Burnett, M., Bonsell, P., Stith, K., & Sanchez, S. (2014). Implementation of an innovative postoperative monitoring approach for patients with obstructive sleep apnea**.** Healthcare Management Forum*, 27*(1), S6-16. Article found in MEDLINE	This article highlighted the fact that patients with OSA are at an increased risk of developing respiratory complications after receiving anesthesia. It was concluded that OSA patients should be monitored postoperatively in accordance with the latest practice guideline. It also identified that OSA patients need to be monitored, but most times do not need to be monitored on a critical care unit. An observation unit was developed with a 2:1 nurse ratio and patients were continuously monitored. Patients received the same quality of care that they would have received in the critical care unit. There was also a reduction in length of stay for some patients with OSA owing to the standardized postoperative monitoring guidelines and order sets. The source is credible because it is a peer-review scholarly journal. The review process has been tested with good results. When this system was implemented other agencies became interested because of the positive results. This facility is willing to share their experience with other agencies.
Kadam, V. R., Markman, P., Neumann, S., & Kingisepp, S (2015). Risk stratification for obstructive sleep apnoea and optimal post-operative monitoring in an overnight stay ward. *Australian Journal of Advanced Nursing, 33*(2), 12-19.	This article reviewed data that highlights that OSA patients had a high risk of developing other complications that precipitate unanticipated admission to the ICU, such as hypoxaemia and cardiac arrhythmias. The article stated that surgical patients with OSA are at an increased risk of having perioperative complications such as difficult intubation and prolonged hospital stay. Patient with OSA were identified through screening tool published by the American Association of Anesthesiology. The study concluded that combining sensitive risk-stratifying questionnaire and overnight stay in an observation unit for known or suspected OSA is economical and safe in managing this population. The source was credible as a peer review journal and underwent a critical review process. The authors are associated with department of anesthesia and clinical services coordinators.
Practice guidelines for the perioperative management of patients with obstructive sleep apnea: A report by the American Society of Anesthesiologists Task Force on perioperative management of patients with obstructive sleep apnea*. Anesthesiology, 120*(2), 268-286.	The purposes of these Guidelines are to improve the perioperative care and reduce the risk of adverse outcomes in patients with confirmed or suspected OSA who receive sedation, analgesia, or anesthesia for diagnostic or therapeutic procedures under the care of an anesthesiologist. The source is credible as the authors are associated with the American Society of Anesthesiology committee. It is an updated practice guideline and new evidence was presented. The new findings did not necessitate a change in recommendations from the former guidelines

Summarizing Key Factors in the Guideline

One of the key factors in the proposed guideline promotes adequate preoperative assessment using the STOP-BANG questionnaire. This questionnaire was developed as a tool to screen patients in the perioperative setting for OSA (Tan et al., 2016). The criteria for moving to the medical-surgical unit versus the ICU, step-down unit, and PACU involves the stability of the patient only requiring continuous pulse oximetry monitoring after surgery. When patients' acuity levels are within the normal range they do not require observation in a critical care area but can be observed on the medical-surgical unit with parameters in place by trained nurses.

The protocol for monitoring OSA patients on the medical-surgical floor includes patients whose oxygen saturation and respirations are within the normal limit. Patients will be monitored on continuous pulse oximetry until discharged per unit policy. Nurses on the medical-surgical unit will be trained and educated on the parameters of adverse reactions to include assessment, documentation, and reporting to medical providers any abnormalities that may develop such as hypoxemia, level of consciousness, and respiratory distress. For instance, airway obstruction with subsequent hypoxemia is considered one of the major of complications from OSA (Hai et al., 2014).

Contribution of Project Team

The members of the project team included a respiratory therapist, the respiratory therapist director, PACU director, medical-surgical manager, an anesthesiologist, trauma medical doctors, the vice president of patient services, the senior vice president of acute care surgery, director of nursing practice education & research, the director of clinical

engineering, the vice president critical care services, a pulmonologist, the vice president clinical operations, and me. Members of the team attended several meetings to review the literature and to discuss the various drafts of the proposed guideline. The AGREE II (2013) instrument was used to assess the quality of the guideline, provide a methodological strategy for the development of the guideline and inform what information was used and how it should be reported. The final draft of guideline (see Appendix A) was sent to members for review using the AGREE II instrument.

The purpose of using of the AGREE II instrument in grading the guideline is to critically assess the document by team members. Based on feedback, the guideline can be revised if necessary. Although there were several team members that participated in the development of the OSA guideline only three of the team members responded in a timely manner. These members were the anesthesiologist, medical-surgical director, and pulmonologist.

The anesthesiologist was in agreement with 14 domains, partially agreed with six, and felt neutral with three of the domains. The director for the medical-surgical unit strongly agreed with six of the domains, agreed with ten of them, and was neutral to seven. The pulmonologist was strongly agreed to one of the domain, agreed to one, partially agreed to four, neutral to one, partially disagreed to two, disagreed to six, and strongly disagreed to eight of the domains. The domains rated the most agreed were domain 6, “the target uses of the guidelines are clearly defined”, domain 8, “the criteria for selecting the evidence are clearly defined,” domain 16, “the different opinions for the management of the condition or health issue are clearly presented,” domain 17, “key

recommendations are easily identifiable," domain 18, "the guideline provide advice and/or tools on how the recommendations can be put into practice," and domain 20, "the potential resource implications of applying the recommendations has been considered." The two neutrals were domain 21, "the guidelines present monitoring and/or auditing criteria," and domain 22, the views of the funding body have not influenced the content of the guideline." Two members did not disagree with any of the domains, while one consistently disagreed.

While this input was reviewed by the overall committee, the group agreed that changes will not be made to the guideline, as there are parameters that were put in place with input from respiratory, anesthesiology, and the technology department. The use of the guideline will be closely monitored for quality outcomes indicators prior to any additional changes to the proposed guideline. The focus now is to install the correct technologies that will allow proper monitoring of the patients. The medical-surgical unit has been designated to observe the OSA patients post-operatively.

Recommendations

The guideline will move forward for review as suggested by the team members. Final approval will be made by the Education Committee through the Quality Care Committee. According to the National Institute for Clinical Excellence (2010), clinical guidelines are recommendations on the appropriate treatment and caring of people with specific disease and conditions. Nurses will be educated on the care, treatment, and the parameters of observing the OSA population on continuous pulse oximetry monitoring on the medical-surgical unit instead of the ICU, PACU, and step-down units. These

parameters were developed by the participating team members to ensure that OSA patients have reliable equipment in place for monitoring and a respiratory assessment flow sheet that alerts nurses to normal and abnormal values and to those that require interventions. The results of these recommendations, flow charts and nursing responsibilities will be monitored for 6-12 months to determine the effectiveness of the guideline.

Section 5: Dissemination Plan

This guideline will be disseminated throughout the organization and will be made available to staff and other departments regarding the care and observation of OSA patients that require postoperative care with continuous pulse oximetry monitoring. The dissemination of clinical guidelines is an important and integral aspect of the guideline process. Strategies to disseminate, educate, and implement should have a clear identification of the target audience (National Institute for Clinical Excellence, 2010). This will be part of the facilities manual and will be accessible to those enquiring about the purpose, procedure, definition of the OSA patients, ongoing monitoring and nursing responsibilities. Based on the nature and success of the guideline, other hospitals and clinics across the healthcare system can access and review the document and implement guideline as appropriate for OSA population.

Analysis of Self

When I started the DNP program, my focus was not developing a hospital guideline. I was in the middle of working on another project for the program. When I started the practicum hours, my preceptor, the CNO, and senior president of patient service was aware of the issue involving OSA patients. I was asked to conduct a research of the literature and develop a guideline to better serve this population. I was intimidated and felt as though I lacked the knowledge and experience to undertake such a task. I had to conduct the research, form a team, and set meetings in accordance with team members' availability. Although I am a nurse and interact with medical providers daily, I was anxious about meetings with these heads of departments that included trauma directors,

vice presidents, and various directors from other departments to develop the guidelines. For each meeting, I had to generate an agenda with measurable goals. The process was strenuous but rewarding. I received tangible feedback from team members, and often had to go back to develop a workable guideline for this targeted population. Along with team members, I met and had meetings with technology representatives and had interactive demonstrations regarding the proper equipment for monitoring the OSA patients. I am not sure if my long-term professional career will involve developing guidelines and protocols, but I learned a lot that will enable me to work solely on my own or with other team members.

The project is in the final phase and has to be reviewed before becoming part of the standard hospital guidelines. The main challenges for me was gathering the material needed for the guideline and setting up meeting times. These were extremely busy medical doctors and directors; therefore, planning meetings and times were challenging. It was challenging for me as a student to get the team members to measure the guideline that was developed using the AGREE II instrument. There were a lot of insights gained in conducting the research. I learned the importance of focusing on the main criteria, the development of policies and guidelines, the importance of evidence based research, proper training of staff, and that developing guidelines is time-consuming.

Summary

The doctoral project was an important and an essential aspect of the hospital's commitment to quality care. Patients will be screened before surgery using the STOP-BANG questionnaire, and those identified as having obstructive sleep apnea (OSA) or

with a prior diagnosis will receive care and treatment on a designated medical-surgical unit with trained and educated nurses. Having a designated area instead of the ICU, PACU, and step-down unit will be cost effective for the facility. There will free up additional space for trauma patients, sepsis, myocardial infarcts, and more acutely ill patients.

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Appendix: Policy for Obstructive Sleep Apnea Patients

Policy for obstructive sleep apnea (OSA) patients who require continuous oxygen monitoring postoperatively (Created 3/22/17)

POLICY KEY ELEMENTS

POLICY STATEMENT: It is the policy of Grady Health System (GHS) to provide a safe patient environment and ensure that patients with obstructive sleep apnea (OSA) who do not require an ICU/step-down bed are properly monitored after surgery on a medical/surgical floor by remote telemetry monitoring with pulse oximetry.

I. PURPOSE:

The purpose of this policy is to outline and provide guidelines for patient selection an monitoring for continuous pulse oximetry monitoring for patients with obstructive sleep apnea (OSA) post-operatively.

II. PROCEDURES:

The procedures necessary to approve, process and implement the actions outlined in the policy; covered as briefly but efficiently as possible.

III. DEFINITIONS:

Definitions: Obstructive sleep apnea (OSA) is a chronic condition and is characterized by partial (hypopnea) or complete closure (apnea) of the upper airway despite ongoing respiratory efforts, leading to oxygen desaturation of the blood, and frequent arousals, resulting in restless sleep. It is associated with significant morbidity and mortality. This population will require continuous monitoring and observation post-operatively.

CONTINUOUS PULSE OXIMETRY (Supportive Data)

Obstructive sleep apnea (OSA) patients who require continuous pulse oximetry monitoring duties will be performed by RN/RCP. Physician order is required
A. The continuous pulse oximeter provides continuous, non-invasive measurements of both oxygen saturation and pulse rate. The accuracy of the continuous pulse oximeter is affected by:
1. Significant levels of dysfunctional hemoglobin (methemoglobin or carboxyhemoglobin).
2. Sensor position.
3. Perfusion of tissue while measurement is taken.
4. Motion artifact.
5. Bright ambient light.

6. Nail polish.
7. IV dyes such as methylene blue or cardiogreen, depending on concentration.

EQUIPMENT (Phillips?)
Default alarm limits: High (100%), low (92%), Desaturation (85%)

I. ONGOING MONITORING OF PATIENT:
Sedation score is a more reliable indicator than respiratory rate in assessing for opioid induced respiratory depression.

- Continuous ventilation monitoring utilizing etCO2 monitor to monitor etCO2 respiration rate, etCO2, SpO2, pulse rate and IPI (Integrated Pulmonary Index)
- Assess and document sedation score, SpO2, etCO2 respiratory rate, etCO2 and IPI every hour for the first 12 hours, then every 2 for the next 12 hours. (The respiratory rate that is displayed by the etCO2 monitor may very well be different than the rate that you get when you count chest wall movement or the rate that is displayed by other monitoring devices. This is because capnography measures only effective breaths, not just chest wall movement, or attempts to breathe. It is a true airway rate, measured by actual air movement rather than rise and fall of the chest).
- After first 24 hours and no events, assess and document sedation score, SpO2, etCO2 respiratory rate, etCO2, and IPI every 4 hours for 24 hours.
- Continuous pulse oximetry, for high risk population as defined above. A decline in SPO2 during room air breathing appears to be a reliable indicator of abnormal ventilation. However, the presence of abnormalities may go undetected with the use of supplemental oxygen
- Document monitoring on Respiratory Assessment Flowsheet

SCORE TABLE

IPI	**Patient Status**
10	Normal
8-9	Within Normal Limits
7	Requires close attention
5-6	Requires attention and may require intervention
3-4	Requires intervention
1-2	Requires immediate attention

a. All patients admitted to the designated nursing unit with Patient Safety Net (PSN) installed will be continuously monitored for pulse oximetry (SpO2) and pulse rate monitoring.

b. A nurse will initiate surveillance monitoring by admitting the patient to the central station, and assigning the patient to staff assignment.

c. Inpatient surgical and medical units: All patients admitted for OSA will be monitored on admission until patient is discharged and/or moved to a highler level of care.

d. Upon admission to the unit and/or criteria met for monitoring, patient will be admitted on a monitor.

e. The patient admitted to the monitoring system will be linked to the primary nurses' phone.

f. Place an oximeter probe on the patient's finger.

g. Verify settings and saturation reading capture. Monitor instrument cell border for the color green to indicate a successful admission and connection with oximeter.

h. A registered nurse will verify that the patient is admitted correctly.

i. Document oxygen saturation with vital signs per unit policy.

j. Pre-determined settings, which activate alarm, may only be changed with a written physician's order. These settings can be changed by the charge nurse, assistant director, director, nursing supervisor, or clinical engineering.

k. When a patient's oxygen saturation falls below pre-determined settings, alarms will sound.

l. For sustained decrease oxygen saturation, refer to current physician order. If no order call physician.

m. Patients will be placed on portable pulse oximetry monitor when transported outside their room. The primary nurse/charge nurse will instruct individuals transporting and

receiving staff in other areas radiology etc. to call them if individual portable monitor alarms.

n. Upon discharge, disconnect patient from finger probe and bedside monitor and discharge patient from monitoring system.

CARE AND MANAGEMENT

Site selection/Application:

- Optical components of the sensor must be aligned
- Star on the nail bed, black box on the flesh
- Site selection is intended for use on the patient's finger or toe; preferably the patient's non-dominate hand and preferred ring or middle finger
- For best results it is recommended Nail polish and/or artificial nails be removed (Note the sensor will read through artificial nails and some nail polish, it is recommended any blue, black or sparkle nail

Site Assessment:

- Avoid, when possible, application to edematous tissue or distal to arterial catheters, intravenous lines and blood pressure cuffs
- Exercise caution with poorly perfused patients; skin erosion and/or pressure necrosis can be caused when the sensor is not frequently moved
- Inspect sensor site (digit or acoustic monitor) for skin and sensor
- integrity with head to toe assessment
- Assess site frequently with poorly perfused patients and move sensor if there are signs of tissue ischemia (this may be as frequent as every 1 hour)

Poor Perfusion:

- Warm extremity or choose an alternate site. The site must be checked to ensure adequate adhesion, circulation, skin integrity, and correct optical alignment.

Motion:

Move the sensor to a less active site. Replace with a fresh adhesive sensor. Recommend the following steps:

- Ensure proper sensor alignment (star on nail bed and black box on the flesh) and adhesion Replace sensor tapes
- Add double-sided clear adhesive to renew adhesive on emitter and detector
- Change sensor if above steps do not work

DOCUMENTATION

a. At a minimum, SpO2 and pulse rate will be documented in the EMR at the same time as vital signs. The pulse oximeter sensed pulse rate and the patient's pulse rate must correlate.

b. To detect trends in a patient demonstrating early signs of deterioration, such as hypoventilation, SpO2 requiring oxygen titration, the SpO2 should be documented in the EMR more frequently to follow trends.

c. Oximeter reading every 2 -4 hours and PRN

d. Tissue damage a sensor site and action taken

e. Nursing must document in the EMR patient refusal or contraindication of the patient safety net system or acoustic monitoring.

PATIENT/FAMILY EDUCATION

a. Instruct patient, family and/or significant other in the purpose of the monitoring device and the alarms

b. Reassure the patient and family that the monitor is continuously analyzing the patient's oxygenation level, pulse rate and when applicable the respiratory rate and that nursing will respond to alarm conditions

c. Emphasize that unless otherwise contraindicated, the patient is able to move freely about the room

d. Reinforce the need to report early symptoms of respiratory fatigue, shortness of breath or distress

e. Reinforce necessity of maintaining placement of sensor for continuous monitoring

NURSING RESPONSIBILITES:

A. Assess and document **every 4 hours or as needed** while monitored:

1. SpO2 Oxygen Saturation

2. ETCO2 End Tidal Carbon Dioxide level

3. Heart Rate

4. Respiratory Rate

5. Integrated Pulmonary Index (IPI)

6. Report to MD exceeding alarm limits for pulse and oxygen saturation

7. Report to MD tissue damage at oxisensor site

8. Describe/demonstrate method for contacting respiratory therapy.

9. Have available in the patient's room, and know how to use, necessary respiratory equipment

10. Observe for color and pallor of skin and mucous membranes.

11. Demonstrate use of pulse oximetry for monitoring patient.

12. Document all respiratory treatments, medications, related procedures, assessments, interventions

the effects of each. Re-assess patient's status PRN as indicated by the patient's condition.

B. Actions taken- Refer to: **Flow Chart ETCO2 monitoring**

*Consult with Respiratory Care if unable to determine the cause.

MONITORING MAY BE DISCONTINUED WHEN ANY OF THE FOLLOWING OCCUR:

1. Capnography monitoring may be discontinued one hour after the PCA has been discontinued as long as the oxygen saturations are consistently > 92% and/or ETCO2 < 55 with a stable respiratory pattern for 24 hours.
2. Continuous pulse oximetry may be discontinued after 24 hours as long as the oxygen saturations are consistently > 92% and without any incidents of desaturations.
3. As ordered by the physician

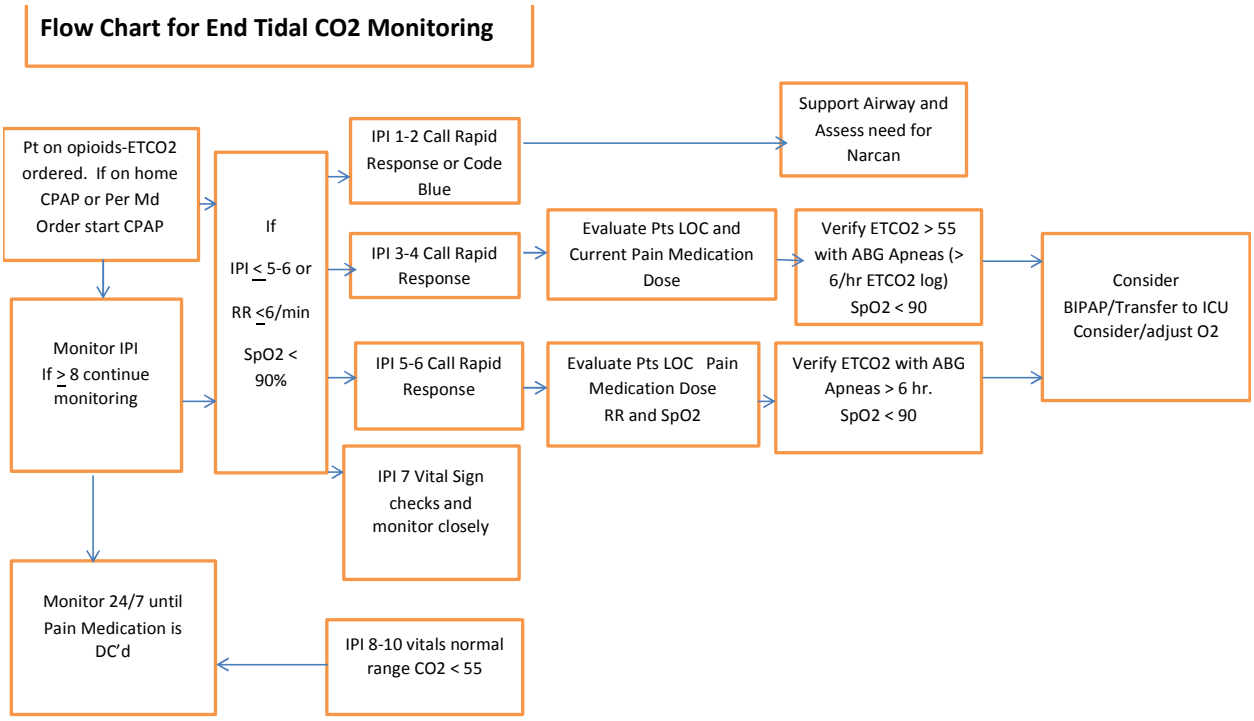
Abnormal Values

1. If ETCO2 is 60 mmHg:

    a. Attempt to stimulate and arouse patient
    b. Evaluate patient via patient driven protocol to improve pulmonary toilet
    c. Notify RN
    d. If patient status does not improve consider call to rapid response

2. If ETCO2 is greater than 60 mmHg notify MD and consider call to rapid response

4. If oxygen saturation is less than or equal to 92% implement patient driven protocol for oxygen therapy



SCREENING
STOP-Bang Questionnaire
Is it possible that you have ...Obstructive Sleep Apnea (OSA)?

Please answer the following questions below to determine if you might be at risk. Yes or No

Snoring ? Yes or No
Do you **Snore Loudly** (loud enough to be heard through closed doors or your bed-partner elbows you for snoring at night)?

Tired ? Yes or No
Do you often feel **Tired, Fatigued, or Sleepy** during the daytime (such as falling asleep during driving or talking to someone)?

Observed ? Yes or No
Has anyone **Observed** you **Stop Breathing** or **Choking/Gasping** during your sleep?

Pressure?

Do you have or are being treated for **High Blood Pressure**? ☐ Yes or No

Body Mass Index more than 35 kg/m^2? Yes or No

Body Mass Index Calculator

☐ cm / kg ☐ inches / lb

Height: ☐ Weight: ☐ BMI: ☐

Age older than 50? Yes or No

Neck size large? (Measured around Adams apple) Yes or No

For male, is your shirt collar 17 inches / 43 cm or larger?

For female, is your shirt collar 16 inches / 41 cm or larger?

Gender = Male Yes or No

For general population

OSA - Low Risk : Yes to 0 - 2 questions
OSA - Intermediate Risk : Yes to 3 - 4 questions
OSA - High Risk : Yes to 5 - 8 questions
or Yes to 2 or more of 4 STOP questions + male gender
or Yes to 2 or more of 4 STOP questions + BMI > 35kg/m^2
or Yes to 2 or more of 4 STOP questions + neck circumference 17 inches / 43cm in male or 16 inches / 41cm in female

Predisposing Conditions to Obstructive Sleep Apnea

Condition	**Example**
Obesity	Adult Obesity
Age	More than 50 Years
Gender	Male
Neck Circumference	More than 40 cm

Nasal Obstruction	As in Septal Deviation
Pharyngeal Obstruction	Tonsillar and Adenoidal Hypertrophy
Larygeal Obstruction	Laryngomalacia, Tracheomalacia
Craniofacial Abnormalities	Down's, Micrognathia, Achondroplasia, Acromegaly, Macroglossia
Endocrine and Metabolic Causes	Hypothyroidism, Cushing's Disease
Neuromuscular Disorders	Stroke, Cerebral Palsy, Head Injury, Poliomyelitis, Myotonic Dystrophy Marfan's
Connective Tissue Disorders	
Genetic Predisposition	
Alcohol, Sedatives and Smoking	
Medications and Anesthesia	

MONITORING PATIENTS WITH OR WITHOUT CPAP/BIPAP

Guidelines for the respiratory care practitioner, anesthesia and nursing to manage patients requiring PSN monitoring. When SpO2, Pulse Rate and End Tidal CO2 (ETCO2) trigger alarm conditions, CPAP/BIPAP should be considered.

III. Indications- initially identify patients on home BIPAP/CPAP
   A. Patients utilizing a controlled analgesia pain pump
   B. Post-operative/post-procedural patients who are positive or screened positive using the Stop-Bang Sleep Apnea Assessment Tool for Obstructive Sleep Apnea (OSA). (See attachment Assessment Tool).
   C. Any patient identified with possible risk factors for respiratory compromise

IV. Contraindications to therapeutic BIPAP exclusive of monitoring interventions
   A. Patients incapable of maintaining life sustaining ventilation in the event of malposition of the mask.
   B. Patients at risk for aspiration of gastric contents.
   C. Patients at risk for rebreathing CO2 if there is a loss of flow from the BIPAP system (circuit disconnected).
   D. Patients susceptible to pneumothorax or pneumomediastinum with the use of positive pressure.
   E. Hypotension induced by positive pressure ventilation.
   F. Hypersensitivity to the mask where an allergic reaction outweighs the benefit of ventilator assistance.
   G. Patients requiring maximum ventilatory support and frequent suctioning.

V. Procedure
   A. Anesthesia or Primary physician will assess the patient and generate the order for PSN monitoring based on their assessment, use of a PCA pump for pain management, and/or OSA.

B. Nursing/Respiratory will be responsible for setting up the monitoring devices. Patients may require monitoring without initiation of CPAP/BIPAP.

C. Default Alarm Parameters:
1. Low SpO2 85%
2. Low Pulse Rate 50
3. High Pulse Rate 140
4. Low RR 7
5. High RR 35
6. High ETCO2 55
7. Low ETCO2 20

D. For CPAP/BIPAP
1. Explain the procedure to the patient and fit the mask.
2. IPAP – inspiratory pressure (8-15).
3. EPAP – expiratory pressure (5-6).
4. IPAP – pressure is set above the level of EPAP. EPAP level acts as the baseline. If IPAP is 10 and EPAP is 5 the total peak pressure is 15.
5. Set rate, I.T., and rise time if appropriate
6. Adjust oxygen for desired SpO2
7. Set alarms

G. Monitor patient for tolerance, and adjust parameters as appropriate

H. Document and charge based on the Non-Invasive Template in EPIC. Include a plan of care note each shift.

VII. Special Considerations

A. When NPPV is implemented, the patient should be assessed to determine the need for periodic suctioning to ensure a patent airway. This is totally patient dependent considering the level of consciousness, gag/cough reflex, and ability to tolerate the interruption of support.

B. Patients requiring BIPAP for sleep apnea with PSN monitoring should be placed on the floors capable of supporting the monitoring.

VIII. Termination of therapy

A. 24-hours post-operative on Room Air and no PCA pump, IV Opioids, no known history of OSA, and BMI less than 40.

B. Patient refusal

C. When physician discontinues intervention.

IX. Cleaning and Sterilization

A. Wipe down non-disposable equipment prior to removal from the room

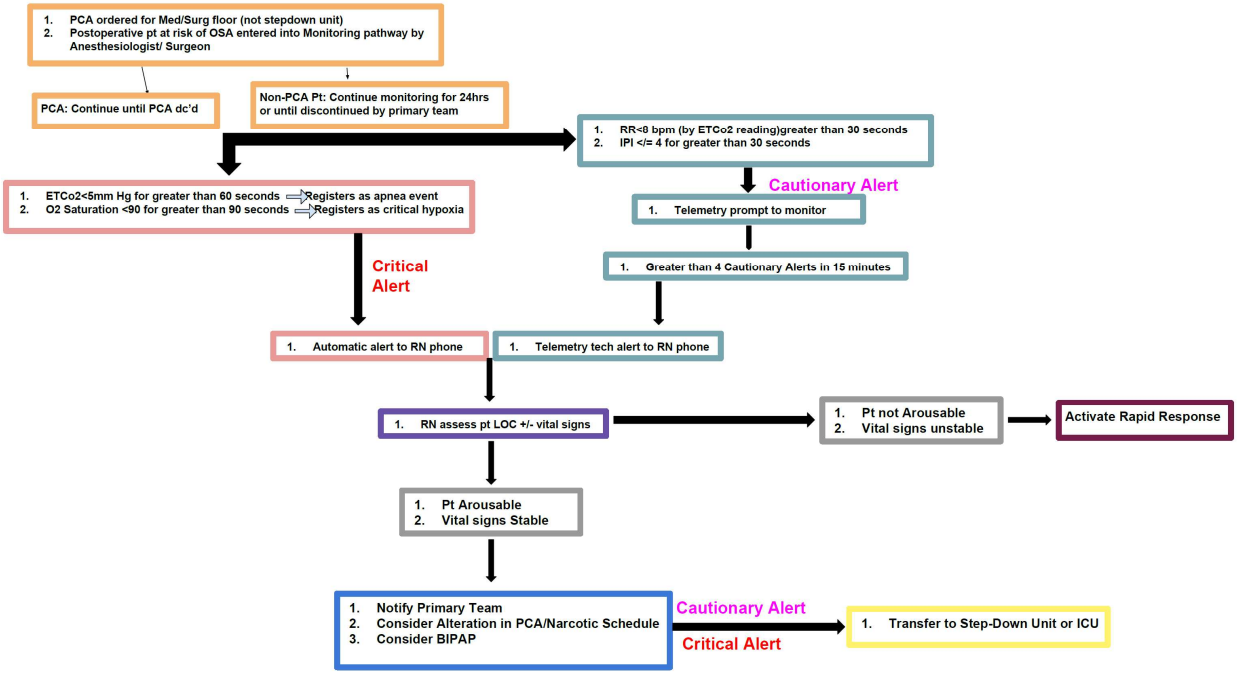
B. Dispose of any single patient use equipment

C. Return non-disposable equipment to appropriate department.

X. Definitions:

A. Surveillance Monitoring: Use of non-invasive oxygen saturation and pulse wave monitoring for early detection of unanticipated events. Measured parameters serve to trigger intervention when physiologic deterioration occurs.

B. Patient Safety Net (PSN): A remote monitoring and clinician notification system that combines pulse oximetry and pulse rate monitoring with wireless notification to staff to provide direct patient surveillance and prevent unanticipated events



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