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Obstructive Sleep Apnea: Emphasis On Discharge Education After Surgery

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OBSTRUCTIVE SLEEP APNEA:
EMPHASIS ON DISCHARGE EDUCATION AFTER SURGERY

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Abstract

In the United States, the prevalence of obstructive sleep apnea (OSA) in the adult population is increasing. Over half of the surgical patients with OSA are predisposed to increased incidence of perioperative complications. Based on recent evidence, obstructive events are at the highest on the third day after surgery, which predisposes them for postoperative complications. The American Society of Perianesthesia Nurses recommends that discharge education (DCE) on OSA should be provided after surgery to patients diagnosed with OSA to promote continuous positive airway pressure (CPAP) compliance and self-care behaviors at home. However, CPAP adherence is poor. The purpose of this evidence-based practice project is to evaluate the effectiveness of DCE on OSA for increasing CPAP compliance after surgery among adult surgical patients diagnosed with OSA, who use CPAP.

Keywords: obstructive sleep apnea, discharge education, CPAP, adherence

Background & Evidence

Obstructive sleep apnea (OSA) is a sleep-disordered breathing characterized by a repetitive, partial, or complete obstruction in the upper airway that occurs during sleep.[1–7] It is the most common sleep-related breathing disorder.[1,5,7] In the United States, the prevalence of OSA in the adult population is estimated to be 20%.[5,8,9] In spite of increased awareness and diagnosis of OSA, 90% of people living with OSA remain undiagnosed.[1,5,10,11] Some common risk factors are advancing age, male gender, smoking, and obesity.[5,12] OSA affects about 9% of women and 24% of men.[1,6] OSA patients are at risk for serious long-term health consequences if left untreated.[1,4] Among men with OSA, higher apnea-hypopnea index (AHI) is associated with cardiovascular events.[13] Patients with OSA are also associated with impaired daytime function, motor vehicular accidents, metabolic syndrome, diabetes, nonalcoholic fatty liver disease, and all-cause mortality.[4,5,7]

In the surgical population, the prevalence of patients with OSA is higher compared to the general population.[6,8,14] Based on a review of literature, surgical patients with OSA are at higher risk of perioperative complications.[1,2,5,15] Perioperative complications include postoperative oxygen desaturation, respiratory failure, and postoperative cardiac events, which would necessitate their transfer to a monitored unit.[1,5,8,15] Chung et al[10] reported that sleep disturbance is highest on postoperative night one for both patients with and without OSA. However, obstructive events are at the highest on the third night after surgery. On postoperative night five, the AHI remains increased and returns to preoperative level by postoperative night seven. These findings suggest that patients with OSA are at increased risk for postoperative complications for

about a week after surgery.[1,10] These prompted the American Society of Anesthesiologists and American Society of Perianesthesia Nurses (ASPAN) to develop clinical practice guidelines and protocols for the perioperative management of patients with OSA.[1,2,4] Thus, it is essential to ensure that OSA patients use their CPAP and learn self-care behaviors after surgery.[16] The purpose of this evidence-based practice (EBP) project was to evaluate the effectiveness of discharge education (DCE) on OSA for increasing CPAP compliance after surgery.

OSA is considered a chronic disorder that requires a long term, multidisciplinary approach.[4,7,17] Weight loss and CPAP are the cornerstones of therapy in patients diagnosed with OSA.[4,5,5] The American College of Physicians recommends CPAP as the initial management for patients diagnosed with moderate or severe OSA.[4,11] CPAP continuously blows air under pressure into the mask when the person breathes.[3,4,7,18] This prevents the collapse of the upper airway during sleep in patients with OSA.[3,7] There is high quality evidence that shows CPAP reduces AHI during sleep, improves daytime cognition, helps control systemic blood pressure and blood glucose, and increases quality of life. Based on several studies, CPAP usage greater than six hours per night reduces signs and symptoms of OSA.[3] Unfortunately, patients' use of CPAP is often less than optimal. The patients often report nasal congestion, facial irritation, headaches, and bloating with the use of CPAP.[11] Because of its side effects, adherence to CPAP is poor, ranging from 30% to 60%.[3] Suboptimal adherence can lessen the potential benefits of CPAP therapy.[3,4] Additional patient education or interventions may be needed to improve CPAP adherence.[4,8]

Project Design

The framework for this EBP project was based on the Evidence-Based Practice Institute Model[19] by Dr. Caroline Brown and Dr. Laurie Ecoff. The model is adapted from Dr. Hayward's Evidence-based Information Cycle and Dr. Rosswurm and Larrabee's EBP Model for Change.[20] The risk for postoperative complications and low CPAP compliance rate among surgical patients with OSA serve as the catalysts for this EBP process change. A discharge education program on OSA after surgery had not been instituted at this academic medical teaching health system in southern California as recommended by ASPAN.[1] A focused question was developed using the PICO format.[21] The following PICO question served as a guide to search for the best evidence: In surgical patients with obstructive sleep apnea (P), does the DCE on OSA (I) compared to usual care (C) increase CPAP compliance (O) after surgery?"

Evidence-based Intervention

This EBP project was initiated in an effort to improve CPAP compliance after surgery. The EBP project evaluated the effectiveness of DCE on OSA for increasing CPAP compliance after surgery in patients diagnosed with OSA. Verbal and written instructions in the form of a handout were provided to the patients (Appendix G).The content of the handout was based on the current evidence and ASPAN's updated practice recommendation for care of the adult patient with OSA.[1] The handout provided an overview of the causes of OSA, complications, treatment, and measures on how to take care of themselves after surgery.[1,4,7] In a Cochrane systematic review it was concluded that educational interventions increase CPAP machine utilization by about 35 minutes per night. The evidence to support this finding was gathered from low to moderate quality

studies. It also increased the number of participants who used their CPAP machines for longer than four hours per night. The participants also reported minor improvement in symptoms based on Epworth Sleepiness Scale (ESS).[22]

The DCE on OSA also utilized the teach-back method. Evidently, The Agency for Healthcare Research and Quality recommends the use of teach-back method by healthcare professionals when delivering patient education in patients with chronic disorder.[23] OSA is a chronic disease and requires self-management approaches.[17,24] Teach-back involves asking patients to repeat back important information that was discussed during the education. This method is effective in patients with low health literacy. This leads to increased health knowledge and retention of key points of the instructions.[24] It also promotes treatment compliance, follow up instructions, and reduces hospital readmission.[17,21,22]

Also, the discharge education was given on an individual basis and in multiple sessions. Fredericks et al[25] conducted a systematic review of 58 randomized clinical trial and quasi-experimental design studies to evaluate the effectiveness of specific approach, method of delivery, and frequency of postoperative patient education. The specific outcomes considered were improvement in self-care knowledge, self-care behavior, and symptom experience. Based on the findings, surgical patients who were given discharge education in an individualized approach, on an individual basis, and in multiple sessions showed the most improvement in all specific outcomes of interest. Moreover, the studies that provided a combination of different media such as phone contact with nurse and distribution of written resources demonstrated improvement in self-care knowledge, self-care behavior, and symptom experience.

Project Plan Process

The project plan was submitted to the Institutional Review Board and deemed excused from IRB oversight. The EBP project took place at an academic medical teaching health system with two campuses serving north and central San Diego in southern California. Adult surgical patients over 18 years old diagnosed with OSA, who use CPAP, were identified at their preoperative clinic evaluation before their surgery. Phase one was implemented from August 2015 through September 2015. In phase one, the Apnea Knowledge Test (AKT)[26] was completed. AKT is the only validated tool which measures patients' knowledge on OSA. It assesses the patient's knowledge on OSA and CPAP usage. It is comprised of 15 questions: 13 multiple choice and two open-ended questions. Total AKT score ranges from zero to 20. Higher AKT score indicates greater knowledge on OSA and CPAP usage. Pretest AKT was administered before the DCE on OSA was provided to the patient on the day of surgery. First post-AKT was administered immediately after DCE on OSA was provided. Second post-AKT was administered three days after surgery. Table 1 displays patient demographics.

Table 1. Patient characteristics

	Phase I (n= 16)	**Phase II (n=50)**
Age (years)	57.3 ± 14.4	58.7 ± 11.1
Gender, male (%)	68.6	56
BMI (kg/m^2)	33 ± 7.4	35.7 ± 10.4
Type of surgery (%)		
Orthopedic	25	38
Genitourinary	25	24
Gastrointestinal	6.3	20
Head & Neck	31.3	10
Other	12.5	8

Phase two was implemented from October 2015 through December 2015. It included a second set of surgical patients who were contacted and provided DCE on OSA by the DNP student by telephone, five to seven days before surgery. On the day of surgery, DCE on OSA was reinforced by a perioperative nurse. The DCE on OSA handout was given to the patient prior to discharge. Subjective CPAP usage and the Epworth Sleepiness Scale[27] was determined prior to surgery, on the day of surgery, and seven to 10 days after surgery to evaluate effectiveness of the DCE on OSA project. The ESS is an eight-item questionnaire that subjectively measures daytime sleepiness in adults. It asks people to rate their chances of dozing off or falling asleep in eight different common situations or activities that most people engage in their daily lives. It is a 4-point scale with high internal consistency as measured by Cronbach's alpha (0.88) and reliability (r=0.82). The total ESS score ranges from zero to 24. The higher the score, the higher level of daytime sleepiness of the person.[27] Postoperative complications and length of stay in the hospital were also assessed.

Evaluation Results

In phase one, a total of 16 patients were included, 11 men and six women, with a mean age of 57.3 ± 14.4. Mean body mass index (BMI) was 33 kg/m^2 ± 7.4. Patients underwent orthopedic (25%), genitourinary (25%), gastrointestinal (6.3%), head and neck (31.3%), and other surgery (12.5%) (Table 1). Mean pre-AKT score was 15.9. First post-AKT score was measured right after DCE on OSA was provided. Mean first post-AKT score was 17.8. An 11.9% increase was noted of the mean AKT score from pretest to first posttest. Second post-AKT was administered three days after surgery. The mean second

post-AKT score was 19.7. This resulted in a 10.7% increase from the first mean post-AKT score, and a 23.9% increase from mean pre-AKT score (Figure 1).

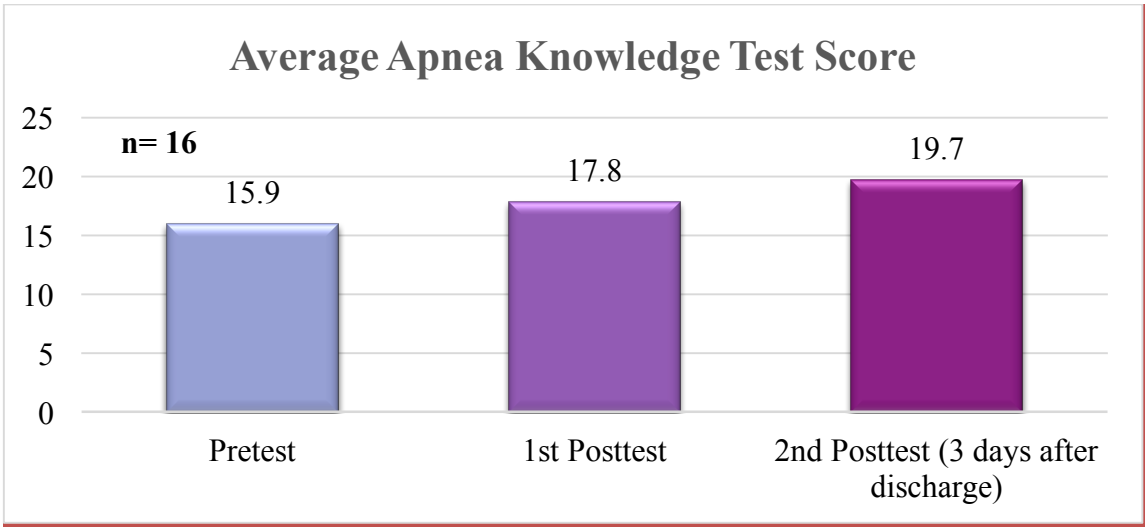

Figure 1. Average AKT score administered before and after surgery. An 11.9% increase was noted of the mean AKT score from pretest to first posttest. Second post-AKT showed an increase of 10.7% and 23.9% from the mean pre-AKT and first post-AKT respectively.

In phase two, a total of 50 patients were included, 28 men and 22 women, with a mean age of 58.7 ± 11.1. Mean BMI was 35.7 kg/m^2 ± 10.4. Patients underwent orthopedic (38%), genitourinary (24%), gastrointestinal (20%), head and neck (10%), and other surgery (8%) (Table 1). Subjective CPAP hours per night usage was measured before and after DCE on OSA. Preoperative CPAP hours per night usage was measured five to seven days before surgery. Mean presurgery CPAP hours per night usage was 5.8. CPAP hours per night usage was measured again on the day of surgery. Mean CPAP hours per night usage on the day of surgery was 6.3. An 8.6% (30 minutes) increase was noted of the mean CPAP hours per night usage from five to seven days before surgery to the day of surgery. Seven to 10 days postoperative, CPAP hours per night usage was measured again. Mean CPAP hours per night usage was 7. This resulted to an 11.1% (42 minutes) increase from the day of surgery to seven to 10 days postoperative, and 20.7% (72 minutes) increase from the mean presurgery CPAP hours per night usage (Figure 2).

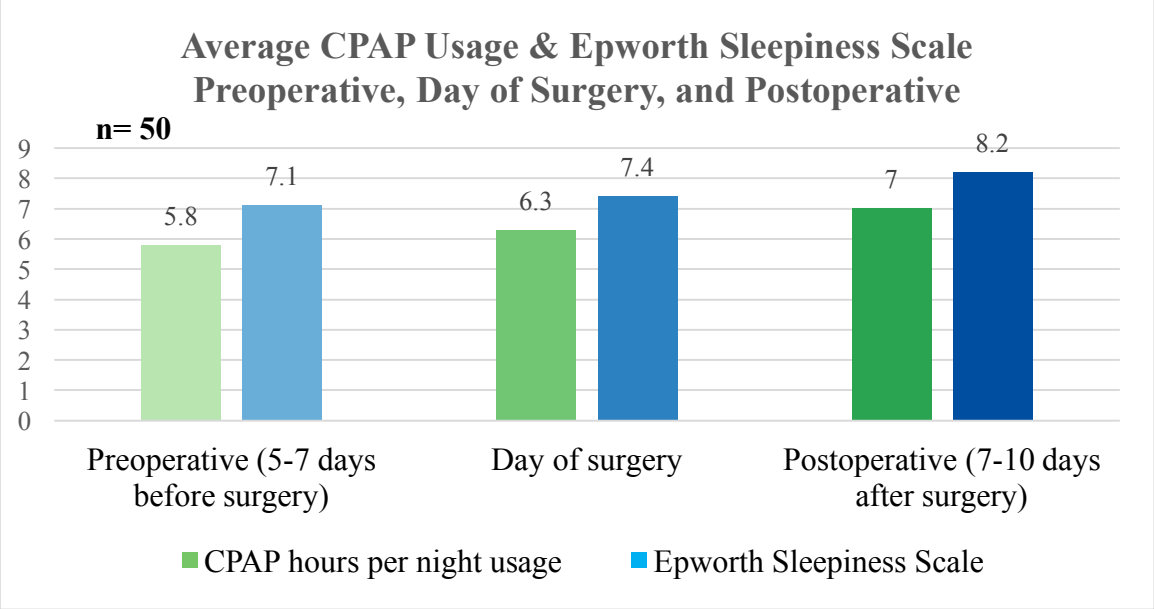

Figure 2. Average Epworth Sleepiness Scale & CPAP Usage Preoperative, Day of surgery, and postoperative. An 8.6% (30 min) CPAP usage increase from preoperative to day of surgery. An 11.1% (42 min) CPAP usage increase from day of surgery to postoperative. A 20.7% (72 min) CPAP usage increase from preoperative to postoperative (F=5.019, p=0.008).

A one-way analysis of variance (ANOVA) was used to detect whether or not there was a statistically significant change in CPAP usage over time. A statistically significant increase in CPAP usage was found over time (F=5.019, p=0.008). In addition, a post-hoc analysis was utilized to determine at which time point the statistically significant change in CPAP usage occurred. There was no statistical significant change of CPAP usage between preoperative to day of surgery or day of surgery to postoperative. However, there was a statistical significant change of CPAP usage from preoperative to postoperative (F=8.145, p=0.005) (Table 2).

Subjective daytime sleepiness scale was measured using the ESS.[27] Pre-ESS was administered five to seven days before surgery. Mean pre-ESS score was 7.1. First post-ESS was administered on the day of surgery. Mean first post-ESS score was 7.4. A 4.2% increase was noted of the mean ESS score from pretest to first post-ESS score. Second

post-ESS was administered seven to 10 days after surgery. The mean second post-ESS score was 8.2. This resulted to a 10.8% increase from the first mean post-ESS score, and a 15.5% increased from the mean pre-ESS score (Figure 1).

Table 2. Post-hoc analysis

Preoperative to Day of Surgery						
		SS	**df**	**MS**	**F**	**p**
	Between:	6.25	1	6.25	1.763	0.187
	Within:	347.41	98	3.545		
	Total:	353.66	99			
Preoperative to Postoperative						
		SS	**df**	**MS**	**F**	**p**
	Between:	36	1	36	8.145	0.005
	Within:	433.16	98	4.42		
	Total:	469.16	99			
Day of Surgery to Postoperative						
		SS	**df**	**MS**	**F**	**p**
	Between:	12.25	1	12.25	3.92	0.051
	Within:	306.25	98	3.125		
	Total:	318.5	99			

Note: Significant at $p < 0.0167$

Forty-four patients (88%) reported using their CPAP every night after DCE on OSA compared to 37 patients (74%) five to seven days preoperatively (Figure 3). Out of the 50 patients, an additional sixteen percent had reported CPAP usage during daytime naps after surgery. One patient started using his CPAP every night from not completely using it for months before education was provided. However, out of the 50 patients, three patients were not able to use their CPAP after surgery. Two patients did not use their CPAP as advised by their surgeon after a nasal surgery. Another patient with OSA did not use his CPAP as it was not communicated to the floor nurses that he uses CPAP at home.

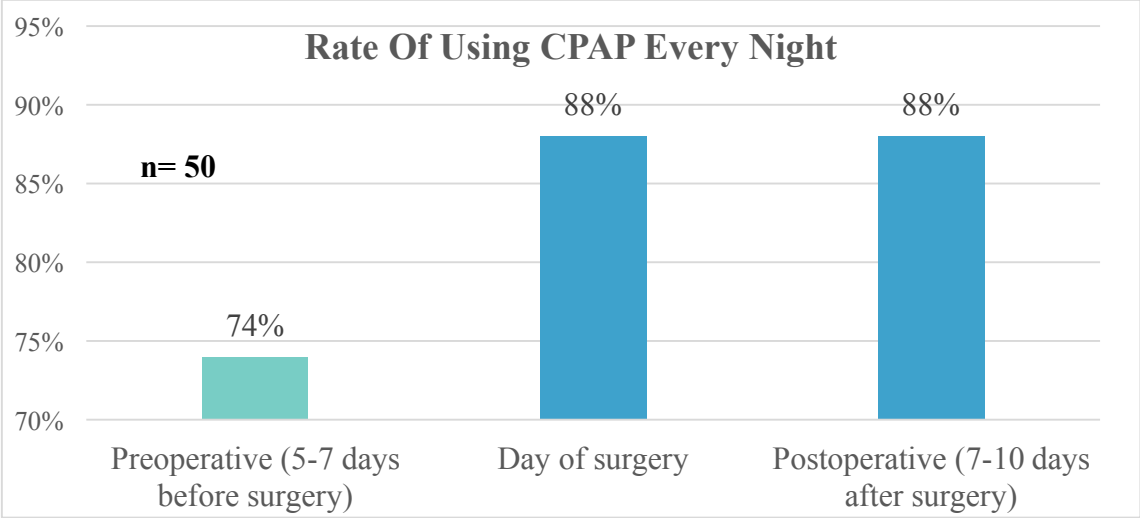

Figure 3. Rate of patients using their CPAP every night preoperative, day of surgery, and postoperative. A 14% increase of CPAP usage every night after DCE on OSA given was noted.

Also, it has been noted that 11 patients who received the DCE on OSA had shorter length of hospitalization than what was expected prior to surgery. Most of these patients were discharged to home a day before the expected day of discharge. Three patients were discharged home on the day of surgery when the plan was for this patient to be admitted overnight. On the other hand, postoperative complications arose during the implementation of the discharge education program. Four patients from the outpatient surgical center were unexpectedly admitted overnight. Two of the patients suffered oxygen desaturation which necessitated an overnight stay in a monitored unit. The other two patients needed monitoring for postoperative pain management. Another five OSA patients were expected admitted but stayed one day longer than expected discharge date (Table 3). Consequently, another three patients visited the emergency department (ED) after surgery. Of all the patients who were admitted after surgery, nine surgical patients stayed one day longer than the expected discharge date. One patient stayed three days longer than what was expected.

Table 3. Rate Of Patients Who Had Longer LOS	
	Phase II n=50
Patients who had longer LOS, n (%)	**9 (18)**
Expected admission, n (%)	5 (10)
Nutritional issues, n (%)	2 (4)
Postoperative pain management, n (%)	2 (4)
Infection, n (%)	1 (2)
Unexpected admission, n (%)	4 (8)
Oxygen desaturation, n (%)	2 (4)
Postoperative pain management, n (%)	2 (4)

Table 3. Rate of OSA patients who were admitted and had longer LOS in the hospital.

Discussion

An EBP project was initiated and implemented in order to evaluate the effectiveness of the DCE on OSA for increasing CPAP compliance after surgery among adult surgical patients diagnosed with OSA, who use CPAP. Phase one's main objective was to evaluate the effectiveness of the DCE on OSA in increasing knowledge on OSA and CPAP. In phase one, sixteen surgical patients received the DCE on OSA. These patients demonstrated an increased knowledge on OSA and CPAP. Majority of these patients had a great baseline understanding of OSA and CPAP even before the DCE on OSA was provided. The mean pre-AKT score was 15.9. There was minimal room for improvement. AKT was measured immediately after the DCE on OSA was provided. This allowed the patients to have a better understanding about OSA and CPAP usage. Verbal instructions and a written handout were provided. The DCE on OSA contains the information covered on the test. An 11.9% increase was noted of the mean AKT score from pretest to first posttest. The questions that were missed were reviewed and discussed with the patient. This may have an effect on allowing the patients to remember the correct answers on the AKT. Second post-AKT was administered three days after surgery. An

increase of 10.7% and 23.9% from the mean pre-AKT and first post-AKT respectively were noted. Thus, patients demonstrated knowledge retention on OSA and CPAP usage even after surgery.

Phase one has shown that the DCE on OSA is effective in increasing patient's knowledge on OSA and CPAP usage. It is imperative to investigate how the gain in knowledge among surgical patients with OSA affects CPAP compliance after surgery. In phase two, another set of 50 patients underwent surgery and received the DCE on OSA before and after surgery. These patients demonstrated increase CPAP hours per night usage. Also, there was an increase in CPAP usage during daytime naps among users. The educational intervention stresses the significance of using CPAP whenever they sleep. This includes daytime naps. Often times, patients did not believe it was necessary to use their CPAP when taking a nap during daytime. Also, some of the patients reported that they often do not put their CPAP back on after they use the bathroom at night. The discharge education stresses the importance of using their CPAP for at least six hours per night.[3] Again, reinforcement of teaching regarding importance of using CPAP was significant.[16] Also, the education started five to seven days before surgery. This allows the patients time for psychological preparedness. It also lessens fear and anxiety regarding the upcoming surgery.[1]

An increase in the number of patients using their CPAP every night was also noted. Stressing the importance of using CPAP and untoward negative effects for not using it may have caused patients to use their CPAP more before and after surgery.[3,4,28] Based on the evidence, even one night of missing CPAP usage may cause reoccurrence of more apneas and hypopneas and increased daytime sleepiness.[3,18] Reinforcement of

teaching by a perioperative nurse on the day of surgery may have provided benefits.[16] This allowed the patient to hear the key points of the education again. The OSA handout was also given to the patient on the day of surgery. When they go home after surgery, the handout served to help reinforce the importance of using their CPAP and knowing what to do if problems arise.[16]

Eleven of the patients with OSA had shorter length of hospitalization than what was expected. Most of these patients were discharged a day earlier than expected. Nagappa et al found that patients who use CPAP consistently before and after surgery had a shorter length of stay (LOS) in the hospital.[29] All of the eleven patients started using CPAP every night between 4.5 hours to 10 hours after receiving the DCE on OSA.

On the other hand, nine patients had longer LOS in the hospital (Table 2). Five patients were expected to be admitted. These patients stayed one day longer in the hospital for pain management, infection, and nutritional issues. These complications were unrelated to OSA. Another four patients were unexpectedly admitted overnight. Two of the four patients, who were unexpectedly admitted, were transferred to a monitored unit. These two patients were admitted for one-night observation due to oxygen desaturation and a history of OSA. This is not surprising. Respiratory and pulmonary problems are the greatest concerns postoperatively for surgical patients with OSA.[6,8] Interestingly, these two patients were not consistent in using their CPAP every night prior to surgery. The other two patients were admitted overnight for postoperative pain management which was not related to OSA.

Even though the DCE on OSA demonstrated an increase CPAP usage, three patients were not able to use their CPAP after surgery. Two patients underwent a nasal

surgery. Their surgeon advised them not to use their CPAP until the wounds were healed to prevent complications. Per one patient, the surgeon recommended not to use his CPAP for about a month. One of the three patients was unable to use his CPAP because the medical team was unaware that he uses CPAP at home. The patient stated that he was not placed on CPAP at night during a four-day inpatient admission. Since then, the patient had not been using his CPAP. However, he was re-educated and the use of CPAP was resumed. The patient was reminded to use his CPAP again and make an appointment with his primary care physician for follow up about his OSA. In addition, another three patients visited the ED after surgery. These patients experienced surgical complications such as low hemoglobin, hematuria, or a urinary catheter issue. Based on the literature, these complications are not associated with OSA complications.[5]

Daytime sleepiness scale was measured using the ESS, which is widely used in the clinical setting. Presurgical ESS was administered five to seven days before surgery. It was done via a phone call by the DNP student. On the day of surgery, a printed ESS questionnaire was given to the patient. Seven to 10 days after surgery, the patient was called on the phone and ESS was measured. Based on the findings, an increase in mean ESS was noted before, on the day of, and after surgery. Measuring ESS through phone call and printed questionnaire may have caused the discrepancy of ESS score between five to seven days before surgery and on the day of surgery. Postoperatively, most of the patients reported more daytime sleepiness despite using their CPAP more. Postoperative pain has always been an issue after surgery.[16] All patients that participated in the project were taking pain medications after surgery. In this project the increase in CPAP did not decrease the sleepiness scores. However, the modest non-clinically significant rise in

scores occurred when the postoperative patient can assume to be in pain and taking pain medications. Even though causality cannot be assumed, it is likely that the sleepiness score would have been higher if the patients had not increased CPAP use.

This project is limited by its small sample size and restricted time for reinforcing the discharge education on the day of surgery. We were not able to capture all surgical patients with OSA who use CPAP due to time constraints. Also, CPAP usage and daytime sleepiness scale were self-reported. It is possible that patients overestimate their CPAP use.[3] An objective measurement of CPAP compliance and daytime sleepiness scale will provide a better gauge on the impact of an educational intervention after surgery.[3] Most of the patients reported their CPAP usage with a range of hours. It was deemed necessary to calculate the average and use it for the patient's CPAP usage. Furthermore, CPAP adherence was measured seven to 10 days after surgery. It is uncertain if CPAP compliance will be sustained for long-term use. The reinforcement of teaching on the day of surgery was provided by three different perioperative nurses. Their level of expertise on OSA may vary and could have affected the outcome.

Cost Benefit Analysis

OSA is a chronic sleep-disordered breathing that requires lifelong management. Often, patients with OSA have comorbidities such as cardiovascular diseases, hyperlipidemia, depression, diabetes, and obesity. They utilize more medical resources, and have an increased medical disability compared to patients without OSA.[30–33] Also, they have more ED visits or urgent care, which often times lead to hospital admission.[1,34]

At the community health system's perioperative services, approximately 40-50 patients with OSA have surgery every month. At least 50% of these patients use CPAP at

home. Between January 2015 through February 2015, out of 105 patients with OSA, 9.5% of patients were unexpectedly admitted in a monitored-unit related to OSA. According to the assistant director of perioperative services, the cost of admission into a monitored-unit overnight is estimated to be $6,700 (E. Lee, personal communication, December 28, 2015). During the implementation phase, only 4% were unexpectedly admitted due to OSA. This EBP project demonstrated that 11 patients had shorter LOS in the hospital. Three patients were discharged home instead of being admitted. Unexpected inpatient admission occupies bed space and may result in bed shortage. In 2010, the average cost per hospital stay was $9,700.[34] Thus, it is important for patients with OSA to adhere to CPAP treatment, because it may potentially reduce and control health care utilization in this group.[5]

This educational program requires minimal resources and manpower. These resources include materials needed to create and print the handout such as the multiuse recycled paper, toner cartridge, and printer. These materials which cost approximately $480 are already being provided by the facility. There are no costs incurred for staffing since the process owners for this project are the staff registered nurses in the perioperative services. No additional staff are required. Providing discharge education to patients is included in the job description of perioperative nurses. It is expected to take an additional 15-20 minutes of the nurses' time to provide the DCE on OSA before surgery and upon discharge. On the other hand, most of the patients who were approached were satisfied and had positive feedback with the project's outcome. As a result, the short term and long term benefits of the DCE on OSA after surgery program outweighs the cost. The extent of the program is worth the investment of resources.

Implications for Clinical Practice and Sustainability

Providing education regarding their health condition is integral in patients with chronic disorder. Educating patients and frequent follow-up regarding the effects of OSA and benefits of CPAP therapy are important in improving treatment adherence and outcome. Verbal and written instructions are recommended in delivering the education.[16] The OSA handout was uploaded in the health system's discharge education directory. This allows accessibility of the OSA handout to the health care providers and nursing staff. It is also important to use the teach-back method to address patient's health literacy. Reinforcement of teaching has proven to be also effective in knowledge retention and treatment adherence.[7,22] Most patients in this project take pain medications after surgery which increases daytime sleepiness and risk for complications in patients with OSA.[10] It is imperative that health care providers educate these patients to use their CPAP before, and most especially, after surgery.

Conclusion

OSA is a common sleep-disordered breathing disorder that is prevalent in the surgical population. Patients diagnosed with OSA are at increased risk for perioperative complications. These complications increased patient's morbidity and mortality, thus increasing health care expenditure. Based on the literature, CPAP is evidently highly effective in treating OSA. However, CPAP adherence is poor. Not only does DCE on the use of CPAP increase patient's knowledge on OSA and CPAP, it has also demonstrated effectiveness in promoting CPAP adherence after surgery with a net reduction in postoperative complications due to OSA. Thus, DCE on CPAP use could be implemented in the surgical setting as part of routine clinical care for patients with OSA.

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