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A Positive Framed Message to Improve CPAP Compliance for Patients with OSA

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A POSITIVE FRAMED MESSAGE TO IMPROVE CPAP COMPLIANCE FOR PATIENTS WITH OSA

by

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DEDICATION

This project is dedicated to my family who served as the catalyst behind my conviction and fortitude for achieving my goals. They instilled a sense of tenacity in me that helped me believe that I could withstand adversity and still meet my objectives.

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ABSTRACT

A Positive Framed Message to Improve CPAP Compliance for Patients with OSA

Frances Clark, MSN, APRN, FNP-BC

Obstructive sleep apnea (OSA) affects 24% of the US population (DiNapoli, 2014). Untreated OSA causes many diseases, affects one's quality of life, and increases mortality (Pengo et al., 2018). Continuous positive airway pressure (CPAP) is the lifelong treatment for OSA; yet 30%-80% of OSA patients are CPAP noncompliant within one year. The purpose of this EBP project was to determine if implementing a positive frame message intervention would improve CPAP compliance for newly diagnosed OSA patients. Based on the evidence, implementation of behavioral interventions, such as a positive framed message, was effective in improving CPAP compliance (Pengo et al., 2018). The Iowa Model (Titler et al., 2001) was used as the framework to guide the project that was undertaken at a pulmonary and sleep clinic in Northwest Indiana. Nineteen (N = 19) newly diagnosed OSA participants were recruited for the EBP project using a rolling enrollment; each participant was followed over a 13-week period. The participants ranged in age from 31 to 76 years with the majority (52%) in the 50-60 age range. CPAP compliance data were recorded on a SD card located in the participants' CPAP devices. The compliance data were retrieved weekly and compared before and after initiating a positive framed message intervention at four-week, nine-week, and 13-week intervals. A one-way repeated-measures ANOVA was calculated comparing the CPAP compliance rates of the participants at the three different intervals. No statistically significant effect was found (F (2, 36) = .984, p > .05). Although the results of the ANOVA were not statistically significant, mean CPAP compliance scores increased from the four-week pre-intervention score (M = 69.65*, SD* = *25.76*) to the nine-week post-intervention score (M = 71.*22, SD* 25.89). Once the participants no longer received phone calls, the 13-week mean CPAP compliance scores decreased (M =

66.62, *SD* 26.92). Further projects investigating message framing to improve CPAP compliance are warranted.

CHAPTER 1

INTRODUCTION

Background

Obstructive sleep Apnea (OSA) is a highly prevalent sleep disorder, affecting about 24% percent of the United States (U.S.) population (DiNapoli, 2014). OSA is growing exponentially each year (DiNapoli, 2014). OSA is characterized by recurrent episodes of obstructive airway closures during sleep (DiNapoli, 2014). These episodes are associated with periods of apneas, oxygen desaturations, hypercapnia, fragmented sleep (DiNapoli, 2014), increased sympathetic activity, systemic inflammation, and oxidative stress (Pengo et al. 2018). Untreated OSA has been shown to cause cerebrovascular, cardiovascular, and metabolic diseases (DiNapoli, 2014; Pengo et al., 2018). Additionally, OSA can cause daytime sleepiness, mood alterations, impaired cognition, and impaired functional capacity (DiNapoli, 2014). These symptoms can affect one's quality of life and increase health-care costs (DiNapoli, 2014; Pengo et al., 2018). More importantly, severe OSA can increase mortality, especially in younger adults (Lo Bue et al., 2014).

A polysomnography is the best diagnostic test used to confirm OSA. An apnea-hypopnea index (AHI) of greater than five events per hour is indicative of OSA (Chaiard & Tungpunkom, 2018). According to Chaiard and Tungpunkom (2018), OSA is classified as mild (AHI of 5 to 14), moderate (AHI 15 to 30), and severe (AHI greater than 30). Continuous Positive Airway Pressure (CPAP) is the "gold standard" life-long treatment for patients with OSA (DiNapoli, 2014, p. 62; Pengo et al., 2018). The core principle of CPAP is to apply positive pressure via the nose, mouth, or both, in order to overcome the collapse of the airway (Chaiard & Tungpunkom, 2018). The use of CPAP stabilizes the airway, suppresses snoring, reduces arousal index, and increases mean oxygen saturation during sleep (Chaiard & Tungpunkom, 2018).

Data from the Literature Supporting Need for the Project

Despite the widespread recommendation of CPAP for patients with OSA, CPAP compliance is inadequate. Noncompliance leads to poor health outcomes for patients with OSA (DiNapoli, 2014). Additionally, untreated OSA affects the overall health care system (DiNapoli, 2014). According to DiNapoli (2014), the costs associated with untreated OSA in the U.S. is approximately 3.4 billion dollars per year. These astronomical costs are associated with more frequent provider visits, increased hospitalizations, and the development of comorbid conditions (DiNapoli, 2014). Research has shown that treating OSA will decrease health care system costs as it reduces the follow up care costs required for the comorbidities associated with untreated OSA (DiNapoli, 2014). Thus, improvement in CPAP compliance is crucial.

Medicare defines CPAP compliance as four hours of daily CPAP usage by patients, at least 70% of the time (DiNapoli, 2014). Research shows that 30%-50% of patients diagnosed with OSA nationwide are noncompliant with CPAP immediately after diagnosis, and 80% of OSA patients are noncompliant within a year (DiNapoli, 2014). More importantly, many adult patients with OSA completely abandoned their CPAP use within one year after initiation (Chaiard & Tungpunkom, 2018). Improvement in CPAP compliance can positively affect patients, their families, and the health care system. Thus, it is imperative to implement strategies to improve CPAP compliance for patients with OSA (Pengo et al., 2018).

Data from the Clinical Agency Supporting Need for the Project

The EBP project site is a privately owned Pulmonary and Sleep clinic that is in Northwest Indiana. The stakeholders at the project site are committed to providing the best possible care for patients with pulmonary diseases and OSA. From January 1, 2019 to June 1, 2019, the average monthly percentage of CPAP noncompliance for adult patients diagnosed with OSA at the site was approximately 43%. The EBP project site’s noncompliance percentage was consistent with the national average.

From January to June 2019, the project site performed a total of 156 sleep studies for new patients with OSA. Thousands of dollars were billed to the insurance companies for the costs of the sleep studies. Additionally, the insurance companies billed thousands of dollars for the costs of the CPAP machines and for the other supplies necessary to use with the CPAP devices. If the EBP project site's noncompliance statistics remained steadfast, an additional 47 of the 156 new patients became noncompliant with their CPAP usage. More importantly, consistent with the statistics, 80% of the site's patients with OSA may abandon their CPAP completely after one year. Thus, without intervention, the overall health care costs for the EBP project site may have continued to rise. The rising costs were attributed to the patients' noncompliance, abandonment of their CPAP and their development of comorbidities.

Purpose of the Evidence-Based Practice Project

The purpose of this EBP project was to implement a positive framed message protocol to improve CPAP compliance for the adult patients with OSA at the project site. The new positive framed message protocol was incorporated into the EBP site's existing protocol. All stakeholders involved with the sleep clinic were included in the implementation and evaluation of the new positive framed message protocol.

PICOT Question

Specifically, this project addressed the following PICOT question: In newly diagnosed adult patients with obstructive sleep apnea (P) will initiating a positive framed message protocol (I) compared to the standard office protocol (C) improve CPAP compliance (O) over a thirteen-week period? (T)

Significance of the EBP Project

In 2014, statistics showed that 24% of the U.S. population is affected by OSA, and this number is continually growing at an alarming rate (DiNapoli, 2014). OSA is associated with a high level of co-morbidities and an increased risk of accidents (DiNapoli, 2014). More importantly, OSA is associated with a significantly increased mortality risk (Lo Bue et al., 2014;

Pan, Xie, Liu, Ren & Guo, 2016). The precise reasons behind the association between OSA and future risks of all-cause mortality remain unclear (Pan et al., 2016). However, OSA mortality may be related to the effects of sleep fragmentation, intermittent hypoxia, alterations in sympathetic activity, and other pathophysiological characteristics (Pan et al., 2016).

Estimates of healthcare costs for patients with OSA are approximately double those costs of patients without OSA (DiNapoli, 2014). The costs associated with untreated OSA in the U.S. is approximately 3.4 billion dollars per year (DiNapoli, 2014). The increased costs of care are related to the severity of the disease (DiNapoli, 2014).

CPAP remains the best available treatment for OSA (DiNapoli, 2014; Pengo, 2018). Symptoms of OSA such as excessive daytime sleepiness, mood changes, and impairments in attention, concentration, and memory are proportionally correlated with the duration of use of CPAP (Sedkaoui et al., 2015). CPAP compliance improves the symptoms, comorbidities, and mortality associated with OSA (Pengo, 2018). According to Sedkaoui et al. (2015), patients with OSA who minimally use their CPAP (< 1 hour/day) experience more symptoms and have a significantly lower survival rate compared to those patients who have greater CPAP compliance (>6 hours/day).

For patients with OSA, compliance with CPAP appears to be an important factor in improving symptoms and outcomes (Sedkaoui et al, 2015). CPAP noncompliance is a significant barrier to the treatment of OSA. The purpose of this EBP project was to help improve CPAP compliance for the patients at the project site, which may improve their outcomes associated with OSA. The EBP project implemented a positive framed message protocol to help improve CPAP compliance in newly diagnosed OSA adult patients.

CHAPTER 2

EBP MODEL AND REVIEW OF LITERATURE

Evidence-based Practice Model

Overview of EBP Model

The Iowa model of evidence-based practice to promote quality care (Iowa model) was used as the framework to guide the development of this evidence-based practice (EBP) project. The Iowa model was developed to serve as a guide to help the practitioner implement evidence that affects patient outcomes into practice (Titler et al, 2001). In 1994, the original Iowa model was developed by the University of Iowa Hospitals and Clinics and was named The Iowa Model of Research-based Practice to Promote Quality Care. The original Iowa model was used to guide the implementation of research into practice (Titler et al., 2001). Changes in the healthcare environment, new terminology, and the emergence of evidence-based practice prompted the revision of the Iowa model (Titler et al., 2001). The revised Iowa model encourages APRNs to focus on knowledge and problem-focused triggers that lead the APRN to question current practice standards to improve patient care and outcomes (Titler et al., 2001).

The steps identified in the Iowa model are: (a) identifying and selecting a trigger, (b) forming a team, (c) retrieving evidence, (d) grading and synthesizing the evidence, (e) developing an evidence-base standard or intervention, (f) implementing the evidence-based intervention for practice change, and (g) evaluating the practice change (Titler et al., 2001, p.498). These steps provided a guide for developing and implementing the EBP project. Also, they highlighted the importance of considering the entire healthcare system through research to guide practice decisions (Titler et al., 2001). Additionally, use of the Iowa model may improve the quality of patient care and help control health care costs (Titler et al., 2001). More importantly, the Iowa Model can be used effectively to implement a practice change at the EBP project site (Titler et al., 2001).

Application of EBP Model to DNP Project

A problem-focused trigger was identified at the EBP site. Forty-three percent of adults with newly diagnosed OSA at the project site were noncompliant with their CPAP. This percentage is consistent with the national average of 30-50% CPAP noncompliance. Therefore, CPAP noncompliance was identified as a high priority problem. This problem-focused trigger provided the impetus for change of the current practice standards at the project site.

Once there was commitment to address the problem and adopt a change, a team consisting of the advanced practice registered nurse (APRN) project facilitator, the physician director of the sleep clinic, the facility advisor, the sleep lab coordinator, a respiratory therapist, the durable medical goods coordinator, and two medical assistants was formed. Under the direction of the APRN project facilitator, the team helped with the development, implementation, and evaluation of the project. Because they were also stakeholders in the process of changing the clinical practice, the remainder of the clinic's staff served as support staff and were included in the change process.

Evidence was retrieved by the APRN project facilitator through electronic databases and hand searching. Once the evidence was collected, the APRN project facilitator critiqued, graded, and synthesized the evidence. The APRN project facilitator considered the effectiveness, appropriateness, and feasibility of the evidence to support a successful practice change. The APRN project facilitator discussed the evidence and interventions with the stakeholders prior to determining whether a specific intervention can and should be implemented.

Once the stakeholders agreed that a specific intervention was appropriate, feasible, patient-centered, and cost effective for the practice, the intervention was developed and implemented at the clinical site. To determine the effectiveness of the intervention, data were collected and analyzed over a thirteen-week period. The evaluation process highlighted the intervention's impact on CPAP compliance and control for the newly diagnosed adult patients

with OSA at the clinical site. The evaluation determined if the change should be permanently implemented at the practice site.

Strengths and Limitations of EBP Model for DNP Project

The Iowa model was selected as the framework for the EBP project because it has been utilized effectively in numerous healthcare settings (Titler et al., 2001). One of the major strengths of the model is its simplicity. The Iowa model provided the APRN project facilitator with a step-by-step guide on how to take a problem trigger and match it with an intervention based on research and evidence to make a change to a standard practice. The Iowa mode can help APRNs translate evidence into clinical practice while improving patient outcomes.

The most significant limitation of the Iowa model for the EBP project is that the steps in the Iowa model made it difficult to incorporate representation by the target population (the newly diagnosed patients with OSA). This limitation may have affected the success of the EBP project.

Literature Search

Sources Examined for Relevant Evidence

A comprehensive literature search for interventions designed to increase CPAP compliance was conducted in multiple databases including Joanna Briggs Institute (JBI), the Cochrane library, CINAHL, MEDLINE with Full text, Google Scholar, and PsycINFO. The final keywords used in the literature search were: “obstructive sleep apnea” OR “sleep apnoea” OR OSA, AND “continuous positive airway pressure” OR CPAP, AND compliance OR adhere*. In addition to the database searches, a thorough hand search of the reference pages from selected articles for the EBP project was completed.

The limiters for the literature search were January 2013 to June 2019, the English language, humans, adults, and scholarly peer-reviewed journal articles. The completed database literature search yielded a modest number of pieces of evidence. Therefore, a hand search was completed using limiters January 2011 to June 2018, English language, and adults.

The inclusion criteria encompassed the previous limiters and included strategies that improved CPAP compliance in newly diagnosed (by polysomnography) adult patients with OSA. The exclusion criteria included studies which (a) focused on central apneas, (b) used a diagnostic test other than polysomnography to diagnose OSA, (c) concentrated on surgical, pharmacological, or dental procedures, (d) focused on anatomy, (e) centered on BIPAP equipment, or (f) focused on the use of different types of masks or humidification used in the treatment of OSA.

The evidence from the database searches revealed that behavioral interventions are the best type of strategy for implementation to improve CPAP noncompliance. Positive message framing is identified as a behavioral intervention. Also, it was considered a feasible and sustainable intervention to implement at the EBP project site. However, there were only two studies found that used positive message framing as an intervention to improve CPAP noncompliance. Because few articles were found on the implementation of positive message framing for improving CPAP compliance, a hand search was completed. The hand search identified evidence where positive message framing was used to improve a preventive behavior in older adults. If the evidence on positive message framing met the inclusion criteria it was kept for use in the EBP project.

Within the literature search, the JBI database resulted in four pieces of evidence. However, all four pieces of evidence were excluded. The first piece of evidence was excluded because it was a systematic review protocol which described the rationale, hypothesis, and planned methods for conducting a review. The other three pieces of evidence were excluded because they were not relevant to the EBP project's intervention. The first piece of evidence focused on oral appliances to improve CPAP compliance. The second piece of evidence focused on surgical procedures to improve OSA. The last piece of evidence focused on different types of positive airway pressure.

The Cochrane library resulted in four pieces of evidence. One piece of evidence was excluded because it focused on educational interventions to improve CPAP adherence. One piece of evidence was excluded because it focused on positional therapy to improve compliance. The third piece of evidence was excluded because it focused on the delivery and modification of air pressure. The last piece of evidence met inclusion criteria and was kept for the EBP project.

The CINAHL database resulted in 260 articles. Five articles were duplications. Two hundred and fifty pieces of evidence were excluded for not meeting the inclusion criteria. The focus for these studies were on educational and supportive interventions, use of oral appliances, Bilevel Positive Airway Pressure (BIPAP) for OSA treatment, use of hypoglossal nerve stimulation, and pharmacological or surgical management to improve CPAP compliance. The other studies focused on the association of OSA with other disease processes. The remaining five randomized control trials (RCTs) were thoroughly examined, but after full article review, they were excluded for not meeting the inclusion criteria.

Medline with Full text yielded 399 results. Three hundred seventy-nine pieces of evidence were excluded for not meeting inclusion criteria; eight pieces of evidence were duplications, and 12 were kept for a thorough review. After reviewing the 12 articles thoroughly, only four pieces of evidence were accepted for the EBP project. The first piece of evidence was an RCT that successfully used positive message framing to improve CPAP compliance in older adults. The second article piece of evidence was an integrative review which reviewed CPAP adherence over a twenty-year period. The third piece of evidence was an expert opinion by the American Academy of Sleep Medicine that focused on clinical practice guidelines for OSA. The last article was an RCT which focused on how gained framed messages were more effective than loss framed messages in inducing preventative behavioral changes in older adult people with diabetes. The other eight pieces were excluded for not meeting inclusion criteria.

Google Scholar produced 30 pieces of evidence; two of them were duplications, and the other 28 did not meet inclusion criteria because they focused on nonbehavioral interventions. PsycINFO database produced 17 pieces of evidence, but only one article met inclusion criteria. It was a meta-analysis that centered around how message framing affected behavior, attitudes, and intentions. The other articles focused on nonbehavioral interventions and alternative interventions to improve CPAP compliance. The hand search yielded three pieces of evidence on using message framing to change behavior. All three articles were included in the EBP project.

Thus, the total literature search yielded 717 results, but 15 pieces of evidence were duplications. Seventy-five abstracts were reviewed, and 33 articles were chosen and thoroughly examined for relevancy to the EBP project. Following the review of the database articles, and including the three hand search articles, nine pieces of evidence were selected for inclusion in this EBP project. The evidence for the EBP project was selected if (a) a behavioral strategy was implemented to improve CPAP compliance, (b) a positive framed message was implemented to improve CPAP compliance, or (c) a message framing was used to promote a behavioral change related to preventative health outcomes. Table 2.1 contains a summary of the databases and pieces of evidence produced and used for the EBP project.

Levels of Evidence

The Melynk and Fineout-Overholt (2015) rating system was used to rate the nine pieces of evidence selected for inclusion in the EBP project. Melynk and Finehout-Overholt's evidence rating system is used to categorize literature in six evidence levels: (Level I) systematic reviews, (Level II) randomized controlled trials (RCT), (Level III) controlled cohort studies, (Level IV) uncontrolled cohort studies, (Level V) case studies, case series, qualitative and descriptive studies, EBP implementation and QI projects, and (level VI) expert opinion. This rating system methodology ranks evidence in a hierarchy which is based upon the strength of evidence that is presented in the article (Melnyk & Fineout-Overholt, 2015). The hierarchy of evidence provided

guidance about the different types of literature, as it rated the evidence from the strongest to least biased (Melnyk & Fineout-Overholt, 2015). Using Melnyk and Finehout-Overholt's (2015) rating system for this EBP project, two pieces of evidence were rated as Level I, five pieces of evidence were rated as Level II, one piece of evidence was rated as Level III, and the final piece of evidence for the project was rated as a Level VI.

Appraisal of Relevant Evidence

The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) research evidence appraisal instrument was used to grade the quality of the evidence selected for the EBP project. The JHNEBP instrument rated the evidence as Grade A (high), Grade B (good), or Grade C (low/poor) quality evidence (Dang & Dearholt, 2018). In the JHNEB, Grade A evidence had adequate conclusions, sufficient controls, and consistent recommendations that are based on a comprehensive literature review and scientific evidence (Dang & Dearholt, 2018). Grade B quality had a satisfactory sample size, but only has some control, some consistent results, and reasonable recommendations (Dang & Dearholt, 2018). Grade C was low quality with major flaws that are reflected by little evidence, small sample size, and are absent of solid conclusions (Dang & Dearholt, 2018).

Level I evidence.

Gallagher and Updegraff (2011) conducted a meta-analysis review. It was the first review ever conducted that focused on what influence gain- and loss-framed messages had on a person's health behavior. Ninety-four peer-reviewed studies comparing gain- and loss-framed messages instead of behavior as an outcome were examined (Gallagher & Updegraff, 2011). The framed messages used in the studies for analysis were representative of health promotion information, and the measures of persuasion were reflective of attitudes, intentions, or behaviors (self-reported or objective) (Gallagher & Updegraff, 2011).

Every study was coded for certain characteristics: (a) the function of the health behavior (prevention or detection), (b) the domain of the advocated health behavior (breast cancer, skin

cancer, physical activity, and others), (c) sample size of the combined gain-and loss framed message groups, (d) the effect size of the gain- versus loss-framed message comparison on outcomes, (e) the timeframe of the outcome, the average age of the population, and (d) the type of message (print, audio, or video) (Gallagher & Updegraff, 2011, p.103). Gallagher and Updegraff (2011) observed no significant moderating effect of framing on the persuasiveness of health messages when persuasiveness was assessed as either attitudes towards the behavior ($Q(1) = 1.209$, $p = 0.272$), or intentions to perform the behavior ($Q(1) = 1.588$, $p = 0.208$). However, Gallagher and Updegraff found that gain-framed messages were more likely to encourage prevention behaviors ($r = 0.083$, $p = 0.002$). In the meta-analysis, Gallagher and Updegraff observed significant results when gain-framed messages were used for skin cancer prevention, smoking cessation, and physical activity. The meta-analysis supported the hypothesis that gain-framed messages appear to be more effective than loss-framed messages in promoting prevention behavior. The findings from the meta-analytic review provided evidence that how a health message is framed is important and that message framing may be a beneficial intervention for changing other health behaviors (Gallagher & Updegraff, 2011). Thus, implementing a positive framed message to improve CPAP compliance for adult patients with newly diagnosed OSA may be beneficial.

Wozniak, Lasserson and Smith (2014) conducted a systematic review (SR) with meta-analysis to examine what effect educational, supportive, and behavioral interventions had on CPAP usage. Thirty studies consisting of 2,047 participants were included in the SR, and they were categorized by the prevailing intervention type, educational, supportive, or behavioral (Wozniak et al., 2014). The studies included in the SR were randomized, single-blinded, or unblinded parallel-group studies of low- to moderate quality evidence. The duration of the studies included in the SR ranged from four weeks to 12 months.

According to Wozniak et al. (2014), all three interventions demonstrated an increased CPAP use for naïve participants with moderate to severe OSA. Wozniak et al. found that

behavioral interventions demonstrated a substantial improvement in CPAP usage, an increase of 1.44 hours per night (95% CI, 0.43 to 2.45, N = 584, six studies), compared to supportive interventions which had an increase CPAP use of 50 minutes per night (0.82 hours, 95% CI, 0.36 to 1.27, N = 803, 13 studies) and educational interventions which had an increase CPAP usage of 35 minutes per night (0.60 hours, 95% CI, 0.27 to 93, N = 508, seven studies). Wozniak et al. concluded that educational, supportive, and behavioral interventions may help improve CPAP usage for naïve adults with OSA. However, the greatest improvement in CPAP usage resulted from the implementation of behavioral interventions (Wozniak et al., 2014). Positive message framing is a behavioral intervention, and, if implemented to improve CPAP compliance for adults with newly diagnosed OSA, it may prove to be beneficial.

Level II evidence.

Five pieces of Level II evidence: three individual randomized control trials (RCTs), one piece of evidence consisting of two RCTs, and one evidence summary, were included in this EBP project. Grady, Entin, Entin and Brunye (2011) examined how gain- or loss framed video messages effected changes in health-related knowledge, attitudes, and behavior in persons with diabetes. The sample consisted of 155 elderly participants who were randomized to two equally sized groups which received either a gain-framed or a loss-framed diabetic foot care video to watch. Grady et al. hypothesized that the gain framing video message would have a greater effect on producing positive behavioral changes in diabetic foot care at three-months and six-months post intervention intervals compared with using a loss framing video message. Grady et al. demonstrated that the three-month and six-month post intervention behavior scores for the diabetic participants were significantly higher in the gain-framed group compared to the loss-framed group. Additionally, the results of the three-month behavioral scores for participants were higher than their initial scores, $F(1,154) = 118.01$, $p < .01$, and the six-month behavioral score for participants was higher than the three-month behavioral score $F(1,152) = 4.75$, $p < .04$. As hypothesized, presenting a message using gain framing produced higher behavioral

scores than loss framing messages over long-term follow-up (Grady et al., 2011). The authors concluded that their study adds to the evidence base for the implementation of message framing strategies to improve health behaviors, and supports the belief that the way messages are framed can impact outcomes as much as the content of the message itself (Grady et al., 2011).

Notthoff and Carstensen (2014) used two different studies in their article to examine whether using message framing influenced walking in older adults. In study one, Notthoff and Carstensen examined if emphasizing the positive consequences of walking versus the negative consequences, or neutral consequences, had any impact on walking as (measured by pedometer counted steps) for both older adults and younger adults over a one-week period. The participants in a one-to one session were given either a positive, negative, or neutral script about walking. The group that received the neural scripts were considered the control group. Notthoff and Carstensen found that regardless of the message received, younger participants walked a comparable number of steps. However, Notthoff and Carstensen found that older adults walked significantly more when they received positive framed messages about walking compared to negative framed messages, t (58) = 2.29, p = .03. Yet, the difference between the positive framed message and the neutral framed message t (58) = 1.16, or the negative framed message and the neutral framed message, t (58) = - 1.20, was not statistically significant, but an increase in steps was found between the groups, with the positive message group having more steps (Notthoff & Carstensen, 2014).

In study two, Notthoff and Carstensen (2014), examined how framed messages effected within-person change in walking in older adults over 28 days. Once again, Notthoff and Carstensen found that positive framed messages were more effective at promoting walking in older adults compared to negative framed messages over the 28-day period (M_{positive} = 6,883.41, SD = 435.07, M_{negative} = 5,705.69, SE = 378.37, t (56) = -2.08, p = .04). Notthoff and Carstensen (2014) second study supported and extended the findings from their first study that

positively framed messages are more effective than negatively framed messages in promoting walking among older adults. The authors concluded that positively framed messages are more effective than negatively framed messages in promoting walking in older adults and the results may endure over time (Notthoff & Carstensen, 2014). Considering these findings, it is reasonable to assume that positive framing messages may be more influential in targeting the behaviors of people who are noncompliant with the CPAP usage.

Pengo et al. (2018) examined the effect that positive framed messages, negative framed messages, or standard care, had on short-term CPAP usage at two- and six-week intervals following CPAP initiation. One hundred and twelve participants were randomized into one of three groups, the positive message group, negative messages group, or the control group (Pengo et al. 2018). The participants in the positive and negative message groups received standardized messages at the initial teaching session and weekly telephone calls (up to a total of six phone calls per participant) (Pengo et al., 2018). The positive framing message group demonstrated greater CPAP use after two weeks (total use 53.7 $\pm$ 31.4 hours) compared to the negative framed message group and the control group (35.6 $\pm$ 27.4 and 40.8 $\pm$ 33.5 hours, $p < 0.05$) (Pengo et al., 2018). However, after six-weeks of CPAP treatment, compliance data demonstrated no differences between groups (Pengo et al., 2018). Pengo et al. recommend that further research supporting the use of behavioral interventions, specifically in the form of positive message framing, is required in patients with OSA on CPAP.

The integrative review by Rotenberg, Murariu and Pang (2016) consisted of 82 pieces of evidence (RCTs) that examined trends in CPAP adherence over twenty years. The evidence analyzed in the Rotenberg et al. integrative review focused on evidence that examined changes made to the CPAP machines and mask, and behavioral interventions that were used to improve CPAP adherence. Although Rotenberg et al. found no significant improvement to CPAP adherence over the 20-year period, behavioral interventions improved CPAP adherence rates by approximately one hour per night on average which can be significant for some people on

CPAP. The mean duration of nightly CPAP use in the review was 4.7 hours, which by Medicare standards is indicative of CPAP compliance.

The last Level II piece of evidence included in the EBP project was an RCT by Trupp, Corwin, and Ahijevych (2011). The authors assessed the effectiveness of a behavioral intervention using positive and negative framing messages compared with standard care on improving CPAP use over a 30-day period in patients with a history of cardiovascular disease (CVD). According to Trupp et al. (2011), the negative message group showed an increase CPAP adherence (63.14%) compared to the positive message group (42.15%), t (52) = -2.19, p = .033, over the 30-day period. Trupp et al. suggested that the CVD patients may have responded better to the negative framed message to avoid additional losses in their health. Trupp et al. concluded that message framing influences decisions and behaviors and that further studies investigating message framing on CPAP adherence with other people with and without CVD are warranted. Consistent with other findings, positive framed messages are more effective in encouraging health-promotion behaviors such as diabetic foot care and walking in older adults (Gallagher and Updegraff, 2011; Grady et al., 2011, and Notthoff & Carstensen, 2014).

Level III evidence.

Mikels et al. (2016) used a quasi-experimental design to assess age differences in affective response to gain and loss framed health messages. The subjective and physiological affective responses of younger and older adults to framed messages about exercise was assessed over a two-hour period. Sixty-two participants (31 younger and 31 older adults) were enrolled in the study. They were given a framed message (gain or loss) and message outcome (desirable or undesirable) was measured for both groups (young and old). Mikels et al. found that older adults responded more positively to the messages compared to younger adults (p = .001), and that older adults responded more positively to gain-framed messages than to loss-framed messages (p = <.001). Thus, considering the subject and physiologic responses to

positive framed messages for older adults, positive framed messages of older adults with OSA may be beneficial to improve CPAP compliance.

Level VI evidence.

Although the last piece of evidence is considered a low- level piece of evidence, it was included in the EBP project because it is a clinical practice guideline developed by the American Academy of Sleep Medicine (AASM). The AASM has made recommendations for the treatment of adults with OSA. It is a commissioned task force of experts in sleep medicine (Patil et al., 2019). According to Patil et al. (2019), the task force developed recommendations based on the quality of evidence and the clinically significant benefits and harms. The number eight recommendation made by the AASM (Patil et al., 2019) stated that behavioral interventions for people using positive airway pressure (PAP) should be utilized during the initial period of treatment for adults with OSA. This recommendation was a conditional recommendation for patients with OSA who are noncompliant with their CPAP use. See Appendix A for the complete evidence summary for this EBP project.

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

Evidence used in the appraised literature provided support for implementing positive message framing to promote health behavioral changes for older adults (Gallagher & Updegraff, 2011; Grady et al., 2011; Mikels et al., 2016; Notthoff & Carstensen, 2014; Pengo et al., 2018). Mikels et al. (2016) suggested that although health message framing matters, it depends on the age of the person receiving the message. Positive message framing was used to achieve behavioral changes (improved foot care) in older diabetic patients (Grady et al., 2018), improve exercise (walking) in older patients (Notthoff & Carstensen, 2014), and improve CPAP compliance in adults with OSA (Pengo et al.,2018). Also, Gallagher and Updegraff (2011) found that gain-framed messages appeared to be more effective than loss-framed messages in

promoting prevention behaviors such as skin cancer prevention, smoking cessation, and physical activity.

Despite improvements in CPAP devices and masks, trends in CPAP adherence over a 20-year data collection period have not been encouraging (Rotenberg et al., 2016). Although trends in CPAP compliance have not been encouraging, Rotenberg et al. (2016) concluded that behavioral interventions improved CPAP adherence by almost an hour. Wozniak et al. (2014) found that behavioral interventions increased CPAP usage by almost one and a half hours per night. Increases in CPAP compliance can positively impact the health outcomes of a person with OSA (Pengo et al., 2018). Additionally, recommendations were made by the AASM that behavioral interventions should be used during the initiation period of CPAP (Patil et al., 2019).

Even though Trupp, Corwin Ahijevych and Nygren (2011) concluded that in their study negative framed messages improved CPAP compliance in patients with CVD. Trupp et al. supported the idea that the way information is presented directly influences the decisions made by patients. Also, they admitted that there is an absence of literature that examines the influence that message framing has on CPAP adherence. Furthermore, Trupp et al. concluded that message framing is a technique used to motivate individuals to comply with health recommendations. Positive message framing has been found effective in other studies to successfully motive behavioral changes (Gallagher & Updegraff, 2011; Grady et al., 2011; Mikels et al., 2016; Notthoff & Carstensen, 2014; Pengo et al., 2018). More importantly, untreated OSA has been shown to cause cerebrovascular, cardiovascular, and metabolic diseases and impaired cognition (Pengo et al., 2018). Thus, it is imperative that there are continued efforts to examine strategies to improve CPAP adherence. The choice of interventions that best matches the patient population needs, the one that is the most feasible, and most cost-effective, would be the most successful (Wozniak, et al., 2014). Health messages can be framed to highlight benefits or consequences (Gallagher & Updegraff, 2011), and are easy to implement (Grady et al., 2011), and are cost-effective (Pengo et al., 2018).

Best Practice Model Recommendation

Several interventions were examined by the literature review. The evidence available supported implementing behavioral interventions to improve CPAP compliance (Patil et al., 2019; Rotenberg et al., 2016; Wozniak et al., 2014). Message framing has been reported to be an effective behavioral intervention used for promoting desired behaviors in health promotion and prevention (Pengo et al.,2018; Trupp et al., 2011). The effectiveness of using messages for motivating change may depend on how the message is presented more than the actual content (Grady et al., 2011). Gain framed (positive) messages appeared to be more effective than loss-framed (negative) messages in promoting prevention behaviors (Gallagher & Updegraff, 2011) such as improving CPAP compliance. Additionally, the AASM endorsed the use of behavioral interventions to improve CPAP adherence. The literature review helped answer the following question for the EBP project's clinical problem: what would be the most feasible, sustainable, and cost-effective strategy to implement to improve CPAP compliance in this practice setting? The most appropriate intervention that was recommended to address this EBP project was implementing a positive framing message protocol to improve CPAP usage for adults with newly diagnosed OSA at the EBP project site.

Table 2.1

Evidence Search Table

Database Searched	Articles Found	Duplicate Articles	Articles Used for the Project
JBI	4	0	0
Cochrane	4	0	1
CINHAL	260	5	0
Medline with Full Text	399	8	4
PsycINFO	17	0	1
Google Search	30	2	0
Hand Search	3	0	3

Note. Databases are listed in the order they were searched.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

The primary focus of this EBP project and the proposed practice change at the project site was to improve CPAP compliance for adult patients newly diagnosed with OSA. The objective for implementing this behavioral intervention was to incorporate a feasible, sustainable, and cost-effective practice change to improve CPAP compliance for the OSA patients. If successful, this project would improve CPAP compliance, and it would improve the health outcomes for the OSA patients at site. This practice change would be incorporated into an existing protocol at the EBP project setting.

Participants and Setting

The EBP project was implemented at a 30-year established private pulmonary and sleep practice in Merrillville, Indiana. From January 1, to June 1, 2019, patient demographics and CPAP compliance data were obtained at the EBP project site. The site's CPAP compliance data and demographics were collected with the assistance from the site's sleep coordinator and head biller. The APRN project facilitator, a 21-year veteran Nurse Practitioner (NP), reviewed the compliance data and patient demographics. In response to difficulties patients have in maintaining long-term CPAP compliance, as demonstrated by the site's data, permission to implement this project was granted from the site facilitator, the physicians within the practice, and Valparaiso University.

Implementation of the EBP project was based on the identification of a problem-focused trigger, CPAP noncompliance. The Iowa model helped: (a) guide the development of the project, (b) select the team needed to complete the project, (c) develop and implement the project, (d) and guide the evaluation process. Additionally, meetings with the site facilitator, the physicians, and other stakeholders at the site, helped advance the EBP project. This evidence-based project was implemented in September 2019, and data collection was completed in

January 2020. The patient inclusion criteria included: (a) adult patients, 18 years and older with newly diagnosed OSA (by polysomnography); (b) patients initiated on CPAP therapy, and (c) patients who were being followed at the EBP project site. Exclusion criteria included: (a) patients with mental or physical disabilities (b) patients who have failed CPAP titration, or (c) patients who have refused to have a titration study completed. See Appendix B for a full description of the inclusion and exclusion criteria.

Pre-Intervention Group Characteristics

Although this project included adults 18 years and older, this EBP project focused on patients in the range of 30-69 years of age. This specific age group was most representative of the OSA patients seen at the project site; 86% of patients with OSA at the site fell within this age range. Fifty-one percent of them were males, and 49% were females.

From January 1, 2019 to June 1, 2019, the EBP site's monthly noncompliance rate for established OSA patients on CPAP was approximately 43%. However, during this same time frame, 156 new patients who completed sleep studies at the EBP site were diagnosed with OSA and were started on CPAP. If the project site's CPAP noncompliance percentage remained steadfast, it was predicted that another 67 patients started on CPAP at the site would also become noncompliant. These additional noncompliant patients would be added to the existing number of noncompliant CPAP patients identified at the EBP project site. National statistics show that up to 80% of these patients may abandon the use of their CPAP entirely within the first year. Thus, implementing an intervention to improve CPAP compliance was vital for the EBP practice site.

Intervention

Prior to implementation of the EBP project, several documents were developed to provide a solid foundation for the success of the EBP project. The APRN project facilitator created, laminated, and distributed to each stakeholder the positive framed message that was used as the intervention implemented for the EBP project. She developed the inclusion and

exclusion criteria for patients included in the project. The APRN project facilitator used this criterion to determine what patients were enrolled in the project. The APRN project facilitator developed a CPAP follow-up protocol policy to clarify the steps of the EBP project for the stakeholders at the EBP site. Also, the APRN project facilitator developed a CPAP follow-up documentation sheet to record the weekly telephone calls that were made to the patients, the noncompliance data, and the patients' apnea-hypopnea index scores (AHIs). To house the patients' follow-up CPAP documentation sheets and compliance reports, individual patient folders were made for newly diagnosed OSA patients that were included in the EBP project. The patient folders were kept in a secure file folder container which was kept in a secure office within the project site. The: (a) inclusion/exclusion criteria, (b) protocol policy, (c) CPAP follow-up documentation sheet, and (d) the positive framed message, are described in Appendices B, C, D, and E respectively.

After the pre-intervention documents were developed, the APRN project site facilitator identified the newly diagnosed OSA patients who had completed a titration study at the project site. The titration study was obtained to determine the amount of pressure that was necessary for the patients to keep their airways open. After the titration study, the patients met with the respiratory therapist. She instructed the patients on the use of their CPAP machine and supplies; and she explained the definition of CPAP compliance according to Medicare guidelines and its importance. Medicare defines compliance as using the CPAP device at least four hours per night for 70% of the nights (Chaiard & Tungpunkom, 2018). The respiratory therapist answered any questions that the patients may have had, and she instructed the patients on whom they should call if any problems arise. Once the respiratory therapist educated the patients, they were sent home with a CPAP device and supplies.

After the patients received their CPAP devices and supplies, they were enrolled in the EBP project. They received a weekly follow-up telephone call by a site stakeholder for four weeks to discuss their compliance rates. The stakeholder who called the patients obtained the

patients' compliance reports from a website that houses the patients' compliance information which is stored in the CPAP devices. The stakeholder printed and placed the compliance reports in the patients' designated folder. Also, the stakeholder recorded on the documentation sheet that the patients were contacted, or that they were unable to be reached by telephone. The four-weekly telephone calls were part of the EBP project site's existing policy, and the stakeholders at the site were familiar with this policy. If the stakeholders were not able to contact the patient by phone, they recorded the three attempts that were made on the documentation sheet.

After receiving the four weekly telephone calls, the patients had a follow-up visit with the APRN site facilitator (on the 5th week of CPAP use). During the follow-up visit, the NP implemented the positive framed message to the patient. The positive framed message was developed by Pengo et al. (2018); and permission to use the positive framed message for this EBP was granted by Dr. Pengo. After the implementation of the intervention by the APRN, weekly for the next four weeks (week 6, week 7, week 8 and week 9), the site's stakeholder called the patients. The stakeholder read the same positive framed message to the patient that was delivered by the APRN. The message was read verbatim from the laminated card that was given to every stakeholder. The stakeholder reading the massage identified herself and asked the patients listening to the positive framed messages not to discuss any issues, or concerns. Any clinical questions or complaints were directed to the sleep coordinator to be addressed. If the patients did not answer the telephone after three attempts, the positive framed message was left on the patient's answering machine. In addition to calling the patients, the stakeholder retrieved a weekly compliance report, and she placed the compliance report in the designated patient folder.

After the four weekly positive framed message calls were made, the stakeholder continued retrieving weekly compliance reports on the patients for four additional weeks (week 10, week 11, week 12 and week 13). The stakeholder placed these compliance reports in the

designated patient's folders. During this last four-week compliance report collection period, no additional telephone calls were made to the patients.

Comparison

The data collected at the EBP practice site demonstrated a CPAP noncompliance rate of 43%. Additionally, research showed that 30%-50% of patients diagnosed with OSA nationwide are noncompliant with CPAP immediately after diagnosis; and 80% of OSA patients are noncompliant within a year (DiNapoli, 2014). More importantly, many adult patients with OSA completely abandon their CPAP use within one year after initiation (Chaiard & Tungpunkom, 2018). CPAP noncompliance can have devastating results on the patients' health outcomes at the EBP practice site. The costs associated with untreated OSA in the U.S. is approximately 3.4 billion dollars per year (DiNapoli, 2014). Additionally, the costs associated with more frequent provider visits, increased hospitalizations, and the development of comorbid conditions for noncompliant CPAP patients could be overwhelming for the EBP site. A practice change to improve patients' CPAP compliance at the EBP site was vital.

Outcomes

The primary outcome for this EBP project was comparing the total amount of time of CPAP usage, demonstrated by the patients' compliance rates, pre-and post-intervention. The secondary outcome for the EBP project was comparing the patients' AHIs (apnea-hypopnea index scores) pre-and post-intervention. The compliance rates and AHIs were obtained from the patients' CPAP devices which recorded, stored, and sent the information to a website. The compliance reports were retrieved from the website. SPSS Statistics software was used to analyze the data. Descriptive statistics were used to describe the patients' demographic data. The pre-and post-intervention data were compared using repeated measures ANOVA.

Time

To ensure adequate time for recruiting the newly diagnosed OSA patients, and collecting their compliance data, the implementation of the behavioral intervention, a positive framed

message, began in September of 2019. The data collection period for the EBP project continued over a rolling enrollment of a 13-week period for every patient enrolled in the project.

Protection of Human Subjects.

To protect the human subjects for this EBP project the APRN, a DNP student project facilitator, completed the Collaborative Institutional Training Initiative (CITI) for principle investigators on April 15, 2019. Also, IRB approval was sought from Valparaiso University, and an exempt status from IRB review was granted. Additionally, to comply with the Health Insurance Portability and Accountability Act (HIPPA) standards and to protect the human subjects included in this EBP project, the participants' data were accessed from secured computers located at the clinical site. Also, the patients' folders containing their compliance data and AHI data were housed in a secure area at the project site. More importantly, there were minimal risks or harm to the human subjects from the exposure of the intervention used during the EPB project. The only patient risk identified with the EBP project was that the patients may experience some anxiety associated with receiving eight telephone calls over a nine-week period or listening to messages left on the phones. However, the site's existing policy presently had the patients receiving four telephone calls over a four-week period. No other risks or harm to the subjects were identified.

CHAPTER 4

FINDINGS

The purpose of this EBP project was to determine what effect a behavioral intervention, a positive framed message, had on improving CPAP compliance for newly diagnosed OSA patients. The primary focus of this EBP project and the proposed practice change at the project site was to improve CPAP compliance for newly diagnosed adult OSA patients. The project was carried out at a pulmonary and sleep clinic in Merrillville, Indiana. The following data analysis provides details of this EBP project's outcomes by comparing the effectiveness of a positive framed message intervention with the standard office protocol to improve CPAP compliance.

Participants

Nineteen participants (N = 19) were enrolled in the EBP project based on the proposed inclusion/exclusion criteria. The participants were patients from the project site who had been newly diagnosed with OSA by completing a polysomnography (PSG). The patients' inclusion criteria included adult patients 18 years and older who were: (a) newly diagnosed OSA by PSG, (b) initiated on CPAP therapy, and (c) followed at the EBP project site. Exclusion criteria included: (a) patients less than 18 years of age, (b) patients with mental or physical disabilities (c) patients who have failed CPAP titration, and (d) patients who have refused to have a titration study completed.

The participants' PSG AHIs were examined to grade the severity of their OSA (Chaiard & Tungpunkom, 2018). The 19 participants were categorized as having mild, moderate, or severe OSA based on the results of their polysomnography AHIs. Four of the participants were diagnosed with mild (21.1%), seven had moderate (36.8%), and eight had severe (42.1%) OSA. Table 4.1 summarizes the participants' demographic information.

Table 4.1

Characteristics of the Participants

N =19	n (%)
Age range	
30-39	4 (21.1)
40-49	2 (10.5)
50-59	10 (52.6)
60-69	2 (10.5)
70-79	1 (5.3)
Gender	
Male	10 (52.6)
Female	9 (47.4)
Race	
White	9 (47.4)
African American	9 (47.4)
Hispanic	1 (5.3)
Living Arrangements	
Significant other	10 (52.6)
Living alone	9 (47.4)
Insurance	
Private pay	7 (36.8)
Medicare	5 (26.3)
Medicaid	7 (36.8)

Note. No participants fell in the age ranges 18-29 or 80 +.

Eleven participants (57.9%) were CPAP compliant and eight participants (42.1%) were CPAP noncompliant at the end of the project. Participants ranged in age from 31 to 76 years with the majority (52%) in the age range of 50-60 years. This age group was representative of the OSA patient population seen at the project site. Eighty-six percent of patients seen at the site fell within this age range. Ten males (52.6%) and nine females (47.4%) were enrolled in the project. The male to female percentages in the project were similar to the patients seen at the EBP site; 51% of the patients were males and 49% were female.

Changes in Outcomes

The PICOT question addressed was: In newly diagnosed adult patients with obstructive sleep apnea, will initiating a positive framed message protocol compared to the standard office protocol improve CPAP compliance over a 13-week period? Prior to implementation of the positive framed message intervention, the project site reported an average monthly CPAP noncompliance rate was 43% for their patients with OSA. After completion of the EBP project, the 19 participants enrolled in the project were found to have a CPAP noncompliance rate of 42.1%.

Statistical Testing and Significance

To determine the effectiveness of the positive framed message intervention on improving CPAP compliance, a one-way repeated-measures analysis of variance (ANOVA) was conducted using the IBM Statistics software, SPSS version 22. The repeated-measures ANOVA functions like a paired t-test when more than two levels are being compared (Gravetter & Wallnau, 2011). The ANOVA test was used to compare the pre-and-post intervention data for the 19 participants' CPAP compliance rates and their AHI's at three different time intervals. Additionally, the ANOVA analyzed the sample's mean differences (Gravetter & Wallnau, 2011)

of CPAP compliance rates and AHIs at four-week, nine-week and 13-week intervals. Statistical significance used during analysis was established at $p < .05$.

Findings

The primary outcome analyzed was CPAP compliance for the 19 participants over a 13-week interval. A one-way repeated measures ANOVA was calculated comparing the participants' CPAP compliance rates before and after initiation of a positive framed message intervention at three different times: four-weeks, nine-weeks, and 13-weeks. No significant effect was found (F (2, 36) = .984, $p > .05$). Although the results of the ANOVA were not statistically significant, mean CPAP compliance scores increased from the four-week pre-intervention score (M = 69.65*, SD* = *2*5.76) to the nine-week post-intervention score (M = 71.22*, SD* 25.89). However, once the participants no longer received phone calls, the 13-week mean CPAP compliance scores decreased (M = 66.62*, SD* 26.92). To better understand if the difference in means from nine-weeks to 13-weeks was statistically significant, a paired t-test was performed. Results indicated that there was a statistically significant difference between compliance from nine-weeks to 13-weeks *(*t (18) = 2.18, $p < 05$).

The participants' AHIs were analyzed as secondary outcome data. The AHIs were analyzed at four-week, nine-week, and 13-week intervals using the one-way repeated-measures ANOVA. No significant effect was found (F (2, 36) = .879, $p > .05$). Additionally, no significant difference exists among 4-week pre-intervention (M = 4.73, SD = 3.37), post-intervention (M = 3.78*, SD* 2.21), and final CPAP compliance rates (M = 4.21*, SD* = 3.70). However, follow-up paired t-tests revealed that the participants' AHIs decreased from the four-week interval compared to the nine-week interval (t (18) = 2.24, $p < .05$).

CHAPTER 5

DISCUSSION

CPAP treatment for OSA is a life-long commitment and maintaining long-term compliance with CPAP therapy is a challenging task. This EBP project was designed to answer the following question: In newly diagnosed adult patients with obstructive sleep apnea will initiating a positive framed message protocol compared to the standard office protocol improve CPAP compliance over a thirteen-week period? The purpose of Chapter 5 is to provide an evaluation and interpretation of the results, discuss the strengths and limitations, and describe the implications for future utilization of the EBP project.

Explanation of Findings

Improvement in the participants' CPAP compliance post-intervention was the primary outcome evaluated. The question, did implementation of a positive frame message protocol for newly diagnosed adult OSA patients have any effect on improving their CPAP compliance at the EBP project site, was assessed. The repeated-measures ANOVA analysis found no significant statistical effect. However, the mean CPAP compliance scores increased from the four-week pre-intervention score (*M = 69.65, SD = 25.76*) to the nine-week post-intervention score (*M = 71.22, SD 25.89*) and decreased at 13-weeks, (*M = 66.62, SD 26.92*). The fact that the mean CPAP scores increased post implementation of the positive framed message and then decreased after the message was discontinued may imply that positive messaging framing had some influence on improving CPAP compliance, albeit not statistically significant. This partially supports Pengo et al. (2018) who found significant findings that patients' CPAP compliance could be enhanced short-term by using positively framed messages.

Additionally, there was evidence that supported message framing as an effective behavioral intervention used in promoting desired behaviors for health promotion and prevention (Grady et al., 2011; Notthoff & Carstensen, 2014; Pengo et al.,2018; Trupp et al., 2011).

However, the effectiveness of using messages for motivating change such as improving CPAP compliance may depend on more than the actual content of the message; the time frame of delivery maybe equally important (Grady et al., 2011). Also, age difference may affect responses to framed messages (Mikels et al., 2016). Nevertheless, gain framed (positive) messages appeared to be more effective than loss-framed (negative) messages in promoting prevention behaviors (Gallagher & Updegraff, 2011). Rotenberg et al. (2016) found that behavioral interventions improved CPAP adherence by almost an hour. Wozniak et al. (2014) found that behavioral interventions increased CPAP usage by almost one and a half hours per night. Any increases, no matter how slight in improving CPAP compliance, can positively impact the health outcomes of a person with OSA (Pengo et al., 2018). Although the ANOVA analysis of this project data found no statistically significant result for CPAP compliance, there was a slight increase in the mean differences between the four-week and nine-week intervals. This increase is reflective of a slight increase in CPAP usage post-implementation of this positive message. Also, the slight decrease in the mean difference between the nine-week and 13-week intervals is reflective of a decrease in CPAP compliance when the positive framed message was discontinued.

Although the results of the EBP project were not consistent with the findings of the evidence reviewed, the sample size was small. There were two reasons for the small sample size: (a) the sample came from only one practice site, and (b) the inclusion and exclusion criteria used for the project limited the number of participants enrolled in the project. Nine patients were excluded from participation because they had a psychiatric diagnosis, and three participants were excluded because they were not 18 years of age. Another reason the results were not statistically significant may be reflective of the CPAP compliance protocol that was developed which utilized the site's existing protocol (calling patients post OSA diagnosis weekly for four weeks to discuss their compliance rates). If the positive framed message were delivered immediately after diagnosis of the participants' OSA and repeated throughout the 13-

weeks, the impact may have been greater. Pengo et al., (2018) initiated the positive framed message at the same time their participants received their CPAP devices. Thus, timing of the delivery of the positive framed message may affect the participants' CPAP compliance.

The secondary outcome, the participants' AHIs, was examined at four-week, nine-week, and 13-week intervals. The AHI is used to grade the severity of the participant's OSA and determine the effectiveness of the CPAP therapy (Chaiard & Tungpunkom, 2018). If the participant's AHI remains high during CPAP therapy, it could indicate that the therapy was not as effective as it could have been, or that the participant was noncompliant with the therapy. Three participants from the project had higher AHIs (above nine) at the end of four weeks. The three participants (# 6, # 16, and # 19) had their CPAP pressures adjusted during their week five office visit with APRN site facilitator. Participant number 16's CPAP compliance rate improved by 25% at the nine-week interval and remained steadfast at the 13-week interval. Participant number six's CPAP compliance rate decreased by 20% at nine-week interval and the 20% decrease remained at 13-weeks. Participant number 19's CPAP compliance rate remained steadfast at the three-time intervals. Thus, the participants' AHIs may have had no effect on the results of the project. However, through implementation of the EBP project, important information related to the patients' AHIs and the practice's CPAP policy was discovered at the project site. The site's CPAP policy provided a mechanism to monitor newly diagnosed OSA patient's CPAP compliance; however, no mechanism was in place to monitor the patients' AHIs. The stakeholder who assisted with the project was unaware of the importance of monitoring and correcting (if elevated) the patients' AHIs. Also, she was unaware of what an acceptable AHI was or why it needed to be corrected.

Strengths and Limitations of the DNP Project

Strengths

The EBP project was evaluated for both strengths and weaknesses. Because the project was founded on a new CPAP compliance policy (which was incorporated into the old policy), the

implementation of the intervention at the EBP site was successful. The new policy, the positive framed message, and the forms used to collect compliance and AHI data were developed, laminated, distributed, and explained to the stakeholders at the project site. The sites' stakeholders were provided with detailed instructions on how the project should be conducted, and they followed the instructions without deviation. Also, because the sample size was small, the project was manageable, and no additional staff was required to complete the project. Furthermore, the stakeholders directly involved in the project realized the importance of following a policy or protocol. Additionally, they understood the importance of retrieving, printing, reviewing, and discussing the CPAP compliance results with the participants. Prior to implementation of the intervention, the evidence reviewed, synthesized, and analyzed about improving CPAP compliance was discussed with the stakeholders. Therefore, they were aware of the importance of utilizing a positive framed message protocol to improve patient outcomes. More importantly, valuable information about patients' AHIs was uncovered. A practice change that will include education for the stakeholders about the patients' AHIs will be initiated.

Limitations

The EBP project also had limitations. The small sample size which came from only one site may have influenced the results. Furthermore, the results can't be generalized to all patients with OSA. Next, the project's protocol utilized a nine-week interval of phone calls being made to the participants. Several times, the participants did not answer their phones, and the positive framed message had to be left on the participants' voice mails. It is not known if the messages were retrieved, or if the participants listened to the entire message. Lastly, the positive framed message was being delivered by two different people, the APRN site facilitator and a stakeholder from the EBP site. The participants may have been more likely to comply with the positive framed message if the APRN site facilitator (seen as a person of authority) was the person who consistently delivered the positive framed message. Lastly, the stakeholder

assisting with the project was unaware of the importance of monitoring and correcting the participants' AHIs.

Implications for the Future

Although this EBP project did not demonstrate a statistically significant improvement in the participants' CPAP compliance over the 13-weeks, there was an improvement (albeit small) in the participants' mean CPAP compliance rates at nine-weeks post-intervention. Any increase in compliance, no matter how slight, can positively impact the health outcomes of a person with OSA (Pengo et al., 2018). The overall goal of this EBP project was to initiate a practice change that could be integrated and sustained beyond the completion of this project. The remainder of this chapter discussed the ways that the findings of this EBP project can be applied to practice, theory, research, and education.

Practice

Health care prevention and promotion should be grounded on evidence-based practice (Titler et al., 2011). APRNs are at the forefront for utilizing evidence-based strategies to help their patients achieve better health outcomes. The purpose of the EBP project was to implement an evidence-based strategy found in the literature that could improve CPAP compliance for OSA patients. Also, to create a feasible and sustainable practice change at the project site. A review of the literature demonstrated the support for implementing a behavioral strategy such as a positive framed message to improve CPAP compliance. Although the results did not reveal a statistically significant outcome, there was a slight increase in the mean difference in CPAP usage before the intervention compared to after the intervention. Additional research using a positive framed message to improve CPAP compliance for patients with OSA is warranted. More importantly, the project revealed the need for increased education for the staff at the project site about the importance of monitoring and correcting patients' elevated AHIs.

Theory

Although the Iowa model is not a nursing theory, it provided a foundation for critically thinking and clinical decision making. This EBP project was about change, implementing a behavior strategy to improve CPAP compliance. Utilizing a framework to help overcome barriers to the implementation of the strategy increases the chance of success. Because the steps of the model were easy to follow, the Iowa model was an appropriate framework for this EBP project. The Iowa model provided a foundation for developing and guiding the EBP project for the APRN site facilitator. The model helped guide the APRN site facilitator with identifying a problem, developing a team and strategy to solve the problem, and retrieving and synthesizing evidence-based interventions for CPAP compliance (Titler et al., 2001). The Iowa model has been utilized effectively in numerous healthcare settings (Titler et al., 2001), including this EBP project. Future projects aimed at improving CPAP compliance should also be guided by using the Iowa model. APRNs are expected to make choices based on the best available evidence (Titler et al., 2011), and the Iowa model can assist APRNs to make those choices.

Research

Nursing research is a vital component to improving healthcare. Research helps implement new changes or strategies that will improve patient outcomes. APRNs need research to advance their field, stay updated, and offer better patient care. APRNs need to understand, evaluate, and use research to care for today's complex patients.

The findings from the EBP project revealed that the participants' CPAP compliance was not optimal despite the implementation of an evidence-based strategy to improve compliance. However, this EBP project can add to the limited research available on the use of positive message framing as a strategy to improve CPAP compliance. Several questions need to be researched. Should the positive message be delivered immediately upon patients receiving an OSA diagnosis? Is implementing a positive framed message more effective when used with other evidenced-based interventions? Using positive message framing, along with other

evidence-based strategies identified in the literature such as education and support (DiNapoli, 2014), may be the key to improving CPAP compliance. Is there a better method available besides phone calls to deliver the message? Further research is warranted for using positive framed messaging. Perhaps implementing a positive framed message along with education and support may improve CPAP compliance.

Education

APRNs continue to learn throughout their careers as they gather information to keep abreast with the changes and challenges in healthcare. Healthcare is complex and requires critical thinking and evidence-based expertise to care for patients with complex health care diseases. Education is important for APRNs throughout their careers. Lifelong learning gives APRNs the critical-thinking and problem-solving skills they need to resolve issues they may encounter. When APRNs are up to date on new information, techniques, policies and procedures, they can influence healthcare. Lifelong learning gives APRNS the ability to build strong collaborative relationships with colleagues, physicians, staff, and patients. Education provided the APRN project site facilitator with the ability to: (a) identify a problem, (b) seek out an evidence-based solution to the problem with the assistance of the sites' stakeholders, and (c) implement a strategy to improve CPAP compliance for the participants in this project.

Furthermore, the APRN site facilitator will continue to collaborate with the staff at the EBP project site as she provides them with education on the importance of monitoring and correcting elevated AHIs for patients. The education she provides to the staff should help improve patient outcomes and decrease mortality rates for OSA patients. Effective leadership requires the APRN site facilitator to possess not only knowledge of current trends in healthcare and technology, but also to be cognizant of locating and implementing evidence-based knowledge to support practice changes. This EBP project created an environment for the APRN to educate herself and others about evidence-based strategies to improve CPAP compliance.

Conclusion

This project sought to answer the PICOT question, “In newly diagnosed adult patients with OSA, will initiating a positive framed message protocol compared to the standard office protocol improve CPAP compliance over a 13-week period?” Results of the data analysis indicated that there was not a statistically significant improvement in CPAP compliance after the initiation of a positive frame message protocol. However, there was a slight improvement in the mean CPAP compliance at the end of the nine-weeks post-intervention period compared to the four-weeks pre-intervention period. Furthermore, valuable information related to the secondary outcome was uncovered. The need to provide education to the staff about monitoring and having the patients’ elevated AHIs corrected was discovered.

The process of implementing the project allowed the APRN to engage in the roles of clinician, consultant, educator, leader, and researcher. She used critical thinking, lifelong learning, and communication throughout the implementation of the project. The APRN site facilitator became a transformational leader inspiring the site’s staff to assist with the EBP project. Additionally, the project created a platform for the APRN to become a change agent at the site. She recommended education for the staff related to monitoring the patients’ elevated AHIs. Also, a new office policy was recommended. The policy would include initiating the positive framed message immediately upon the patients receiving their CPAP devices and continue during the four weekly follow-up phone calls.

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BIOGRAPHICAL MATERIAL

Frances Clark

Frances Clark graduated from Indiana University with an Associate of Science in Nursing in 1989. She continued her nursing education at Indiana University while she worked on an intermediate care step-down unit at St. Mary's Medical Center. In 1995, she completed her Bachelor of Science in Nursing from Indiana University. After completing her BSN, she worked at St. Mary's Medical Center in the emergency room and held a position as assistant director of nursing. Mrs. Clark continued her nursing education at Valparaiso University, and in 1991 she earned a Master of Science in Nursing, completed the family nurse practitioner program, and obtained ANCC certification. She is currently attending Valparaiso University and in 2020, she plans on completing her Doctor of Nursing Practice. While attending Valparaiso University, Mrs. Clark has fulfilled the role of Adjunct Assistant Professor of Nursing and in 2018, she was awarded an IONE scholarship for nursing leadership. Since completing her FNP 21 years ago, Mrs. Clark has worked in various healthcare settings including practices in cardiology, neurology, orthopedic, and internal medicine as well as in a hospital setting where she developed a heart failure clinic for Methodist Hospital. Her greatest accomplishment as an FNP was establishing her own family practice clinic caring for hundreds of patients in need of healthcare in a rural medically underserved clinic. Mrs. Clark continues to provide healthcare for patients in a pulmonary practice, focusing on patients with obstructive sleep apnea. She is a member of Sigma Theta Tau International, Alpha chapter and a member of the Society of Nurse Practitioners where she served as vice president for a year. She has co-authored and published a case study on clinical decision making for congestive heart failure. She has participated in presentations on orthopedic assessments and injuries, heart failure, and obstructive sleep apnea.

ACRONCONTINYM LIST

AHI: Apnea-Hypopnea Index

APRN: Advanced Practice Registered Nurse

ANOVA: Analysis of Variances

BIPAP: Bilevel Positive Airway Pressure

CPAP: Continuous Positive Airway Pressure

EBP: Evidence-Based Practice

HIPPA: Health Insurance Portability and Accountability Act

JHNEBP: John Hopkins Nursing Evidence-Based Practice

Iowa Model: The Iowa Model of Evidence-Based Practice to Promote Quality Care

OSA: Obstructive Sleep Apnea

PICOT: Population, Intervention, Comparison, Outcome, Time

RCT: Randomized Control Trials

SPSS: Statistical Package for the Social Sciences

U.S.: United States

APPENDIX A
Evidence Summary Table

Authors	Purpose	Design/Level Quality Rating	Sample	Measurement/ Outcomes	Results/Findings
Gallagher & Updegraff (2011).	The meta-analysis distinguished the outcomes used to assess the persuasive impact of framed messages (attitudes, intentions, or behaviors)	Meta-analysis of 94 studies. • Level 1 • A Quality	94 peer-reviewed studies.	Comparison of the persuasive impact of gain- and loss-framed messages in 94 studies.	Gain-framed messages were more likely than loss-framed messages to encourage preventive behaviors (r = 0.083, p = 0.002).
Grady, Entin, Entin & Brunye (2011).	To assess the effectiveness of framed messages on improving long-term behavioral changes if foot care for persons with diabetes.	RCT • Level 2 • B Quality	Total participants N = 64 Gain framed participants n = 32 Loss framed participants n = 32	Self-reported 18-item foot care inventory at 6 months.	The 6-month behavior scores for the group receiving gain framing were significantly higher than the 6-month behavior scores for the group receiving the loss framing, F (1,150) =6.24, p <.02).

Mikels et al. (2016).	To assess age differences in affective responses to gain and loss framed health messages.	Quasi-experimental design • Level 3 • B Quality	Total participants N = 62 Younger adults n = 31 Older adults n = 31	Subjective and physiological affective responses of younger and older adults to gain and loss framed messages about exercise over a 2-hour period.	Older adults responded more positively to the messages than younger adults (p = .170) and older adults responded more positively to gain-framed messages than to loss-framed messages (p = <.001).
Notthoff & Carstensen (2014).	2 different studies conducted. Study 1 compared the effectiveness of positive, negative, and neutral messages to encourage walking. Study 2 examined within-person change in walking	2 RCTS • Level 2 • B Quality • Level 2 • B Quality	Study 1 Total participants N = 126, randomized to 3 groups (# in each group not given), positive, negative and neutral messages.	Number of measured steps after 1 week. Number of measured steps in older patients after 5 weeks.	Older adults walked significantly more when they received positive messages compared to negative messages (p = .03) over a 1-week period, but not a statistically significant difference compared to neutral messages.

	in older adults in response to the type of message received.		Study 2 Total participants N = 59, randomized to 2 groups (# in each group not given), positive and negative messages.		Older adults who received positive as opposed to negative messages walked more steps per day over a 5-week period (p = .04).
Patil et al. (2019).	To examine the Sleep Medicine Clinical Practice Guideline for treatment of OSA with CPAP.	Clinical Practice Guideline • Level 6 • A Quality	Patients with OSA and CPAP.	Practice recommendations for PAP treatment of OSA in adults.	Recommendation that behavioral and/or troubleshooting interventions be given during the initial period of PAP therapy in adults with OSA. (Conditional)
Pengo et al. (2018).	To assess the effectiveness of a behavioral intervention using positive and negative framing messages versus	RCT randomization to 3 groups • Level 2 • A Quality	Total participants N = 112 total	Total CPAP usage after 2 wks. and 6 wks.	Positive framing message group showed greater CPAP use after 2 wks. (total use 53.7 $\pm$ 31.4 hrs.) than the negative framing message

	standard care on improving CPAP use.		Positive framed messages n = 36 Negative framed messages n = 37 Control group n = 39		group, and the control group (35.6 ± 27.4 and 40.8 ± 33.5 hrs., *p* <0.05). However, no difference was noted after 6 wks. between the groups.
Rotenberg, Murariu & Pang (2016).	To assess for improvements in CPAP adherence over 20 years considering multiple interventions.	Integrative Review • Level 2 • A Quality	82 studies reviewed.	Increase in CPAP adherence use per night over 20 years.	There was no significant improvement in CPAP adherence over the 20-year time frame. However, behavioral interventions improved adherence rates by ~1 hour per night on average.

Trupp, Corwin, Ahijevych & Nygren, (2011).	To assess the effectiveness of a behavioral intervention using positive and negative framing messages versus standard care on improving CPAP use.	RCT • Level 2 • A Quality	Total participants N = 70 Positive framed messages n = 34 Negative framed messages n = 36	30-day adherence to CPAP.	Positive message group showed 42.15% CPAP usage after 30 days (Mdn = 33.5). Negative message group showed 63.14% CPAP usage after 30 days Mdn = 82.5.). The difference between the 2 groups was significant (*p* = .015).
Wozniak, Lasserson & Smith, (2014).	To assess the effect of supportive, educational, and behavioral interventions on CPAP usage.	SR of 30 RCTs, randomized, single-blind or unblinded parallel group studies. • Level 1 • A Quality	N = 2,047 total n = 803 for supportive n = 508 for education n = 584 for behavioral	CPAP machine usage in a 24-hour day.	Supportive interventions-increased CPAP use by 50 min/d (0.82 hrs., 95% CI, 0.36-1.27). Educational interventions-increased CPAP use by 35 min/d (0.60 hrs., 95% CI, 0.27-0.93). Behavioral interventions-increased CPAP use by 1.44 hr./d (95% CI, 0.43-2.45).

APPENDIX B

Criteria for EBP Project

Inclusion Criteria	Exclusion Criteria
Adults, 18 years or older.	Patients with mental or physical disabilities that would interfere with the protocol for the duration of the study.
Patients with newly diagnosed OSA (by polysomnography).	Patients who have failed CPAP titration and will require BIPAP.
Patients initiated on CPAP therapy by CDA.	Patients who have refused to have a titration study completed at the EBP project site.
Patients who are being followed at the EBP project site.	

APPENDIX C

CPAP Initiation Follow-Up Protocol

PROCEDURE TITLE:		Telephone follow-up and appointments to Improve CPAP Compliance for Newly Diagnosed OSA Patients.	
AUTHOR:	Frances Clark, MSN, APRN, FNP-BC	APPLICABLE TO:	Healthcare Providers and Support Staff within the office of Chest Disease Associates (CDA).
DATE ORIGINATED:	7/1/2019	DATE EFFECTIVE:	8/1/19
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Policy: CPAP Initiation Follow-Up Protocol.

1.0 Starting September 1, 2019, the CDA staff will use the following protocol for newly diagnosed OSA patients after their CPAP set-up. The following procedure will be used for follow-up telephone calls with new OSA patients, and for follow-up patient appointments with the NP project site facilitator. Every new patient will have a pre-made folder which will contain a CPAP contact follow-up form and the patient's compliance reports.

1.1 Weekly, for four weeks (week 1, week 2, week 3 and week 4) after CPAP initiation, the patients will be contacted by telephone by one of the CDA stakeholders.

1.2 The CDA stakeholder will obtain the patient's CPAP compliance report and discuss with the patient their CPAP progress. The stakeholder will place the patient's compliance report in the patient's folder.

1.3 Three attempts to contact the patient by telephone will be made. If patient contact is unsuccessful, the CDA stakeholder will note the unsuccessful

attempts on the follow-up form that was created and place it in the patient's folder. No further attempts will be made to contact the patient until the following week's telephone call is due.

1.4 If the patient has a complaint or concern related to CPAP use, they will be referred to the sleep coordinator.

2.0 During the fifth week, the patient will have their first follow-up appointment with the NP project site facilitator.

2.1 The NP project site facilitator will review the patient's fifth-week compliance report with them.

2.2 The NP project site facilitator will implement the behavioral intervention, the positive framed message, to the patient.

3.0 After the patient's follow-up appointment with the NP (post intervention), the next four weeks (week 6, week 7, week 8 and week 9), one of the CDA stakeholders will again contact the patient by telephone.

3.1 The stakeholder will read the positive framed message to the patient, exactly as it is written without adding any other comments.

3.2 The stakeholder will make three attempts to successfully contact the patient by telephone. If unsuccessful at contacting the patient, the stakeholder will make a note on the follow-up form. No further attempts to contact the patient will be made until the following week's telephone call is due.

PROCEDURE TITLE:	Telephone follow-up and appointments to Improve CPAP Compliance for Newly Diagnosed OSA Patients.
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3.3 If the patient has any complaints, questions, or concerns, they will be referred to the sleep coordinator and their issues will not be addressed during the positive framed message reading.

3.4 The stakeholder will obtain the patient's weekly compliance report without discussing it with the patient and she will place it in the patient's folder.

4.0 The following four weeks (week 10, week 11, week 12 and week 13) one of the CDA stakeholders will obtain the patient's OSA compliance reports and place them in the patient's folder.

4.1 No additional follow-up telephone calls will be made to the patients during the final four weeks of the EBP project data collection.

4.2 The NP project facilitator will compare the pre-intervention data to the post-intervention data.

4.3 The NP project facilitator will report her findings to the physicians and other CDA stakeholders.

4.4 The patient's names, or any other identifying information, will be kept anonymous during disseminating the project's finding.

APPENDIX D

CPAP Follow-up Documentation Form

OPERATIONAL PROCEDURE: The following form is used to document the follow-up telephone calls and the Nurse Practitioner visit for new patients who have received a CPAP set-up and have been enrolled in the EBP project. **Three attempts, <u>all on the same day</u> but at different times of the day**, will be made to contact the patient. Week 1 starts on the 7th day after CPAP set-up. Weeks 10-13, no telephone calls are to be made to the patient.

Patient name: _____

WEEK	**DATE**	**Call pt. attempt 1 time**	**Call pt. attempt 2 time**	**Call pt. attempt 3 time**	**Compliance Report Printed (√)**	**Initials**
WEEK 1						
WEEK 2						
WEEK 3						
WEEK 4						
NP VISIT (5)						
WEEK 6						
WEEK 7						
WEEK 8						
WEEK 9						
WEEK 10						
WEEK 11						
WEEK 12						
WEEK 13						

APPENDIX E

A POSITIVE FRAMED MESSAGE TO IMPROVE CPAP COMPLIANCE

A POSITIVE FRAMED MESSAGE

I. Using CPAP at least 4 hours per night will reduce your daytime sleepiness and give you more energy.

II. If you use your CPAP at least 4 hours per night, you can experience benefits that may save your life.

III. Using CPAP at least 4 hours per night will increase your chances of lowering your blood pressure.

IV. Using your CPAP at least 4 hours per night decreases the risk of cardiovascular events.

V. Using CPAP at least 4 hours per night will decrease your chances of experiencing sudden death.

APPENDIX F
A Positive Framed Message Intervention Participant Code Sheet

Code #	Compliance Wks. 1-4	AHI	Compliance Wks. 6-9	AHI	Compliance Wks. 10-13	AHI
001						
002						
003						
004						
005						
006						
007						
008						
009						
010						
011						
012						
013						
014						
015						
016						
017						
018						
019						