Factors Influencing the Uptake and Use of Continuous Positive Airway Pressure Therapy for Women With Sleep Disordered Breathing

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Abstract

The consequences of sleep disordered breathing (SDB) in women are fatigue, morning headaches, insomnia, depression, low functional status, daytime sleepiness, mood disturbances, and poor neuro-behavioural performance. Women appear to be more symptomatic at lower disease severity than men. When CPAP is prescribed, women use it less than men, they reduce their usage within the first week of treatment, and they discontinue it more than men. There is a need to understand the factors influencing CPAP therapy uptake and usage in women to meaningfully address their needs.

The purpose of this qualitative evidence synthesis was to identify and synthesize the factors influencing the uptake and use of CPAP in women by conducting a qualitative evidence synthesis guided by the Bargaining and Balancing Life with CPAP theory for content, and the Theoretical Domains Framework for data analysis.

Twenty-one studies were included. Barrier domains were *Skills, Emotions, Social/Professional Role and Identity,* and *Beliefs about Capabilities*, while facilitator domains were *Reinforcement, Social Influences, Goals,* and *Optimism*. Seven themes emerged : *1) Expectations about CPAP, 2) Learning to use my CPAP machine, 3) The burden of the technology, 4) Improvement of SDB symptoms, 5) Not feeling (or looking) like myself, 6) Receiving support, and 7) Choosing my attitude.*

To ensure appropriate and meaningful SDB care for women, practices must be based on knowledge relevant to women with SDB. Findings from this thesis can inform the design and development of interventions to support women with CPAP therapy uptake and usage. Research on this topic is urgently needed because there was no study eligible with a sample comprised of women only.

Acknowledgments

I would like to dedicate this thesis to the women who inspired me to be their advocate. These women were patients whom I cared for as well as colleagues who struggled with CPAP therapy usage. Your testimonies motivated me to explore further how it is for women to use CPAP therapy.

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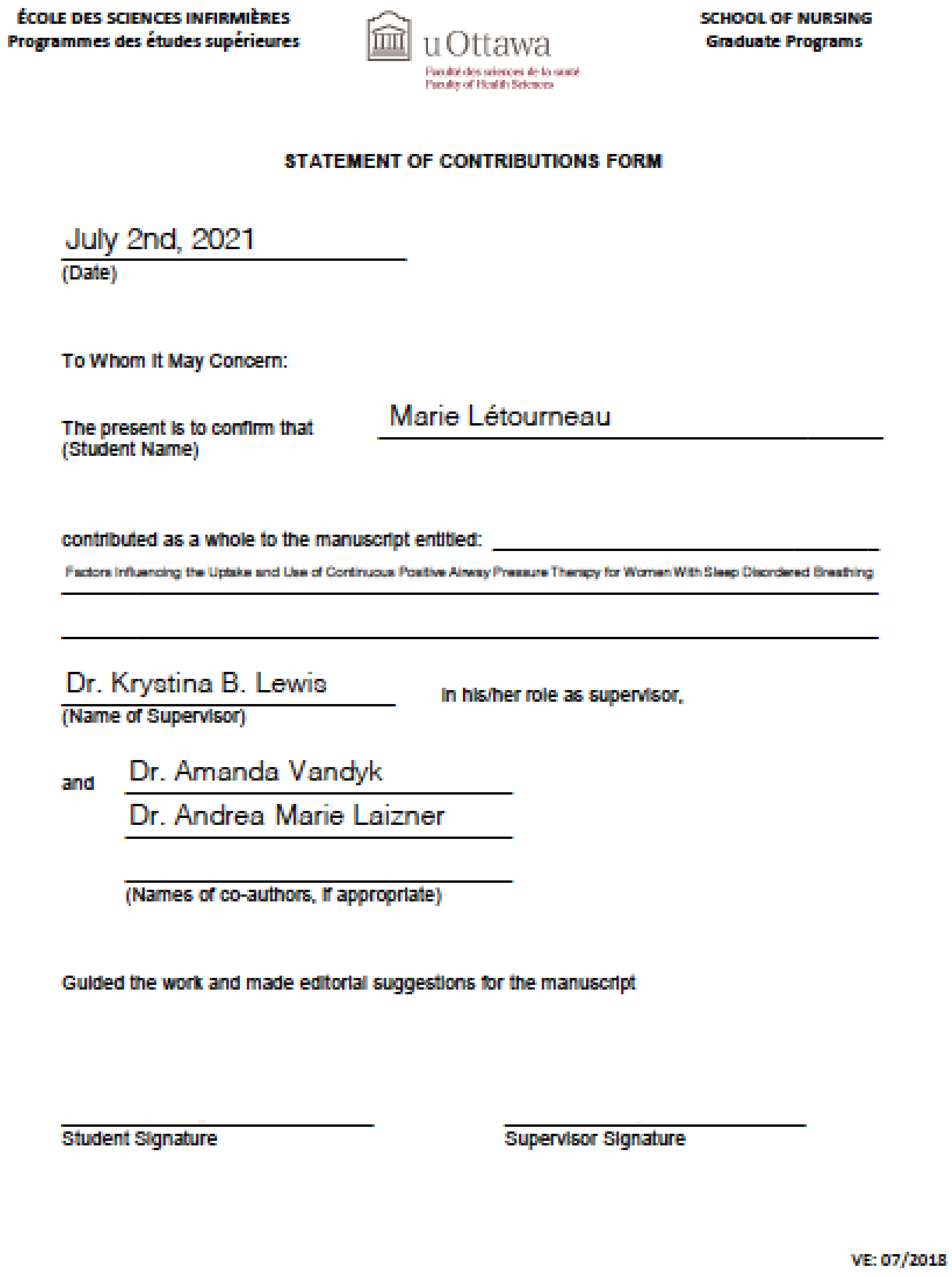

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List of abbreviations

APN: Advanced Practice Nurse
BCT: Behavioural Change Technique
BCW: Behavioural Change Wheel
CASP: Critical Appraisal Skills Programme
CPAP: Continuous Positive Airway Pressure
OSA: Obstructive Sleep Apnea
SDB: Sleep Disordered Breathing
TDF: Theoretical Domains Framework

Chapter 1: Introduction

Introduction

In 1997, when Collard and colleagues published the first review article about compliance with Sleep Disordered Breathing (SDB) treatment, sleep medicine clinicians learned that Continuous Positive Airway Pressure Therapy (CPAP) immediately splints the airway open when applied at the appropriate pressure. This treatment is effective at eliminating the repetitive nocturnal airway obstructions that occur with SDB, however, the efficacy of this self-administered treatment is dependent on the individual's willingness to accept and use the device long-term (Collard et al., 1997). At that time, Collard et al. found that a high percentage of individuals declined CPAP therapy, and many abandoned it after a short trial. For persons accepting of the therapy, the average CPAP therapy use duration was only 3.2 to 4.3 hours per night (Collard et al., 1997). Today's CPAP therapy use is not much improved (Cistulli et al., 2019; Simon-Tuval et al., 2009), the mean use increased to approximately 5.2 hours per night (Cistulli et al., 2019). Considering that a full night of sleep should be between seven and nine hours of restorative sleep (Watson et al., 2015), this nightly usage remains low, with 25 to 42% of sleep time not benefiting from CPAP therapy. Despite these facts, CPAP therapy continues to be the most commonly prescribed treatment for SDB (Patil et al., 2019).

SDB affects men more than women, at a ratio of between 3:1 and 5:1 (Wimms et al., 2016). Attempts to increase clinician awareness about the existence of SDB in women seem effective, since more women are being offered CPAP therapy in clinical practice (Patel et al., 2020). It is important that women are provided access to treatment, because while SDB is less common in women, the consequences of the disease are similar and women appear to be more symptomatic at lower disease severity than men (Wimms et al., 2016). Further complicating SDB treatment in women, is the fact that women appear to consistently use their CPAP devices less compared to men. Specifically, women reduce their usage within the first week of treatment more than men, and they discontinue the treatment entirely more than men (Patel et al., 2020).

To increase CPAP therapy usage, researchers have found that behavioural interventions are most effective (Patel et al., 2020). These interventions aim to target modifiable behaviours originating from psychological theories of health behaviour change and pre-existing health beliefs (Wozniak et al., 2014). There is a need for clinicians to understand the barriers and facilitators to CPAP therapy uptake and usage in women to meaningfully address the needs of women and to develop effective interventions for this population. To ensure appropriate and meaningful SDB care for women, practices must be based on knowledge relevant to women with SDB.

Objectives of the Thesis

The overarching purpose of this thesis is to identify and synthesize the factors influencing the uptake and use of CPAP therapy for women with SDB. To achieve this, I will 1) review the literature about relevant concepts related to CPAP therapy uptake and usage, 2) present the thesis' theoretical underpinnings to explain behaviors and factors involved with CPAP therapy uptake and use, 3) conduct a qualitative evidence synthesis to identify and synthesize the factors that influence women's' behaviours about CPAP therapy uptake and usage, and finally 4) discuss the implications for nursing practice, policy, education, and research that arise from these findings.

Situating the Researcher

Personal Impetus

In 2018, I decided to pursue graduate studies while working as a nurse clinician in a sleep disorders clinic, a position I held since 2006. Through my work in this setting, I have often been faced with issues related to access to care. The province of Québec, where I practice, has very long wait times for initial consultation for sleep medicine; it is not uncommon for patients to wait two to three years before being seen. I have noticed, that after this long delay, patients with a confirmed diagnosis of SDB who are prescribed CPAP therapy, have many obstacles to overcome. For example, CPAP therapy is not an insured treatment under our provincial health insurance program. Patients are responsible to pay 100% of the initial start-up costs (between $1600-2000). Those with a private or collective insurance plan may be eligible for partial reimbursement, depending on their coverage.

My role at the clinic was to facilitate access to care and treatment. I helped patients obtain their CPAP therapy device, promoted usage, and resolved issues when patients experienced difficulties using CPAP therapy. As a result of the health coverage in Québec, my work with patients to increase their CPAP therapy usage cannot begin until CPAP therapy is available in the person's home. In my practice, CPAP uptake is a prerequisite to usage. However, when I reviewed the literature on CPAP uptake, these processes do not appear clearly independent – unlike my clinical observations. This complicates the process of applying research findings to my practice, especially when this knowledge is garnered from settings where health coverage is different than in Québec.

My interest for SDB in women grew as the clinician-researchers in our institution started to conduct randomized controlled trials and publish articles on the topic of maternal SDB (Champagne et al., 2009; Duong et al., 2020; Kimoff, 2016-2018; Pamidi & Kimoff, 2018; Pamidi, Marc, et al., 2015; Pamidi et al., 2013; Pamidi et al., 2016; Pamidi et al., 2014). As a result, I started counseling a growing number of women. With time, I started to notice that the issues encountered were different with women compared to men. For example, women's concerns were often related to their familial obligations the coordination of medical appointments around their children's schedule, cost of the CPAP therapy when they were planning for a reduced income after pregnancy, night-time disruptions from their children, and the effect of the CPAP mask on their physical appearance. In contrast, men were relieved to learn their bed partners would not be disturbed by their snoring anymore, that daytime sleepiness would no longer disrupt their lives. Men's main concerns were related to whether they could maintain their employment if the SDB was not treated. I turned to the literature to see if my clinical observations were supported by evidence yet found little evidence representing women's views and experiences. I now work as an advanced practice nurse clinician in respirology. I intend to use this leadership role to affect change by conducting research with women living with SDB.

Paradigmatic Stance

A paradigm is a set of basic beliefs that represent a worldview that defines the nature of the world (ontology), the individual's place in it (epistemology), and the range of possible relationships to that world and its parts (methodology) (Guba & Lincoln, 1994). I situate my paradigmatic stance within the post-positivist paradigm. Important authors promoting the post-positivist paradigm were Karl Popper, Jacob Bronowski, Thomas Kuhn, and Charles Hanson (Clark, 1998). The ontological assumption of this paradigm is that a reality is exists, but it is imperfectly captured (Guba & Lincoln, 1994). The epistemological assumptions of post-positivism are that the researcher and their perceptions are not seen as being wholly detached from inquiry (Clark, 1998). The kind of knowledge that is created from a post-positivist stance is conjectural meaning, as an absolute truth can never be found; evidence established in research is always imperfect and fallible (Creswell, 2009).

I believe that the assumption that reality is not fully understood is appropriate when considering that research in the field of SDB and CPAP therapy use in women is in its infancy. There are many factors influencing the prevalence and incidence of SDB, which are constantly evolving with many researchers acknowledging that this process is not fully understood (Pamidi & Kimoff, 2018; Wimms et al., 2016). It is challenging to remain entirely detached from this inquiry because of my extensive clinical experience working in this field, which aligns well with the epistemological assumption of a post-positivist stance.

Overview of the Chapters

This monograph style thesis contains six chapters and includes one study. In this current chapter one, I have introduced the research problem, presented the overall aim and specific objectives, shared my personal impetus, and paradigmatic stance. In chapter two, I present the findings from a review of the literature on my thesis topic. In chapter three, I introduce the theoretical framework guiding this thesis. In chapter four, I describe the methods for the qualitative evidence synthesis. In chapter five, I present the results. Chapter six is the discussion, in which I discuss the findings of this thesis and situate them within the broader theoretical and empirical literature, present the strengths and limitations of the study, and discuss implications for nursing practice, policy, education, and research, and a conclusion.

Chapter 2: Literature Review

In this chapter, I review the important concepts related to SDB discussed in this thesis. First, I offer background information for the reader to understand the pathophysiology, prevalence, and treatment options for SDB. Second, I define and discuss CPAP therapy uptake and usage, including known factors and interventions influencing its uptake and usage. Finally, I conclude with a thorough examination of what is known about SDB specifically in women including prevalence, pathophysiology, symptoms, and health conditions associated with SDB in women, clinical response to CPAP therapy, and the known barriers and facilitators influencing its uptake and usage.

Sleep Disordered Breathing

Pathophysiology

SDB consists of three distinct clinical syndromes: obstructive sleep apnea syndrome, central sleep apnea-hypopnea syndrome, and sleep hypoventilation syndrome (Fleetham et al., 2006). Obstructive Sleep Apnea (OSA), the most common form of SDB, occurs when repetitive collapse of the upper airway occurs during sleep (American Thoracic Society, 2010). The frequency of obstructive events is reported as an Apnea Hypopnea Index (AHI) or Respiratory Disturbance Index (RDI) and SDB severity is defined as mild for RDI ≥ 5 and < 15, moderate for RDI ≥ 15 and ≤ 30, and severe for RDI > 30 (Epstein et al., 2009). SDB causes sleep fragmentation, hypoxemia, hypercapnia, marked swings in intrathoracic pressure, and an increase in sympathetic activity. Signs and symptoms of SDB include nocturnal witnessed apneas, snoring, gasping or choking at night, excessive daytime sleepiness, non-refreshing sleep, nocturia, morning headaches, poor concentration, memory loss, decreased libido, and irritability (Epstein et al., 2009). Untreated SDB is associated with adverse health outcomes including excessive sleepiness, impaired quality of life, increased motor vehicle accidents, and cardiovascular events (Patil et al., 2019).

Prevalence

Recently, Matsumoto and Chin (2019) conducted a meta-analysis of 19 population-based cohort studies on the prevalence of SDB from 1988 to 2016. The authors reached a conclusion that the prevalence of SDB was 24.0–83.8% in men and 9.0–76.6% in women. The wide range of prevalence was explained by the divergent methodology used between cohort studies. Specifically, there was a wide variation between studies in regards to: 1) baseline characteristics of the study participants, 2) type of sleep study and diagnostic criteria used to define SDB, and 3) the likelihood that some studies were conducted in a population with a high pre-test probability of having SDB (Matsumoto & Chin, 2019). Matsumoto and Chin's meta-analysis included studies from Australia, Brazil, France, Iceland, Japan, Korea, Poland, Spain, Singapore, Switzerland, and the United States of America; there was no study from Canada.

While prevalence data is limited for Canada, the 2009 Canadian Community Health Survey-Sleep Apnea Rapid Response estimated that 3% of Canadian adults were told by a health professional that they have SDB, and an additional 26% of adults have symptoms and risk factors that are associated with a high risk of having or developing SDB (Public Health Agency of Canada, 2010).

In the United States adult population, the prevalence of mild to severe SBD was estimated to be 26% in a prevalence study conducted from 2007 to 2010. This estimated prevalence represented an increase between 14-55% (depending on age, sex and SDB severity subgroups) as compared to a sample from 1988-1994 (Peppard et al., 2013). This increase has been explained by the increasing prevalence of obesity, improvements in diagnostic methods, and aging of the population (Matsumoto & Chin, 2019). The prevalence of SDB also increases when certain co-morbidities are present, such as obesity, heart disease, and metabolic syndrome (Foster et al., 2009; Lopez et al., 2008; Ruttanaumpawan et al., 2009).

Treatment Options for SDB

Multiple treatment options are available to manage SDB, of which CPAP therapy is the most common (Patil et al., 2019). CPAP therapy delivers pressurized air to the airway, via a sealed mask worn over the nose or the nose and mouth, during sleep to prevent upper airway collapse. This form of treatment applies a constant pressure throughout the respiratory cycle to splint the airway open (Patil et al., 2019). CPAP therapy is a highly effective treatment to restore airway patency during sleep, resolve symptoms, as well as improve quality of life (Weaver & Sawyer, 2010). Other management or treatment strategies include: 1) behavioural lifestyle options such as weight loss, positional therapy, and avoiding alcohol and sedatives before bedtime (Epstein et al., 2009); 2) oral appliances including mandibular repositioning appliances which covers the upper and lower teeth and hold the mandible in an advanced position with respect to the resting position; as well as tongue retaining devices which holds only the tongue in a forward position with respect to the resting position, without mandibular repositioning (Epstein et al., 2009); and 3) surgical interventions if the person has severe obstructing anatomy that is surgically correctible, or for individuals who fail other treatment options (Epstein et al., 2009).

CPAP Therapy

Consistent nightly use of CPAP therapy is paramount to achieving therapeutic goals, yet many patients requiring CPAP therapy do not accept a trial at home, fail to purchase the CPAP therapy device, or do not use the treatment enough each night; all of which limit clinical benefits (Rotenberg et al., 2016; Shahrabani et al., 2014; Simon-Tuval et al., 2009; Weaver et al., 2020). The following section will define and discuss: 1) CPAP therapy uptake, 2) CPAP therapy usage; 3) barriers and facilitators to CPAP therapy uptake and usage; and 4) interventions to improve CPAP therapy uptake and usage.

CPAP Therapy Uptake

There are multiple definitions of CPAP therapy uptake, which include: accepting a CPAP therapy trial, obtaining a personal CPAP machine after an initial trial period, obtaining a loaner CPAP therapy machine after purchasing a mask, or having purchased a CPAP therapy device (Bartlett et al., 2013; Chang et al., 2019; Goyal et al., 2017; Lee et al., 2017; Skinner et al., 2013; Tan et al., 2018). Generally speaking, the term CPAP therapy uptake involves obtaining or buying a CPAP therapy device for personal use for an extended period of time. Other terms used in the literature to refer to CPAP therapy uptake include primary acceptance, acceptance, acceptors, and purchasing CPAP (Buswell et al., 2018; Collard et al., 1997; Leemans et al., 2018; Rauscher et al., 1991; Rezaie et al., 2018; Shahrabani et al., 2014; Simon-Tuval et al., 2009; Tzischinsky et al., 2011). Early studies on CPAP therapy uptake have shown that 15-30% of patients are unwilling to use CPAP therapy even before trying it (Collard et al., 1997; Weaver et al., 1997). In 2009, Simon-Tuval et al. reported that 35% of patients who were prescribed CPAP therapy did not obtain the device after a four to six weeks training program. Therefore, there is a need to understand what influences uptake from the perspective of patients.

CPAP Therapy Usage

A minimum usage of 4 hours per day is commonly used to clinically define the minimal acceptable levels of usage (Patil et al., 2019; Weaver et al., 2020). This threshold is based upon three germinal papers published in 1993 and 1994 which suggested the average CPAP therapy use was 4.7 hours per night (Engleman et al., 1994; Kribbs et al., 1993; Reeves-Hoche et al., 1994; Sawyer et al., 2011). Subsequently, a common assumption emerged wherein CPAP therapy use of 4 hours per night on 70% of the nights was established as a clinical and empiric benchmark of sufficient CPAP therapy usage (Sawyer et al., 2011). Several studies have shown that using CPAP therapy for greater than 4 hours per night results in normalization of daytime symptoms and improvements in cardiovascular disease conditions and diabetes (Weaver et al., 2020). Studies have used 4 hours per night as the cut-off point differentiating users and non-users of CPAP therapy. Consequently insurers, too, have adopted this cut-off (Weaver et al., 2020). However, the literature to date suggests that the optimal level of CPAP therapy use differs depending on the desired clinical outcome (Bakker et al., 2019), with the therapeutic threshold generally falling between 5 and 6 hours per night (Rotenberg et al., 2016). For example, optimal usage for controlling daytime symptoms including functional status was 7.5 hours per night (Weaver et al., 2007). Furthermore, residual memory impairment was observed in individuals using CPAP therapy for 3.4 hours per night whereas the group using CPAP therapy for 5.2 hours per night exhibited normal memory performance (Zimmerman et al., 2006). Current evidence suggests a continuous dose-response relationship between hours of use per night and therapeutic response, therefore most clinicians recommend the utilisation of CPAP therapy for the entire sleep period (Patil et al., 2019).

The number of individuals meeting the minimal level of CPAP therapy use is believed to range from 40-85% (Mehrtash et al., 2019). The wide range of usage rates can be explained by the divergent definitions of usage between studies, as well as populations being studied. A recent data analysis of a large internet cloud database of 2.62 million CPAP therapy users showed that the mean CPAP therapy use was 5.1 hours per night across all nights reported, and that 25% of users did not meet the minimal level of CPAP therapy use when defined as at least 4 hours per night on 70% of the nights (Cistulli et al., 2019). Defining factors that promote or hinder CPAP therapy usage is important to identify and design targeted interventions to support individuals not using CPAP therapy enough to benefit from this treatment (Mehrtash et al., 2019).

Factors influencing CPAP Therapy Uptake and Usage

According to Mehrtash (2019), factors associated with CPAP therapy uptake and usage can be classified into four categories: 1) socio-demographic characteristics, 2) disease severity and airway anatomy, 3) psychosocial factors, and 4) side-effects.

Socio-demographic Characteristics. Lower income has been associated with poorer health literacy, difficulty accessing health care and lack of medical insurance coverage (Mehrtash et al., 2019). The costs and securing time to obtain the device were barriers to CPAP therapy uptake in three studies

(Shahrabani et al., 2014; Simon-Tuval et al., 2009; Tzischinsky et al., 2011). However, an important observation was that when asked if they would obtain the CPAP therapy device if it was offered free of charge, 56% declined; suggesting cost is not the only barrier (Shahrabani et al., 2014).

Mehrtash et al. (2019) also reported that people who smoke are more likely to refuse CPAP therapy. Conversely, people who smoke who do accept CPAP therapy, use their CPAP devices less often than non-smokers.

Race/ethnicity and age are socio-demographic characteristics believed to affect CPAP therapy uptake and usage; however, these were not consistently found to be determinants of CPAP therapy use across all studies (Mehrtash et al., 2019). For example, some studies have found race to be a predictor of adherence with African Americans exhibiting reduced usage, but others have not (Mehrtash et al., 2019). Some studies showed reduced CPAP use with increasing age while others have noted higher rates of CPAP use with age (Patel et al., 2020). The effect of sex/gender is discussed separately in this chapter.

Disease severity. According to a review by Sawyer et. al (2011), disease severity, measured as apnea hypopnea index, respiratory disturbance index, and oxygen desaturation and self-rated subjective sleepiness are commonly identified as influencing CPAP adherence. Individuals with more severe disease and more impaired daytime sleepiness use their CPAP therapy devices more (Sawyer et al., 2011).

Airway anatomy. The delivery of CPAP therapy is contingent on the patency of upper airway structures. Nasal anatomy has also been found to be associated with CPAP therapy uptake and usage; CPAP therapy uptake and CPAP therapy usage at 18 months was lower in individuals with small nasal volume and high nasal resistance objectively measured with acoustic rhinometry (Weaver et al., 2020).

Psychosocial factors. In a systematic review of CPAP usage published in 2011 by Sawyer et al., the psychological factors influencing the decision to obtain and use a CPAP therapy device included the level of perceived susceptibility to SBD complications, the knowledge about the risks and consequences if CPAP therapy is not used, the levels of perceived benefits of using CPAP therapy, the perceived barriers (inconvenience, unpleasantness), and the perceived ability to overcome barriers to manage CPAP therapy (Sawyer et al., 2011). In a more recent review, Weaver (2021) identified the lack of a positive perspective regarding the benefit of CPAP therapy, poor self-efficacy, claustrophobic tendencies, and the inability to overcome obstacles and problem-solve as psychological factors influencing CPAP therapy usage.

Social factors, including social support in general and the involvement of the bed partner, were identified as important factors associated with CPAP therapy uptake and usage (Mehrtash et al., 2019). Positive feedback from bed partners on the individual's symptomatic improvements (reduced snoring, less daytime sleepiness) may promote CPAP therapy usage (Mehrtash et al., 2019). Bed partners have been found to provide a strong incentive to maintain treatment (Ye et al., 2015). However, they have also been found to negatively influence the individual's CPAP therapy usage, as individuals pressured by bed partners to seek medical evaluation for SDB may be a marker of reduced patient motivation (Ye et al., 2015). CPAP therapy usage is negatively affected if the individual is coerced by the bed partner into seeking medical attention, because the individual may not be ready to commit to this therapy (Mehrtash et al., 2019). Furthermore, difficulty being intimate with partners during the first week of therapy has been found to correlate with poor CPAP therapy usage (Ye et al., 2015).

Side-Effects. The perceived physical benefits, more energy, reductions in comorbidity, and resolution of symptoms related to untreated SDB promoted CPAP therapy uptake and use (Bröstrom et al., 2010); whereas the physical discomforts or ineffectiveness during a short CPAP trial led to non-use in several studies (Ayow et al., 2009; Bröstrom et al., 2010; Shahrabani et al., 2014; Simon-Tuval et al., 2009; Tzischinsky et al., 2011). As many as 65% of individuals reported nasal congestion, dry nose or throat, and discomfort from using their CPAP therapy device as reasons for considering or stopping the use of their CPAP device (Mehrtash et al., 2019).

Interventions to Improve CPAP Therapy Uptake and Usage

Efforts to improve CPAP therapy side effects (e.g. mucosal dryness, poor mask fit, intolerance to pressure) by device manufacturers include the development of comfort-related technological advances in CPAP therapy equipment (Sawyer et al., 2011). These technological advances include nasal and face mask innovations, humidified systems, and pressure modality add-on options (Weaver et al., 2020). Despite these technological advances, usage rates have not improved when comparing usage data from published studies dated 1996 to 2006 (Rotenberg et al., 2016). Recent efforts to improve CPAP therapy use include educational, behavioural, and troubleshooting interventions (Patil et al., 2019).

According to Wozniak (2014), educational interventions are standardized and delivered at the beginning of treatment (either in-person or by video) and focus on providing information about sleep apnea and how CPAP therapy will treat SDB. These interventions educate individuals on the pathophysiology of SDB, provide training on device operation and cleaning. Self-management topics, such as road and occupational safety, peri-operative guidelines, and weight management are discussed. A meta-analysis demonstrated a clinically significant increase in CPAP therapy usage of 0.6 hours per night with educational interventions (Patil et al., 2019).

Behavioural interventions target factors that are modifiable such as health behaviour and pre-existing health beliefs (Wozniak et al., 2014). As per Weaver (2018) , examples of behavioural interventions are intensive patient support and reinforcement of positive behaviors (Weaver et al., 2021). Cognitive behavioural therapy (CBT) and motivational enhancement are also both considered behavioural interventions to support CPAP therapy usage. Through conversational exchange, the goal of CBT is to reshape the individual’s beliefs that are constraining in order to bring about a change in their behavior (Weaver, 2019). Motivational enhancement therapy applies motivational interviewing to elicit the individual’s thought processes, reinforcing the individual’s own motivational statements through directed interview questions (Weaver, 2019). A meta-analysis demonstrated a clinically significant increase in CPAP therapy usage of 1.2 hours per night with behavioural interventions. Of the three types of interventions reviewed, behavioural interventions were the most effective (Patil et al., 2019).

Troubleshooting interventions focused on close patient communication to identify CPAP-related problems and to initiate potential solutions. The common feature of this type of interventions is that individuals are encouraged to provide feedback on their experience of CPAP therapy on an ongoing basis, so that barriers to or difficulties with treatment can be addressed in timely fashion (Wozniak et al., 2014). A meta-analysis demonstrated a clinically significant increase in CPAP therapy usage of 0.7 hours per night with troubleshooting interventions (Patil et al., 2019).

What is Known About Women and SDB

Prevalence in Women

The prevalence of SDB has been consistently lower in women than in men in prevalence studies, and ranges between 9.0–76.6% (Matsumoto & Chin, 2019). The prevalence of SDB in post-menopausal women was three to six times higher than in pre-menopausal women in three cohort studies (Matsumoto & Chin, 2019). The prevalence of SDB has also been shown to be elevated during pregnancy. A prospective study of a cohort of 105 pregnant women determined that the incidence of SDB increased from 10% to 27% from the first to the third trimester (Pien et al., 2014). A separate cohort of 128 women with high-risk pregnancies showed that 20% of woman developed new onset SDB throughout the course of the pregnancy, and that the prevalence of SDB rose from 30% to 47% from the first to third trimester (Facco et al., 2014). Authors defined a high-risk pregnancy as one with concurrent maternal obesity, chronic hypertension, pregestational diabetes, and/or history of preeclampsia or a current twin gestation.

Aging appears to affect the prevalence of SDB in women differently than men. Peppard and colleagues (2013) observed that there was a stronger association between SDB severity and age in women than in men. For example, the prevalence of SDB in older overweight women was five-fold that of younger overweight women (20% vs 4% respectively). In contrast, the prevalence of SDB in older overweight men was two-fold as compared to younger overweight men (38% vs 18% respectively) (Peppard et al., 2013).

Pathophysiology in Women

This age-related change in SDB in women is believed to be caused by several hormonal changes occurring during or after menopause. First, menopause is associated with weight gain and increase in fat. Second, estrogen and progesterone production, which is associated with ventilatory drive, decreases after menopause (Matsumoto & Chin, 2019). Female sex hormones have some sort of protective effect on upper airway patency or ventilatory drive making post-menopausal women's airway unstable during sleep (Wimms et al., 2016). In pregnancy, several factors contribute to developing SDB. According to a review article by Pamidi and Kimoff (2018), airway calibre is compromised during pregnancy due to increased abdominal girth, weight gain, and nasal mucosal edema from gestational rhinitis.

Symptoms and Health Conditions Associated with SDB in Women

Clinical symptoms also appear to differ between men and women. Ye et al. (2009) found that despite similar age, degree of obesity, and SDB severity, women reported significantly lower functional status, more subjective daytime sleepiness, higher frequency of apnea symptoms during sleep, more mood disturbances, and poorer neuro-behavioural performance compared to men. Fatigue, morning headaches, insomnia, depression and use of sedatives were more frequent in women than in men (Quintana-Gallego et al., 2004). Compared to female controls, women with SDB were more likely to have a comorbid diagnosis including cardiovascular disease, hyperlipidemia, diabetes, asthma, hypothyroidism, arthropathy, reflux/gastritis, and cognitive impairment or dementia (Wimms et al., 2016).

Clinical Response to CPAP Treatment in Women

Ye et al. (2009) found that CPAP therapy significantly improved impaired functional status, daytime sleepiness, mood state, apnea symptoms, and neuro-behavioural performance in both men and women which confirmed the effectiveness of CPAP therapy in both men and women. A tendency toward greater improvement in each outcome was observed in women compared to men, but none of the comparisons were statistically significant (Ye et al., 2009). According to Campos-Rodriguez et al. (2012) adequate CPAP therapy reduced the risks of cardiovascular mortality in women with SDB compared to untreated women. Finally, a cohort study conducted by Loução-de-Amorim and colleagues (2019) showed that women with insomnia and SDB were more likely to experience improvement in their insomnia symptoms after CPAP therapy use when compared to men.

CPAP Therapy Usage in Women

Patel et al. (2020) used telemonitoring data from a CPAP manufacturer database in the United States of America to assess the influence of age and sex on CPAP therapy. Their sample included 789260 individuals starting CPAP therapy in the United States of America. Women composed 41.7% of the sample which, according to the authors, suggest that attempts to increase clinician awareness about the existence of SDB in women over the last 20-30 years has been effective (Patel et al., 2020). CPAP therapy use was measured over the first 90 days of treatment initiation and subgroups of age and sex was analysed. The lowest CPAP therapy usage rate subgroup was women aged 18-30 yrs. old with a mean use of 3.4 hours per night compared to 3.8 hours per night in men of the same age group. 51.3% of women in this subgroup met the predefined minimal usage threshold, which represents an absolute difference of 5.2% compared to men of the same age group. The subgroup who achieved the highest usage rate was men aged 71-80 years old with a mean use of 5.4 hours per night with 80.6% of men in this subgroup meeting the predefined minimal usage threshold. Women used their CPAP devices less than men in each age groups. Women had substantially reduced usage of CPAP in the first week, and their usage declined much more steeply than that for men over the first 90 days of usage. This steeper decline was associated with a larger proportion of young women abandoning CPAP use (Patel et al., 2020). Similarly, Pepin et al. (2021) and Woehrle at al. (2018) also determined that women abandoned their CPAP therapy more than men using telemonitoring data from a CPAP manufacturer database in France and Germany respectively. According to Patel et al. (2020), their work highlights the need to understand the specific challenges faced by younger women and develop strategies designed to address those obstacles.

Factors influencing CPAP Therapy Uptake and Usage in Women

Women have been traditionally underrepresented in SDB and CPAP therapy usage research (Patel et al., 2020). Similarly, much of the literature about factors influencing CPAP uptake and use is male dominated and we cannot assure the factors identified in the literature are applicable to women (Libman et al., 2017; Ward et al., 2014; Wimms et al., 2016). Considering that the prevalence, pathophysiology, symptoms, and health consequences of untreated SDB, as well as clinical response to CPAP therapy and its usage, differ in women compared to men, determining the factors influencing this process in women exclusively is indicated and supported by experts in the field (Patel et. al. ,2020). I was unable to locate neither quantitative nor qualitative research exploring the factors to CPAP therapy uptake and usage with an exclusive focus on women.

Summary

SDB affects at least one in four adults and is associated with negative health outcomes when left untreated. CPAP therapy represents the most effective treatment available, however the clinical outcomes of this treatment are dependent on sustained, long-term nightly usage. Evidence to date indicates that 15-35% of individuals refuse this treatment and that 25% of those who agree to use it fail to meet the minimum nightly usage to achieve the desired clinical outcomes. CPAP therapy appears to improve clinical outcomes similarly in women and men. Despite known effectiveness, women consistently use their CPAP devices less compared to men, they reduce their usage within the first week of treatment more than men, and they discontinue CPAP therapy more than men. Further, while women exhibit a different pathophysiology of SDB, they present with more symptoms for the same level of severity compared to men. Much of the existing literature about the factors influencing CPAP therapy uptake and usage is male dominated. I was unable to find research on this topic with an exclusive focus on the perspective of women. There is a need to identify and understand the barriers and facilitators to CPAP therapy uptake and usage in women to support the development and delivery of effective educational, behavioral, and troubleshooting interventions for this population.

Chapter 3: Theoretical Underpinnings

Theory brings together research findings in a way that helps nursing practice be more purposeful, systematic, and comprehensive (Tracy & O'Grady, 2018). In the clinical context of SDB, CPAP therapy is a challenging treatment because it requires considerable alteration of an individual's lifestyle (Olsen et al., 2008). For example, the individual needs to learn how to turn on and off the device, how to modify humidity settings, how to readjust their mask to troubleshoot air leaks. Beyond the knowledge of how, the individual also needs to be able to perform the task successfully. Treatment of SDB with CPAP therapy is not curative, meaning in most cases the individual will require this therapy for life, with some exceptions (e.g., pregnancy related SDB, medication induced SDB). Adopting CPAP therapy requires the user to learn, practice and integrate new skills – tasks which will be required for life, thus consistent with changing behaviour. Research suggests that psychological correlates (i.e. treatment expectancies, decision-making, self-efficacy) are not only predictive of CPAP therapy use, but also amenable to intervention (Weaver & Sawyer, 2010). Behaviour change theories such as the Trans-theoretical model (Prochaska & DiClemente, 1983), the Health Belief Model (U.S. Public Health Service) (Rosenstock, 1974), Self-efficacy (Bandura, 1997) and Motivational Enhancement (Miller & Rollnick, 2012) have been used to explain, predict or modify CPAP therapy use (Aloia et al., 2005; Aloia et al., 2013; Bakker et al., 2016; Deng et al., 2013; Lai et al., 2014; Olsen et al., 2008; Shahrabani et al., 2014; Weaver et al., 2003).

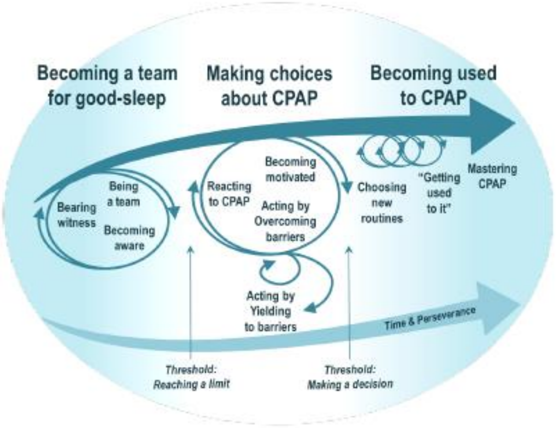
In this chapter, I present the theory guiding the content of this thesis: *Bargaining and Balancing Life with CPAP* theory developed by Ward (2016). I have selected the Bargaining and Balancing Life with CPAP theory as it is a mid-range theory which addresses a particular patient experience, offers a focused structure of ideas and concepts related to SDB and CPAP therapy, and is applicable to nursing practice (Tracy & O'Grady, 2018). Ward's (2016) theory of *Bargaining and Balancing Life with CPAP* explains and predicts behaviours related to living with SDB and using CPAP therapy (Ward, 2016), therefore can be directly linked to the overarching aim of this thesis to identify the factors influencing CPAP uptake and usage.

Bargaining and Balancing Life with CPAP

Ward, Gott and Hoare (2017, 2018, 2019) developed the *Bargaining and Balancing Life with CPAP theory* in 2016 (Figure 1). It was constructed using an extended storyline technique and was based on the experiences of 12 individuals, including four women, using CPAP therapy and four spouses. They found that CPAP therapy use is optimized when individuals engage in teamwork with someone with whom they are in a close relationship, most often their spouse. This theory has three categories separated by two thresholds. Each category is represented by subcategories. The subcategories are considered circular and dynamic. Individuals remain in that category until they cross a threshold and move to the next category.

Figure 1:

Model of the Theory: Bargaining and Balancing Life with CPAP Therapy



Note. This figure depicts constructs and themes of the theory of Bargaining and balancing life with CPAP therapy as explained by Ward (2016). Individuals progress in one direction through the three categories of the pathway starting with becoming a team for good-sleep (Ward, 2016).

Becoming a Team for Good Sleep

In the first category of this theory, termed *Becoming a team for good sleep*, individuals with SDB become aware of their condition. Most often this occurs when their partners express concerns about the disrupting physical manifestations of SDB (snoring, witnessed apneas, sleepiness, sleeping in different bedrooms). Together, they become a team for good sleep and seek medical advice once they can no longer tolerate the status quo (termed *reaching a limit*). *Reaching a limit* describes the point at which individuals choose to act in favour of improving sleep by seeking medical help. Choosing to act and subsequently receiving a diagnosis of SDB represents the first threshold through which individuals pass and do not return because once they become aware of having SDB, they remain aware. Once receiving a CPAP therapy device, individuals begin *Making choices about CPAP*, which is the second main category of this theory (Ward et al., 2018). The construct of *Becoming a team* highlights the influence loved ones have on seeking medical advice for SDB and success with CPAP therapy. Ward et al. (2018) observed that CPAP therapy users desire to protect their loved ones from the effects of SDB; this is a stronger motivator to treat SDB than a clinician’s recommendation to initiate treatment.

Making Choices About CPAP

The second category of this theory is about *Making choices about CPAP therapy* (Ward et al., 2017). In this category, individuals make decisions to achieve good sleep. The authors classified these choices into micro or macro levels. Micro level choices are personal, occur nightly and include choices such as whether to use their CPAP therapy despite feeling ashamed, or how long to use it during the night. Macro level choices are about choosing to place health, longevity, or daily functioning over any negative feelings about CPAP therapy. Based on Ward’s theory, using CPAP therapy at home also elicits affective responses to CPAP therapy, such as feeling relieved, disappointed, or imagining the embarrassment of using the CPAP therapy. Individuals use strategies to enhance motivation to use CPAP therapy such as reminding themselves of the effectiveness of CPAP therapy, recognizing their improvements in daytime functioning, and being afraid of the consequences of untreated SDB. Framing CPAP therapy as a positive choice renders any negative experience as minor and unworthy of attention. Ward's theory highlights the importance of taking time to persevere with CPAP therapy, particularly where time is needed to troubleshoot challenges such as claustrophobia, mask fit, and learning where to position the machine and tubing when sleeping (Ward et al., 2017). *Making choices* is seen as a circular and dynamic process similar to *Becoming a team for good sleep*. Moving on to the next category involves passing another threshold, *decision-making*; after *Making choices about CPAP therapy*, reacting *and by overcoming barriers* the individual makes a commitment to continue this therapy in the long term.

Becoming used to CPAP

The last part of this theory, *Becoming used to CPAP,* is when the individual becomes accustomed to CPAP therapy (Ward, 2016). *Becoming used to CPAP therapy* is achieved through choosing new rituals and routines at bedtime, getting familiar with wearing the device for extended periods of time, and eventually mastering CPAP therapy (Ward, 2016). Ward explains that by choosing new routines, individuals begin to prioritize good sleep, and therefore, make the requisite effort to use CPAP therapy. Getting used to CPAP therapy is contingent on using CPAP therapy regularly and, with time, CPAP therapy becomes routine and part of everyday life (Ward, 2016). Hence, the theory *Bargaining and Balancing Life with CPAP* therefore provides an account of the process involved in using CPAP therapy, viewed essentially as changing a behaviour.

Theoretical Domains Framework

The Theoretical Domains Framework (TDF) primarily guided the data collection and data synthesis of this qualitative evidence synthesis, as it provided a theoretical lens through which to view the cognitive, affective, physical, social and environmental influences on behaviour (Atkins et al., 2017).

The TDF has been used to understand health professional behaviours, as well as patient behaviours (Cane et al., 2012). The theoretical domains also provide a guide to explain current behaviours and key prompts to behaviour change (Michie et al., 2005). Furthermore, there is evidence that behaviour change interventions that are informed by theory are more effective (Cane et al., 2012). Hence, the TDF can assist in the identification of barriers and facilitators to CPAP therapy uptake and use, and eventually inform interventions to promote it. The aim of the TDF is to simplify and integrate a plethora of behaviour change theories and make the theory more accessible to, and usable by, other disciplines (Cane et al., 2012). Therefore, the TDF can be used to understand factors that influence CPAP therapy usage, which as previously stated, requires a behaviour change. The TDF has been primarily used to guide data collection and analysis in qualitative research (Martis et al., 2018; McLellan et al., 2019). The TDF has been used to describe SDB management practices in tetraplegia, and to explore factors influencing clinical practice in sleep medicine physicians (Graco, Berlowitz, et al., 2019). It has also been used to organise findings from qualitative systematic reviews (Craig et al., 2016; Heslehurst et al., 2014; Rushforth et al., 2016; Tuti et al., 2017; White et al., 2020).

Initially developed in 2005 by Mitchie et al. (2005), the TDF is a synthesis of 33 theories and 128 key theoretical constructs of behaviour and behaviour change clustered into 14 theoretical domains (Atkins et al., 2017). As per Mitchie et al. (2012), theoretical constructs are defined as concepts devised to be part of a theory, and theoretical domains are defined as a group of related theoretical constructs. The first version of the TDF contained 12 theoretical domains. This version was validated in 2012, but some domains were reclassified and others added, bringing the most recent TDF version to 14 domains (Cane et al., 2012). In the following table, I have listed and defined all 14 domains, illustrated how each domain could be relevant to CPAP therapy as informed by my clinical experience, and linked the *Bargaining and Balancing Life with CPAP* theory to each domain.

Table 1

TDF Constructs with Illustration of CPAP Therapy Uptake and Usage

Domain	Definition (Danielle et al., 2020)	Illustration relevant to SDB and CPAP therapy	Illustration from *Bargaining and Balancing Life with CPAP*
Knowledge	An awareness of the existence of something	• Knowledge about the signs and symptoms of untreated SDB, • Possible complications if SDB remains untreated, • Information about treatment options, • How to obtain the CPAP therapy device, • How to operate the equipment, • Knowing when and how to clean the equipment, • Knowledge of how long the device needs to be used to experience clinical benefits.	• Seeking information about SDB and CPAP therapy is important to individuals • CPAP therapy-users expressed about how useful it was to have SDB explained to them and how the CPAP therapy device worked
Skills	An ability or proficiency acquired through practice	• Being able to turn on and off the device, • Refilling the water in the humidity chamber, • Installing the mask on one's face, • Adjusting the mask straps to correct leaks, • Being able to clean the equipment.	• Trialing different masks and figuring out the best position for the tubing or machine was common to all individuals interviewed
Social / Professional Role and Identity	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting	• The impact CPAP therapy device has on nocturnal intimacy with partner, • A commercial airline pilot who must use CPAP therapy to keep their license to fly commercial aircrafts	• One participant hid her CPAP therapy device to appear a "well" wife for her in-laws' "strongboy." To this woman, using a CPAP therapy device was not compatible with her role of being a

Domain	Definition (Danielle et al., 2020)	Illustration relevant to SDB and CPAP therapy	Illustration from *Bargaining and Balancing Life with CPAP*
			‘’well’’ wife, as perceived by her in-laws.
Beliefs about Capabilities	Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use	• How easy or difficult it will/would be to use CPAP therapy, • How confident a person feels that they can use CPAP therapy, • Anticipated comfort issues, • How past experiences influence their current or future ability to use CPAP therapy.	• Being prepared to persevere to overcome difficulties with CPAP therapy is a factor in using CPAP therapy
Optimism	The confidence that things will happen for the best, and that desired goals will be attained	• A person’s level of optimism or pessimism regarding the hypothetical effectiveness of CPAP therapy	• CPAP therapy offers a solution to their symptoms which generates optimism for future wellness
Beliefs about Consequences	Acceptance of the truth, reality or validity about outcomes of a behaviour in a given situation	• Potential long-term outcomes of using CPAP therapy, • Health consequences of not treating SDB, • Expecting symptoms of SDB to resolve with treatment, • Anticipated drawback of introducing this type of treatment in the bedroom.	• Being afraid of the consequences of not using CPAP therapy motivates individuals • Individuals believe that not using CPAP therapy jeopardizes their health and increases the risk of road accidents, poor daytime functioning and reduced life expectancy
Reinforcement	Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus	• Relief of SDB symptoms, • Removal of sanctions (such as reinstatement of motor vehicular driving privileges), • Side-effects of CPAP therapy.	• Individuals find strategies to become motivated to use CPAP therapy. • Intentionally testing its efficacy, individuals who tested sleeping without CPAP reported feeling worse the next day. • Individuals report that “seeing the benefit” and having an undisturbed bedpartner makes CPAP therapy use worthwhile.

Domain	Definition (Danielle et al., 2020)	Illustration relevant to SDB and CPAP therapy	Illustration from *Bargaining and Balancing Life with CPAP*
Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way	• The person's motivation to overcome administrative requirements from insurance companies, • The person's inclination to use the CPAP therapy every night all night long	• Most individuals believe that they can get away without CPAP at any given moment • Individuals describe a "certain point" in the night at which they had used "enough" CPAP therapy and choose to "pull it off," while others confessed to occasionally not using CPAP therapy "more out of laziness." • These observations reflect on the stability of intentions over time
Goals	Mental representations of outcomes or end states that an individual wants to achieve	• Resolution of nocturnal or diurnal symptoms, • Being able to return to a shared bed once snoring is no longer present, • Preventing health complications, • Number of hours of usage per night, • The number of nights per week of usage, • Being able to use without side effects.	• The recurrent goal expressed throughout *Bargaining and Balancing Life with CPAP's* storyline is achieving good sleep for both the CPAP user and their partner
Memory, Attention and Decision Process	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives	• Micro and macro level decisions individuals make on a nightly basis	• *Making choices*, the second category of *Bargaining and Balancing Life with CPAP* theory, illustrates some examples of micro and macro level decisions individuals makes on a nightly basis to use CPAP therapy
Environmental Context and Resources	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social	• Costs of therapy or supplies, • Delays getting approval for CPAP from insurances, • Delays meeting with provider, • Time needed to meet provider, • Arranging childcare to meet with	• Power consumption of the CPAP device was a barrier • Does not explore in great depths the environmental context and resources influencing CPAP therapy uptake or usage; this can be explained by the fact that individuals enrolled in this study

Domain	Definition (Danielle et al., 2020)	Illustration relevant to SDB and CPAP therapy	Illustration from *Bargaining and Balancing Life with CPAP*
	competence and adaptive behaviour	provider, • The availability of material and professional resources to troubleshoot side effects of CPAP therapy, • Opening hours and inventory of masks available at the provide, • Nocturnal responsibilities related to caretaking of young children of other family members, • Shift workers.	were eligible for CPAP therapy free of charge by their public health plan
Social Influences	Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours	• How family, friends, and health care worker think, feel, talk and behave in relation to the CPAP therapy, • Spousal support	• *Bearing witness* describes the experience of frustration with, and fear for, the person living with SDB that motivates spouses to act in recognition of symptoms and shared poor sleep which initiates a collaborative team process with the aim to improve sleep for both parties • *Becoming aware* described by Ward explains that without the testimony from loved ones, most CPAP-user remain ignorant of their SDB symptoms • *Acting by overcoming barriers* individuals use strategies for mitigating stigma in response to feelings of shame, embarrassment or fear of rejection from using CPAP therapy. • When individuals anticipate feelings of embarrassment, they conceal their CPAP devices by hiding it away, not taking it when travelling or not disclosing it to a

Domain	Definition (Danielle et al., 2020)	Illustration relevant to SDB and CPAP therapy	Illustration from *Bargaining and Balancing Life with CPAP*
			new partner
Emotion	A complex reaction pattern, involving experimental, behavioural and physiological elements, by which the individual attempts to deal with a personally significant matter or event	• Anxiety • Panic • Claustrophobia	• In *Reacting to CPAP,* individuals describe the emotional reactions to the news they need CPAP therapy, report feeling relieved, feeling disappointed and mistrustful of CPAP therapy while some are embarrassed or ashamed while wearing the mask or fearing what others think of them for needing CPAP therapy
Behavioural Regulation	Anything aimed at managing or changing objectively observed or measured actions	• Self-monitoring of symptoms, • Tracking feedback from the actual device or smart application that reports mask fit, usage and SDB correction during the last period of CPAP device usage, • Behavioural strategies used to overcome claustrophobia, • Adapting the bedtime routine to include refilling the CPAP device humidity chamber before the spouse goes to bed, • Leaving the mask on one's pillow as a reminder to wear the mask when going to bed, • Scheduling the cleaning of the equipment on a calendar.	• Individuals make adaptations to established routines and rituals to cement the intention to become used to CPAP therapy by *choosing new routines* and adapting "just the little things" that enabled "re-learning" of night-time routines to accommodate CPAP therapy use

As presented in Chapter 2, the most effective interventions to improve CPAP therapy uptake and usage are behavioral interventions which target individuals' beliefs, self-efficacy, and motivation (Weaver et al., 2021). These constructs are well contextualised using Ward's theory *Bargaining and Balancing Life with CPAP* and the TDF. *Bargaining and Balancing Life with CPAP* explains what process individuals and their spouses experience while integrating CPAP therapy into their lives, and the TDF provides a conceptual framework for the data collection and analysis of CPAP therapy uptake and usage as a behaviour.

Chapter 4: Methods

In this chapter, I describe the methodology for this qualitative evidence synthesis (QES) which aims to explore the factors influencing CPAP therapy uptake and usage in women. First, I provide a brief overview of various types of knowledge syntheses, then I describe in detail the methods for this qualitative evidence synthesis (QES), including the methods to assure rigor and trustworthiness.

Introduction

A knowledge synthesis summarises all pertinent studies on a specific question, it can improve the understanding of inconsistencies in diverse evidence, and it can define future research agendas (Kastner et al., 2012). There are many types of knowledge synthesis methods, in fact Kastner et. al (2012) identified over 25 different methods. Reviewing all types of knowledge synthesis is beyond the scope of this thesis; however, I will briefly describe the most common types of knowledge syntheses as explained by Whittemore et al. (2014).

Systematic reviews combine evidence from multiple studies by identifying relevant research, appraising study quality, and summarising the findings (Whittemore et al., 2014). Methods are used to minimise bias and provide reliable findings and evidence. Systematic reviews aim for an exhaustive and comprehensive search strategy, quality appraisal may determine inclusion or exclusion of a study and narrative findings are typically presented (Grant & Booth, 2009).

Meta-analysis is a type of systematic review that combines evidence using statistical methods to determine overall effect and the magnitude of effect size (Whittemore et al., 2014). These analyses present a balanced and impartial summary of existing quantitative research (Whittemore et al., 2014).

Mixed studies review is a literature review that concurrently examines qualitative, quantitative, and / or mixed methods primary studies (Whittemore et al., 2014). Mixed review studies can provide robust insight to a complex phenomenon by combining the strengths of both qualitative and quantitative studies (Whittemore et al., 2014). Mixed review studies also provide a potentially more complete picture of the research landscape in a specific topic area (Grant & Booth, 2009).

Integrative review is used to synthesise the results of research or theory using narrative analysis (Whittemore et al., 2014). Scoping review is used to rapidly summarise the range of evidence in order to understand broadly what is known about a phenomenon, and provide a preliminary assessment of the potential size and scope of available research literature (Grant & Booth, 2009).

Umbrella reviews are also known as meta-reviews and overviews of reviews. They are reviews of existing systematic reviews and can be used to assess similarities and differences in published reviews (Whittemore et al., 2014).

Finally, qualitative evidence synthesis (QES) is a method for integrating or comparing findings from qualitative studies (Grant & Booth, 2009). There are multiple purposes to conducting qualitative evidence synthesis which include exploring the barriers, facilitators, perceptions, and attitudes from the participant's perspective (Whittemore et al., 2014). This method helps identify themes or constructs that lie in or across individual studies. The resulting accumulated knowledge may lead to the development of a new theory, an overarching 'narrative' and a wider generalization or 'interpretive translation' (Kastner et al., 2012). I have conducted a QES to identify and synthesize the factors that influence women's behaviours about CPAP therapy uptake and use, from the perspective of women. I decided to focus on qualitative research because I wanted to concentrate on the influencing factors from perspective of women and understand better their experiences with CPAP therapy uptake and usage.

Objectives

The purpose of this qualitative evidence synthesis is to systematically identify and synthesize the existing qualitative evidence on the barriers and facilitators to CPAP therapy uptake and use from the perspective of women with SDB.

Methods

Study Design

This is a QES following the approach articulated by Butler, Hall and Copnell (2016). The conduct and reporting of the study is done in accordance with PRISMA 2020 statement (Page et al., 2021) and the Enhancing Transparency in Reporting the Synthesis of Qualitative Research statement (Tong et al., 2012). The review protocol for this study was registered with the International Prospective Register of Systematic Reviews (PROSPERO) with the registration number CRD42020160696 (Appendix A).

Eligibility Criteria

The eligibility criteria were created using the PICo mnemonic which stands for the *Population,* the *Phenomena of Interest* and the *Context* (Aromataris & Munn, 2020) (Table 2).

Population. Study participants are women and girls of all ages prescribed CPAP as a treatment for SDB. I included reports that referenced study participants as females or women or girls as it is understood that authors often interchange sex and gender-based terms (Clayton & Tannenbaum, 2016).

Phenomena of Interest. Factors that influence the uptake and use of CPAP therapy, as described by the women prescribed CPAP therapy were the phenomena of interest. If a study reported findings from CPAP therapy users as well as from family members or health care workers only findings from the user were included in the review.

Context. Treatment with CPAP therapy must be for the intent to treat SDB at home on a nightly basis.

Study Design. Studies containing qualitative data were included. In the case of mixed methods research, only the qualitative data was extracted and included in the synthesis. Quantitative study designs, commentaries, opinion, and editorials were excluded. Knowledge syntheses of any kind were excluded, but the included primary studies were screened for inclusion.

Table 2

Eligibility Criteria

Criteria	Inclusion	Exclusion
Population	Females with SDB and prescribed CPAP. Prioritization will be given to female-only samples, but samples including both males and females will be included if female only data is available. * will include studies that use term "woman/women" as authors may use this interchangeably with female to denote biological sex.	Infants, children unable to express themselves, and exclusively males/men.
Context	CPAP use for SDB Chronic At home use	CPAP for uses other than SDB. Other treatments for SDB
Outcome	Patient's perspective Perception Attitude Factors influencing CPAP uptake and use (e.g., barriers and facilitators)	Family or health care professional's perspective
Study Design	Qualitative, Mixed methods (only qualitative data will be included)	Randomized controlled trials, Cohort studies, Case studies, Case reports, Knowledge syntheses* (e.g., systematic reviews, integrative reviews)
Publication status	Primary peer-reviewed publications Dissertations / Thesis	Non-peer reviewed literature (e.g., editorials, commentaries); abstract-only papers.
Publication year	All	None
Geographic region	All	None
Language	English and French	None

Abbreviations: CPAP: Continuous positive airway pressure, SDB: Sleep disordered breathing
*= Will review reference list

Search Strategy

Database Searching. A pre-planned comprehensive search strategy was designed in collaboration with two academic librarians (MCD, SV). The search strategy was peer reviewed (PRESS) by an independent librarian (AHo) (McGowan et al., 2016). The following electronic databases were searched: Medline, CINAHL, PsycINFO, Web of Science, Scopus, and ProQuest Dissertations and Theses. Medical subject headings (MeSH) and keywords such as *Sleep Apnea Syndrome*, *Positive Airway Pressure*, *barriers, facilitators, perspective, acceptance*, *treatment adherence, compliance*, *attitude to health* were used. A search filter was used to find qualitative research evidence, including the qualitative component of mixed methods studies (Dejean et al., 2016). The search strategy was translated for each database by ML and verified by SV. See Table 3 for supplemental information on the search strategy. The search strategy for all databases can be found in Appendix B.

Geography and Language. There was no restriction on geographic location. Studies published in English or French were included, whereas other languages were excluded.

Publication Year. No restrictions on publication year.

Hand Searching. Reference lists of included studies were hand searched and screened for inclusion criteria.

Table 3

Building the Search Strategy

Population	Context-SDB	Context-CPAP	Outcome
Adult	Sleep apn?ea* Obstructive sleep apn* (OSA) Sleep apn?ea syndrome (OSAS) Hypopn?ea Sleep disordered breathing	Continuous positive airway pressure (CPAP) Nasal continuous positive airway pressure (NCPAP) Positive airway pressure (PAP)	Perspective* Perception* Attitude* Adapt* Facilitator* Barrier* Coping Cope Adherence Compliance Use Acceptance Buy*

Study Records and Selection Process

Search results were uploaded into Covidence (Veritas Health Innovation Ltd), a systematic review software. Duplicates records were removed on import by Covidence after uploading references. Covidence was used to screen titles and abstracts, full text articles, and resolve disagreements between reviewers. Covidence settings were adjusted to ensure I screened each record at both levels, that each record was screened twice at each level, and reasons for exclusion were captured to generate the PRISMA-Flow diagram. A record-screening tool was developed based on our eligibility criteria (Appendix C). Prior to formal screening, two reviewers (AH, ML) piloted the screening tool with three eligible records to test and refine the screening questions based on accuracy and reliability between reviewers' judgments. Each report was reviewed by two independent reviewers (AH, ML, KL) and screened in a two-step process. First, AH or KL and I, screened each record by title and abstract to determine if the record met the eligibility criteria. If at least one reviewer included the record or was unsure, the record moved ahead to the second screening step. In the second step, remaining full-text records were screened using the same eligibility criteria. Reasons for exclusion (no women/girls in sample, no quotes from women, wrong study design, wrong language etc.) were captured during this step. In the case of disagreements, a third reviewer was available but in the end was not required. Records were excluded only if both reviewers agreed to discard them.

Data Items

Data items included study characteristics (authorship, year of publication, country, study design, setting, sample size), participant characteristics (number of females, age, duration of CPAP therapy usage prior to participation in study), the study objective as related to this review, and all direct participant quotes expressed by women and/or girls related to the barriers and facilitators of CPAP uptake and use. Quotes were extracted from the results and findings section, as well as any supplemental documents available online.

Data Extraction

I created a standardized data extraction form in Excel (Microsoft Office) to extract relevant data from included studies. The form was piloted with four studies and revised to add length of time since initiation of CPAP therapy. AH and I conducted data extraction using this form. Extracted data were compared between us. Discrepancies were resolved by discussion and by referring back to the study. A third extractor was available in the event of disagreements but was not required. In the case of missing data (e.g., if a study did not disclose the sex/gender of participants or when it was not possible to identify the gender of the participant who provided the quotes), I contacted corresponding authors via email or ResearchGate. I sent reminders at three and six weeks. If no response was received within seven weeks, the study was excluded.

Quality Appraisal of Included Studies

I appraised the quality of each included study using The Critical Appraisal Skills Programme (CASP) checklist (Singh, 2013). This 10-item checklist was selected because it is widely used in qualitative systematic reviews (Butler et al., 2016), including a systematic review with a similar phenomenon of interest (Ward et al., 2014).

Each study was critically appraised by two independent reviewers (AH, ML). There were no disagreements in ratings to be resolved. Studies were not excluded based on methodological quality. Rather, this step was done to provide a sense of the quality of evidence available, and to inform future research.

Data Synthesis

The TDF was used to identify and categorise the barriers and facilitators as described by Atkins et al. (2017). Data synthesis occurred in three stages and was managed with Excel (Microsoft Office) and NVivo V.12 qualitative data analysis software (QSR International). The first stage involved the coding of each quote in three distinct steps by two independent coders (ML, AH) in Excel. As recommended by

Atkins et al. (2017), a coding guide was developed for data synthesis (Appendix D). After coding four studies, coders met to compare the labels they applied and agreed on a set of codes to apply to all subsequent studies. The coding guide was iteratively revised three times. First, each quote was coded as a quote referring to either uptake or usage of CPAP therapy. Second, quotes were assigned one or more of the 14 theoretical domains of the TDF to a maximum of three domains per quote since different parts of the quote applied to different domains. Third, the barrier or facilitator label was assigned to the quote's domain(s). Some quotes were coded as barriers and facilitators in the same or different domains. Two independent coders (AH, ML) conducted 100% of the coding. Disagreements in coding were resolved by discussion and the thesis committee was consulted to reach consensus. Once coding was completed and disagreements resolved, original authors of the included studies were contacted. This was done to ensure that the TDF domains attributed to the quotes from their publication were concordant with the message their study participants were conveying during their interviews and/or were concordant with the author's interpretations. Authors were contacted up to two times and given four weeks to respond to each request. Full-text reports were then imported in NVivo V.12 and quotes were coded as per the Excel master file.

The second stage included a frequency analysis across studies using Excel and NVivo V.12. In Excel, the frequency of each identified theoretical domain was calculated across included studies which captured the proportion of included studies that identified each theoretical domain at least once. NVivo V.12 was used to run two *Matrix Coding Query* to see coding intersections between two lists of items (domains). *Matrix Coding Query* allows to make comparisons and see patterns. The first query selected only the quotes coded as 'CPAP therapy uptake' then examined the cumulative frequency counts of TDF domains coded within these quotes. The same process was repeated for the quotes coded as 'CPAP therapy usage'. The last query identified co-occurring TDF domains; this query identified which were frequently coded together for the same quote across all the data.

The last stage involved a qualitative content analysis to generate themes within the women's quotes using Word (Microsoft Office). Generation of themes was inspired by the qualitative content analysis methods described by Graneheim and Lundman (2004) and Vaismoradi et al. (2016). Women's quotes were broken down into condensed meaning unit. According to Granheim and Lundman (2004), a condensed meaning unit is the constellation of words or statements that relates to the same central meaning. Next, each condensed meaning unit was assigned a code. Coding reduced the amount of raw data to what was relevant to the research question, it broke the data down into manageable sections, and allowed the transformation of raw data to higher-level abstractions (Vaismoradi et al., 2016). Themes within the codes were then constructed using the five steps described by Vaismoradi et al. (2016). Classifying (step 1) is the process of grouping a large range of codes under a similarity (Vaismoradi et al., 2016). Once the codes were grouped together by similarity, they were compared within their classification and with other classifications. The purpose of comparing (step 2) was to detect codes which did not belong together and to ensure the codes were exclusive to only one classification (Vaismoradi et al., 2016). Classifications were then labeled using terms derived from the vocabulary found in the codes, known as labelling (step 3) (Vaismoradi et al., 2016). The objective of labelling was to find labels that gave a sense of the main idea emerging from the codes (Vaismoradi et al., 2016). The next step was translating and transliterating (step 4), which entailed identifying and describing the themes through language use (Vaismoradi et al., 2016). The definitions of the words used to label the themes were reviewed to make sure they adequately represented the meaning of the themes. The final step was defining and describing (step 5) the themes. The definition of the themes encapsulates the essence of what each theme is about and signals what aspects of data each theme captured. It encompasses the description of how well the theme fits into the whole data in relation to the research question (Vaismoradi et al., 2016). The constructed themes were then verified, also known as the rectification phase (Vaismoradi et al., 2016). During this process the relative certainty of the constructed themes were checked and confirmed by "immersion and distancing," "relating themes to established knowledge," and "stabilizing" (Vaismoradi et al., 2016). Qualitative content analysis is a self-correcting and cyclic process where researchers need to both immerse themselves in the data while also distancing themselves to reveal themes, and to assess and examine the accuracy of the coding process (Vaismoradi et al., 2016). Once the first round of classification was completed, I did not look at the data for 2 weeks to ensure distancing occurred. This allowed me to identify some codes which did not belong to a classification. Distancing also occurred after labelling. Relating themes to established knowledge allowed me to make inferences from the data; once themes were developed and the literature was studied, I was ready to formulate theme statements (Vaismoradi et al., 2016). The TDF and Ward's *Bargaining and Balancing Life with CPAP* theory were used to make inferences from women's quotes. In the stabilizing stage, themes and their variations were described to enhance transparency and truthfulness, and facilitate transferability of the findings, attention was given to data saturation and description of the original context of data (Vaismoradi et al., 2016). I conducted the qualitative content analysis (ML) which was reviewed by a supervisor experienced with qualitative content analysis (AV).

Confidence in the Synthesized Qualitative Findings

The rigour of this review was ensured by following five criteria for trustworthiness: credibility, dependability, confirmability, transferability, and authenticity (Guba & Lincoln, 1994).

Credibility. The purpose of credibility is to establish confidence that the results are true, credible and believable (Lincoln & Guba, 1986). Credibility was enhanced using a variety of strategies: 1) by providing direct quotes to exemplify descriptions; 2) by engaging in a team-based approach for data analysis by the involvement of members with a wide range of expertise in qualitative research and sleep disordered breathing research, and 3) by keeping an audit trail and reflective journal to provide a clear decision trail.

Dependability. This criteria ensures the findings are reliable meaning that the findings would be the same if the inquiry was repeated within the same participants, coders, and context (Lincoln & Guba, 1986). A rich description of the study methods was provided, detailed documentation of the analysis process was maintained, highlighting all steps and judgments made. Audit trails and peer debriefing provided a detailed log of analytical decisions that were made. Further, all relevant domains, barriers and facilitators, and themes within them were discussed and approved by all committee members to ensure that our findings accurately represented the data.

Confirmability. This criteria is analogous to researcher objectivity (Lincoln & Guba, 1986), which provides confidence that the results would be confirmed or corroborated by other researchers (Forero et al., 2018). Proposed strategies include reflexivity and triangulation (Forero et al., 2018). I used a reflexive journal to describe my experience and thoughts throughout the research process. Data triangulation was used in several methods, 1) by using theory to guide the TDF codebook creation; 2) by reaching out to authors to confirm whether they agreed with our coding, and 3) The TDF and Ward's *Bargaining and Balancing Life with CPAP* theory were used to make inferences from women's quotes.

Transferability. This criteria refers to the extent that the findings can be generalized or transferred to other contexts or settings (Lincoln & Guba, 1986). This was enhanced by providing adequately described characteristics of included studies, and numerous participant quotes. Unfortunately, data saturation was not achieved for some findings due to limited quotes with a similar topic.

Authenticity. This criteria ensure fairness, defined as a balanced view that presents all constructions found in the quotes (Lincoln & Guba, 1986). This was achieved by presenting the findings in a fair and objective manner to ensure the representation of the different women's perspectives uncovered in our study. Quotes representing barriers and facilitators were presented for each theme, when available.

Chapter 5: Findings

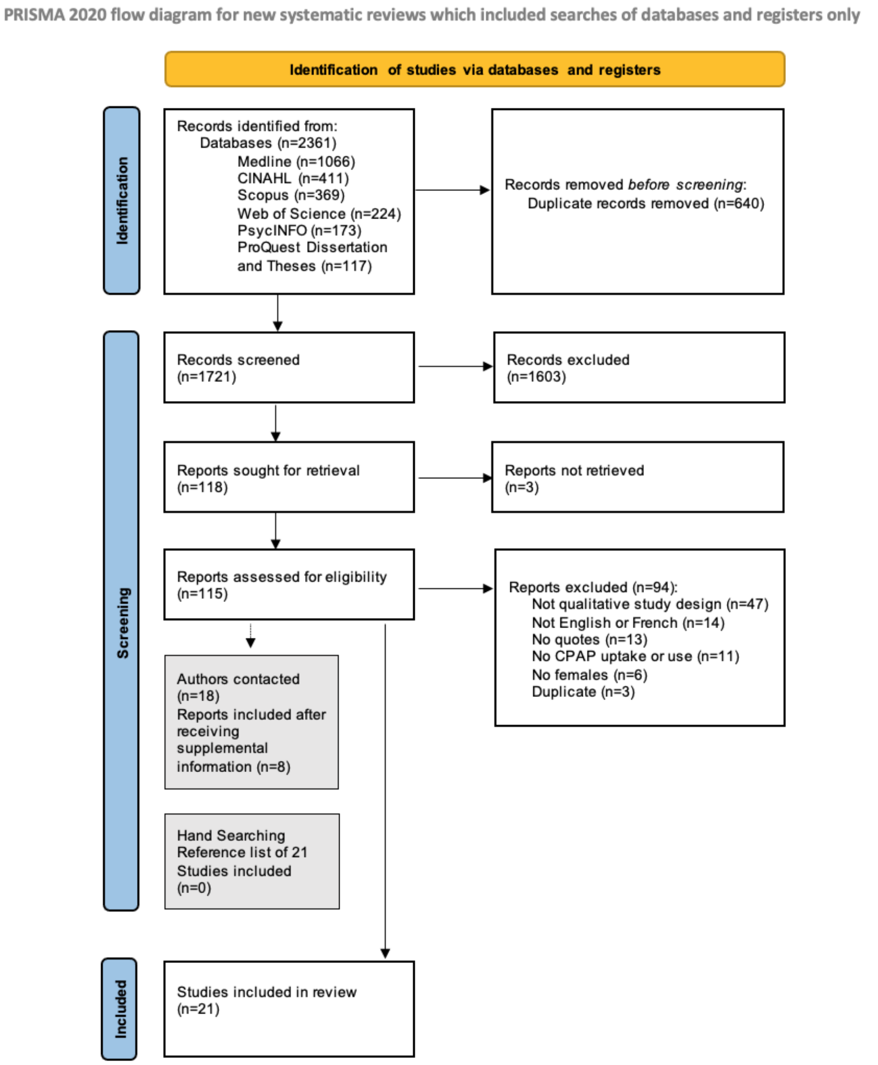
In this chapter, I present the databases search results, characteristics of included studies, a description of study participants, and quality appraisal results. The data analysis findings are presented in two distinct formats, 1) a narrative report and frequency count of frequently cited barriers and facilitators mapped to the TDF domains and 2) a qualitative content analysis describing the barriers and facilitators to CPAP therapy uptake and use from the perspective of women with SDB.

Included Studies

Databases were searched on December 16th 2019, which yielded 2361 records. After removing 640 duplicates and screening 1721 records for title and abstract, 118 reports were retained for full-text screening. Primary reasons for exclusion after full-text review included: not a qualitative study design (n=47), not English or French (n=14), no quotes (n=13), not CPAP uptake or usage (n=11), no females (n=6), and unable to locate full-text (n=3). A total of 21 reports representing 21 distinct studies were included in this review. The Prisma 2020 flow diagram can be viewed in Figure 2.

Figure 2.

Prisma 2020 Flow Diagram



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

Study and Participant Characteristics

Publication dates of the included studies ranged from 2006 to 2019. Studies were conducted in the United States of America (n=10), New Zealand (n=3), Canada (n=2), Israel (n=2), Australia (n=1), India (n=1), Ireland (n=1), and Norway (n=1). Of the 21 studies, 16 used qualitative methods and five used mixed methods. Data collection strategies included narrative and semi-structured interviews, focus groups, and semi-structured questionnaires. Samples were recruited from a wide range of settings, which included community support groups, veterans' affairs medical centers, rural and urban general hospitals, as well as adult and pediatric tertiary care hospitals. Women comprised six to 62 percent of the study samples (n=1-28 women per study), and their ages ranged from 11 to 89 years. Three studies focused on specific developmental stages across the lifespan, including adolescence (n=2 studies) and older adulthood (n=1 study). Study participants used CPAP therapy devices at home for zero days (never used) to seven years. Table 4 provides a summary of the study characteristics of the included studies.

Table 4

Characteristics of Included Studies

Author, year, country	**Methodological approach, Study design and Data source**	**Setting and sample**	**Study objective as related to this review**
Alebraheem et al., 2017, Canada	**Qualitative** Qualitative descriptive Semi-structured interviews	Pediatric tertiary care hospital **Age:** 11-16 years **Females (n, %):** 8 (38%) **Length of CPAP use:** 3-12 months	To explore the facilitators and barriers to CPAP adherence for adolescents.
Ayow et al., 2009, Canada	**Qualitative** Comparative case study Semi-structured interviews	Tertiary care hospital outpatient department **Age:** 38-58 years **Females (n, %) :** 4 (50%) **Length of CPAP use:** 1-52 months	To outline the perspectives of OSA patients who use CPAP compared to the perspectives of OSA patients that have abandoned OSA therapy. Factors that affect use are described.
Bakker et al., 2014, New Zealand	**Qualitative** Qualitative descriptive Focus group	Hospital sleep center **Age:** 30-71 years **Females (n, %):** 7 (39%) **Length of CPAP use:** 9 months	To conduct focus group sessions with Māori, Pacific and NZ European patients referred to a tertiary-level clinic for CPAP treatment.
Dickerson & Kennedy, 2006, United States	**Qualitative** Heideggerian hermeneutics Semi-structured interviews	General hospital in an urban area and a rural hospital **Age:** 40-73 years **Females (n,%):** 5 (29%) **Length of CPAP use:** 1 month-7 years	To examine support-group experiences of individuals with sleep apnea who use CPAP devices.
Dickerson & Akhu-Zaheya, 2007, United States	**Qualitative** Heideggerian hermeneutics Semi-	Sleep center **Age:** 31-72 years **Females (n, %):** 11 (55%)	To longitudinally discover the experiences of individuals with sleep apnea who use CPAP devices from diagnosis to 3 months.

Author, year, country	Methodological approach, Study design and Data source	Setting and sample	Study objective as related to this review
	structured interviews	**Length of CPAP use:** 1-3 months	
Fung et al., 2015, United States	**Qualitative** Qualitative descriptive Semi-structured focus groups	Veterans Affairs Medical Center **Age:** ≥50 years **Females (n, %):** 1 (11%) **Length of CPAP use:** not stated	To explore in detail the types of difficulties experienced by patients with physical/sensory impairments who use PAP devices.
Gibson et al., 2018, New Zealand	**Qualitative** Qualitative descriptive Semi-structured focus groups	Hospital sleep center **Age:** 67-89 y **Females (n, %):** 1 (6%) **Length of CPAP use:** 3 months-6.4 years	To explore the experiences of older people regarding diagnosis and treatment services for OSA.
Goyal et al., 2017, India	**Mixed methods** Cross-sectional Semi-structured questionnaires	Sleep center **Age:** 47-56 y **Females (n, %):** 21 (27%) **Length of CPAP use:** ≥ 1 month	To report the proportion of patients in India who do not use CPAP despite therapeutic indication, and to understand the reasons and barriers for the non-use of CPAP in this patient population.
Graco et al., 2019, Australia	**Mixed methods** Qualitative descriptive Semi-structured interviews	Hospital outpatient department **Age:** 23-79 y **Females (n, %):** 3 (19%) **Length of CPAP use:** 4 weeks	To estimate adherence to CPAP in people with tetraplegia and explore associations between baseline factors and adherence. To understand the individual experience of using CPAP; including barriers and enablers to CPAP use.
Henry & Rosenthal, 2013, United States	**Mixed methods** Exploratory Semi-structured interviews	Sleep center **Age:** 50-66 y **Females (n, %):** 5 (42%) **Length of CPAP use:** <1-6 months	To understand how people within a relationship come to perceive the nature and severity of sleep apnea, and how their experiences influence subsequent help seeking behavior.
Khan et al., 2019, United States	**Qualitative** Qualitative descriptive Semi-structured interviews	Not stated **Age:** 46-70 y **Females (n, %):** 16 (57%) **Length of CPAP use:** 1-17 weeks	To identify OSA patients' preferences, partner experiences, barriers, and facilitators to positive airway pressure adherence.

Author, year, country	Methodological approach, Study design and Data source	Setting and sample	Study objective as related to this review
Lucken, 2019, **United States**	**Qualitative** Qualitative case study research Semi-structured interviews	Hospital outpatient department **Age:** 31-70 years **Females (n, %):** 4 (50%) **Length of CPAP use:** 1-4 months	To explore the self-described successes of new users of CPAP with a diagnosis of OSA within the first month of treatment.
Matthias et al., 2014, **United States**	**Qualitative** Qualitative descriptive Semi-structured interviews	Veterans Affairs Medical Center **Age:** I-CAP study, 54-83 years **Females (n, %):** 2 (9%) **Length of CPAP use:** 0 days-1 month	To understand how patients who have had a stroke or TIA and are diagnosed with sleep apnea understand their diagnosis and navigate the challenges of adapting to CPAP therapy.
Møkleby & Mengshoel, 2019, **Norway**	**Qualitative** Narrative approach Narrative interviews	Hospital outpatient department **Age:** 36-76 years **Females (n, %):** 2 (29%) **Length of CPAP use:** 4 months-3 years	To further explore users' individual experiences of CPAP use in an attempt to enrich the understanding of adherence beyond numeric measurement.
O'Donoghue & McKay, 2012, **Ireland**	**Qualitative** Qualitative descriptive Semi-structured interviews	Community support group **Age:** ≥18 years (not stated) **Females (n, %):** 3 (33%) **Length of CPAP use:** not stated	To investigate how OSA impacts daily life and occupational engagement.
Ong et al., 2017, **United States**	**Mixed methods** Qualitative descriptive Semi-structured interviews	Sleep center **Age:** 37-68 years **Females (n, %):** 21 (62%) **Length of CPAP use:** ≥3 months	To examine the process of care from the patient perspective and to identify important issues related to the assessment and delivery of treatment within an interdisciplinary sleep clinic for patients with OSA and comorbid insomnia.
Prashad et al., 2013, **United States**	**Qualitative** Grounded theory Semi-structured interviews	Pediatric urban hospital **Age:** 12-18 years **Females (n, %):** 6 (29%) **Length of CPAP use:** 3 months-6 years	To identify and explore factors that influenced adolescent CPAP use.

Author, year, country	Methodological approach, Study design and Data source	Setting and sample	Study objective as related to this review
Sawyer, 2007, United States	**Mixed Methods** Concurrent nested Semi-structured interviews	Veterans Affairs Medical Center **Age:** 22-72 years **Females (n, %):** 2 (13%) **Length of CPAP use:** 5-30 days	To elucidate and examine differences among adult OSA patients with regard to their beliefs and perceptions about the OSA diagnosis and treatment with CPAP and self-efficacy relative to CPAP adherence outcomes.
Ward, 2016, New Zealand	**Qualitative** Grounded theory Semi-structured interviews	Hospital outpatient department **Age:** 35-64 years **Females (n, %):** 4 (25%) **Length of CPAP use:** 2-6.5 years	To construct an explanatory theory about how CPAP-users live with CPAP for obstructive sleep apnoea.
Zarhin & Oksenberg, 2017, Israel	**Qualitative** Symbolic interactionism and grounded theory Semi-structured interviews	Sleep center **Age:** 30-66 years **Females (n, %):** 28 (46%) **Length of CPAP use:** <18 months	To understand patients' experiences of CPAP use and non-use.
Zarhin & Oksenberg, 2018, Israel	**Qualitative** Symbolic interactionism Semi-structured interviews	Sleep center **Age:** 30-66 years **Females (n, %):** 28 (46%) **Length of CPAP use:** <18 months	To consider technology's effects on patients' self and subjectivity as a possible cause of nonadherence.

CPAP: Continuous positive airway pressure
NZ: New Zealand
OSA: Obstructive sleep apnea
TIA: Transient ischemic attack

Quality Appraisal of Included Studies

Eight out of the 21 included studies scored 10 out 10 on the CASP checklist (Bakker et al., 2014; Dickerson & Kennedy, 2006; Fung et al., 2015; Gibson et al., 2018; Lucken, 2019; Mokleby & Mengshoel, 2019; Prashad et al., 2013; Ward, 2016), nine studies scored nine out of ten (Alebraheem et al., 2018; Dickerson & Akhu-Zaheya, 2007; Goyal et al., 2017; Graco, Green, et al., 2019; Matthias et al., 2014; O'Donoghue & McKay, 2012; Ong et al., 2017; Sawyer, 2007; Zarhin, 2018), with the authors most commonly omitting to report on the considerations about the relationship between researcher and participants (n=7), and rigorous data analysis (n=4). The remaining four studies scored between six and eight out of 10 (Ayow et al., 2009; Henry & Rosenthal, 2013; Khan et al., 2019; Zarhin & Oksenberg, 2017). All studies met criteria for 1) clear statement on the study findings, 2) study question appropriate for qualitative research design, and 3) valuable research. The most frequently missed criteria was: “Has the relationship between researcher and participants been adequately considered?,” where it was not possible to answer this question for seven studies (Alebraheem et al., 2018; Ayow et al., 2009; Henry & Rosenthal, 2013; Khan et al., 2019; Ong et al., 2017; Zarhin, 2018; Zarhin & Oksenberg, 2017). CASP checklist results are presented in Table 5.

Table 5

CASP Results

Author, Year, Country	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Alebraheem et al., 2017, Canada	🟩	🟩	🟩	🟩	🟩	?	🟩	🟩	🟩	🟩
Ayow et al., 2009, Canada	🟥	🟩	?	?	🟩	?	🟩	🟩	🟩	🟩
Bakker et al., 2014, New Zealand	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Dickerson & Kennedy, 2006, United States	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Dickerson & Akhu-Zaheya, 2007, United States	🟩	🟩	🟩	🟩	🟩	🟩	?	🟩	🟩	🟩
Fung et al., 2015, United States	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Gibson et al., 2018, New Zealand	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Goyal et al., 2017, India	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟥	🟩	🟩
Graco et al., 2019, Australia	🟩	🟩	🟩	🟩	🟩	🟩	🟩	?	🟩	🟩
Henry & Rosenthal, 2013, United States	🟩	🟩	?	🟩	🟩	?	🟩	?	🟩	🟩
Khan et al., 2019, United States	🟩	🟩	🟩	?	🟩	?	🟩	🟩	🟩	🟩
Lucken, 2019, United States	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Matthias et al., 2014, United States	🟩	🟩	🟩	🟩	?	🟩	🟩	🟩	🟩	🟩
Møkleby & Mengshoel, 2019, Norway	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
O'Donoghue & McKay, 2012, Ireland	?	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Ong et al., 2017, United States	🟩	🟩	🟩	🟩	🟩	?	🟩	🟩	🟩	🟩
Prashad et al., 2013, United States	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Sawyer, 2007, United States	🟩	🟩	🟩	🟩	🟩	🟩	🟩	?	🟩	🟩
Ward, 2016, New Zealand	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Zahrin, 2017, Israel	🟩	🟩	🟩	?	🟩	?	🟩	🟩	🟩	🟩
Zarhin & Oksenberg, 2018, Israel	🟩	🟩	🟩	🟩	🟩	?	🟩	🟩	🟩	🟩

Legend

Q1. Was there a clear statement of the aims of the research?
Q2. Is a qualitative methodology appropriate?
Q3. Was the research design appropriate to address the aims of the research?
Q4. Was the recruitment strategy appropriate to the aims of the research?
Q5. Was the data collected in a way that addressed the research issue?
Q6. Has the relationship between researcher and participants been adequately considered?
Q7. Have ethical issues been taken into consideration?
Q8. Was the data analysis sufficiently rigorous?
Q9. Is there a clear statement of findings?
Q10. How valuable is the research?
🟩 = yes
🟥 = no
?= can't tell

Part 1: Narrative Report and Frequency Count

Data extraction resulted in 189 distinct quotes from a sample of 182 women. Individual studies provided between one and 27 quotes. A total of eight studies provided the 14 quotes about CPAP therapy uptake, whereas all 21 studies provided the 175 quotes representative of CPAP therapy usage. It was possible to assign all extracted quotes to TDF domains in such a way that all 14 domains were represented. Domains were not mutually exclusive, and quotes were sometimes assigned to more than one domain (and no more than three domains). Original authors of the included studies were contacted to ensure they agreed with the TDF domains attributed to the quotes. Eight authors responded to our request, out of the 72 quotes reviewed (38 % of total quotes), all domains assigned were representative as per the codebook and 5 quotes were changed from barrier to facilitator as our interpretation was not representative of the original data. Two authors could not be reached due to invalid or missing contact information.

Frequency Count

The frequency counts for all labels assigned (uptake, usage, TDF domain, barrier, and facilitator) is presented for all studies in Table 6. This table allows the reader to identify which study provided data for uptake, usage, TDF domains (alphabetically ordered), and whether the section of the quote represents a barrier or facilitator to CPAP uptake or usage. Only one study provided quotes for all domains (Dickerson & Akhu-Zaheya, 2007). The domain of *Behaviour Regulation* was represented by the greatest number of studies (n=18 studies). All quotes coded as representing the domain of *Goals* were facilitators. The domains of *Intentions* and *Memory/Attentions/Decision Processes* were the least represented with only nine quotes each.

Table 6

Detailed Summary of Frequency Count

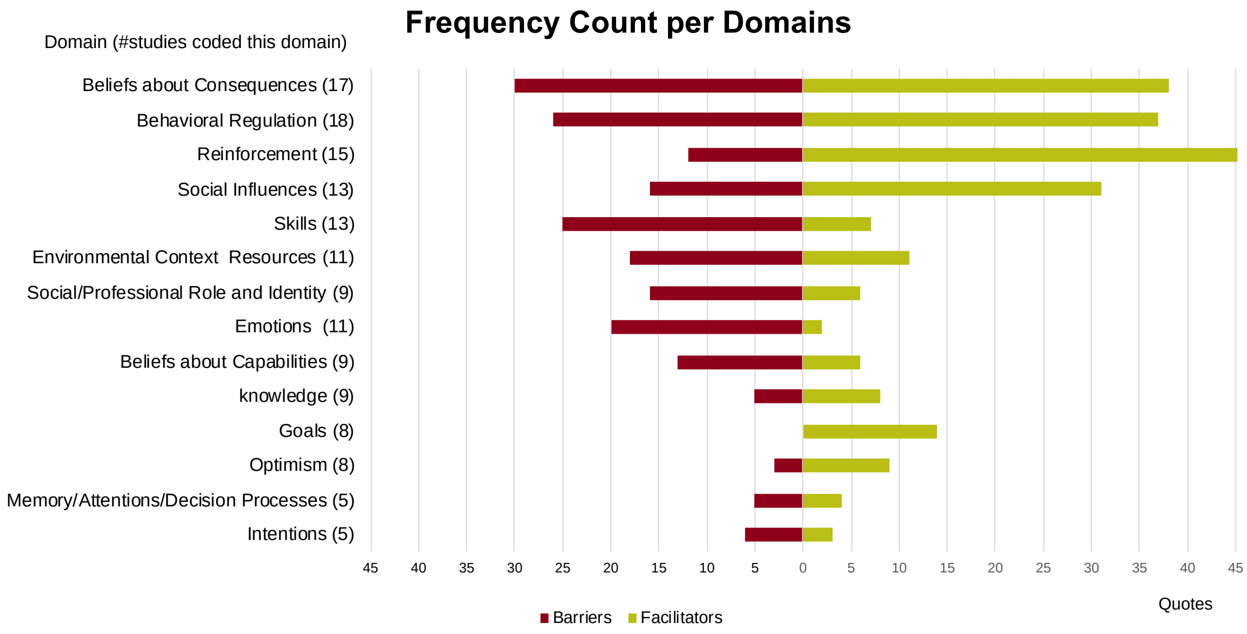
Author, Year, Country	# quotes	% proportion of quotes	#uptake	# usage	Behavioral Regulation		Beliefs about Capabilities		Beliefs about Consequences		Emotions		Environmental Context Resources		Goals		Intentions		knowledge		Memory/Attentions/Decision Processes		Optimism		Reinforcement		Skills		Social Influences		Social/Professional Role and Identity	
					B	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F
Alebraheem et al., 2017, Canada	7	4%		7	2	1		1	2		2		2								1				4		2					
Ayow et al., 2009, Canada	3	2%		3			2		1		1									1									2		1	
Bakker et al., 2014, New Zealand	7	4%	1	6		2				3	1	1	1	2						1				1		2			1	3		
Dickerson & Kennedy, 2006, United States	7	4%		7	3	3	2	1	1	1				1						1		1				1	2			2		
Dickerson & Akhu-Zaheya, 2007, United States	27	15%	2	25	2	7	3	2	6		3		4	2		1		1		2	1	2		2	2	5	8	2	2	4	2	1
Fung et al., 2015, United States	1	1%		1																							1					
Gibson et al., 2018, New Zealand	2	1%		2		1										1			1													
Goyal et al., 2017, India	2	1%	1	1	1								1				1															
Graco et al., 2019, Australia	11	6%		11	1	1	1		2	2	2		1	1		2							1	1	3	3	1				2	
Henry & Rosenthal, 2013, United States	4	2%		4	1				1	1																1	1		2		2	
Khan et al., 2019, United States	16	9%	1	15	2				4	4	2		1	2		3			2	1				1	2	5	2	1		1		3
Lucken, 2019, United States	27	15%		27	2	4	2	1	1	15	2			3		2									1	16	2	3		4		
Matthias et al., 2014, United States	5	3%	2	3		1		1		4								2						2		2						
Møkleby & Mengshoel, 2019, Norway	3	2%		3	1	1			1							1										1			1		1	
O'Donoghue & McKay, 2012, Ireland	3	2%		3		1	1		2																							
Ong et al., 2017, United States	4	2%		4		1			1	1						1				1						1	1					
Prashad et al., 2013, United States	16	9%		16	8	1			3	1	2						4		1	1	3					1	1		5	3		
Sawyer, 2007, United States	5	3%	1	4	1	1				1	1		1											1			1	1	1	1		
Ward, 2016, New Zealand	24	13%		24	1	11				4	1		5			3			1			1				5	2		2	9	2	2
Zarhin & Oksenberg, 2017, Israel	5	3%	3	2	1	1											1							1		1				3	1	
Zarhin & Oksenberg, 2018, Israel	10	6%	3	7			2		5	1	3	1	2										2			2	1			1	5	
Frequency counts	189		14	175	26	37	13	6	30	38	20	2	18	11	0	14	6	3	5	8	5	4	3	9	12	46	25	7	16	31	16	6
Domain frequency counts					63		19		68		22		29		14		9		13		9		12		58		32		47		22	

B = Barrier, F = Facilitator

Data from the detailed summary of frequency count (Table 6) was used to present the cumulative frequency count of each domain across all 21 studies (Figure 3). Figure 3 allows to see which domains were most frequently coded, and the distribution of barriers and facilitators within them. Domains are ordered in descending order of frequency; red bars indicate the number of quotes labeled as barriers whereas green bars represent quotes labeled as facilitators.

Figure 3

Frequency Count per Domains



The most frequently identified domains of the TDF were *Beliefs about Consequences* (17 studies, 68 quotes), *Behavior Regulation* (18 studies, 63 quotes), *Reinforcement* (15 studies, 58 quotes), and *Social Influences* (13 studies, 47 quotes). The remaining domains were coded to varying amounts (from five to 13 studies, and nine to 32 quotes).

The following domains were more commonly coded as barriers: *Skills* (13 studies, 32 quotes of which 25 were barriers and seven were facilitators), *Emotions* (11 studies, 22 quotes of which 20 were barriers and two were facilitators), *Social / Professional Role and Identity* (9 studies, 22 quotes of which

16 were barriers and six were facilitators), and *Beliefs about Capabilities* (9 studies, 19 quotes of which 13 were barriers and 6 were facilitators).

The following domains were more commonly coded as facilitators: *Reinforcement* (15 studies, 58 quotes of which 46 were facilitators and 12 were barriers), *Social Influences* (13 studies, 47 quotes of which 31 were facilitators and 16 were barriers), *Goals* (8 studies, 14 quotes all of which were facilitators), and *Optimism* (8 studies, 12 quotes of which nine were facilitators and three were barriers) were more frequently coded as facilitators.

Uptake vs. Usage

The 14 quotes for CPAP therapy uptake were coded to eight domains. The most frequently coded domains for uptake were *Environmental Context and Resources* (4 studies, 6 quotes), *Optimism* (4 studies, 6 quotes), and *Beliefs about Consequences* (3 studies, 5 quotes). The 175 quotes for CPAP therapy usage were coded to all 14 domains. The most frequently coded domains for usage were *Beliefs about Consequences* (16 studies, 63 quotes), *Behavior Regulation* (18 studies, 62 quotes), and *Reinforcement* (15 studies, 57 quotes).

Co-occurring TDF Domains

Domains that were coded together most frequently were *Beliefs about Consequences* and *Reinforcement* (n= 35 occurrences). *Behavior Regulation* was also frequently coded with other domains, most often with *Reinforcemen*t (n= 14 occurrences), with *Beliefs about Consequences* (n= 11 occurrences), with *Skills* (n= 11 occurrences), and with *Social Influences* (n= 10 occurrences).

Part 2: Qualitative Content Analysis

The qualitative content analysis of factors influencing women's uptake and usage of CPAP therapy revealed seven themes: *1) Expectations about CPAP, 2) Learning to use my CPAP machine, 3) The burden of the technology, 4) Improvement of SDB symptoms, 5) Not feeling (or looking) like myself, 6) Receiving support, and 7) Choosing my attitude.*

Expectations About CPAP

A woman's expectations about how CPAP therapy could improve their health and quality of life facilitate or hinder CPAP uptake and or usage are included in this first theme. CPAP use was facilitated by women's formed beliefs about how CPAP therapy could improve their symptoms of SBD. These expectations were based on their beliefs about the effectiveness of CPAP therapy and the possibility that it might improve their well-being: "*Maybe I'll sleep better with it. Maybe the 4 hours I do sleep will be of better quality (Zarhin & Oksenberg, 2017, Israel, 1380)."* The belief that CPAP therapy would improve their quality of life was common: *"For me the main reason I am using CPAP is, so I'll have better days, physically and mentally (Graco et al., 2019, Australia, 250)"* and *"I want to be healthy; I want to live. I'm going to get a new grandbaby and I want to live. I don't want to sit in a chair the rest of my life (Khan et al., 2019, United States, 1726)."* Concerns about becoming dependent on a medical device hindered CPAP use: *"I have a feeling you become addicted to it. I don't want to become dependent on something external . . . on a device. So . . . When I started thinking about it, I said, "How will I travel abroad? What will I do? How will I go on vacations?" What, I will be like some geriatric person at home with an oxygen mask? I don't want it [. . .] I want to be a free person, not dependent on devices. (Zarhin & Oksenberg, 2018, Israel, 235)."*

Learning to Use my CPAP Machine

Learning to use my CPAP machine describes participants' reports of the knowledge needed to use the CPAP machine properly. It also includes the trial-and-error period required to wear, use the CPAP device properly and get used to wearing it regularly. Women who were prescribed CPAP therapy had many questions about the technical use of the machine: *"I don't know what to do with the hose and stuff (Khan et al., 2019, United States, 1726)"* and *"I wonder how this is actually working. Is there a… well there is a medical reason why we're doing it, but how does the process actually work? (Gibson et al., 2018, New Zealand, 145)."* Becoming comfortable with the application and overnight use of the CPAP machine took time: *"I had a kind of rough spell getting adjusted, trying different nose pieces; (Dickerson & Akhu-Zaheya, 2007, United States, 245),"* and the participants reported that improper use of their machine was at times distressing: *"There were a few nights where I just couldn't work it out. I bumped it or something, and the dial went off and I'd freak out, (Ward, 2016, New Zealand, 143)."* Managing condensation and refilling the water chamber was a challenge for some women *"Gurgling [from the humidifier] [and] you have to lift up the tube and empty that out and go back to sleep (Dickerson & Akhu-Zaheya, 2007, United States, 245)."* Another example included *"Pouring [water into the water chamber] is very hard…That's a challenge because it's a small hole (Fung et al., 2015, United States, 6)."* Overall, there was an appreciation for the importance of learning to use CPAP properly: *"[I learned that] having the proper equipment, wearing your equipment the right way, and cleaning it the right way is vital. (Khan et al., 2019, United States, 1728)."* Women acknowledged that CPAP therapy takes some time to get used to: *"It is something that has to adjust to it is not like you can just pop it on and go to sleep it is not going to be like that and um, its gonna take a lot of time to adjust to (Lucken, 2019, United States, 92)."* Eventually CPAP therapy became part of the bedtime routine "*I honestly have to say I don't notice anymore, I really don't (Dickerson & Akhu-Zaheya, 2007, United States, 248)," "You just put it on each night and you hardly even notice (Ward, 2016, New Zealand, 138)."*

The Burden of the Technology

Overall, the theme of *The burden of the technology* was mostly comprised of barriers to CPAP therapy uptake and usage. Barriers related to the technology were grouped in three categories: 1) Issues related to material resources needed to obtain and use CPAP therapy such as costs, insurance coverage, ensure electrical power; 2) Physical side-effects from using CPAP therapy; and 3) Emotional reactions to using CPAP therapy. Using CPAP therapy came with added responsibilities and disruptions which participants reported as a burden to their daily lives. One woman expressed *"You have all this equipment, you have to take care of it, clean it, wear it.…It's a nuisance. I have to plug it in, fill it, and* *make sure it is clean (Dickerson & Kennedy, 2006, United States, 117).”* CPAP therapy uptake was an added financial responsibility: *“It is an expensive machine, and I am not sure I can afford it if the insurance doesn’t pay (Dickerson & Akhu-Zaheya, 2007, United States, 247).”* Lastly, ensuring electrical power to operate the CPAP device was a common concern for most *“I fear that if the electricity goes off, the machine would go off (Dickerson & Akhu-Zaheya, 2007, United States, 248)”* especially when travelling “*If we ever stay anywhere like a hotel I'm always checking which side the plug’s on. …When I went on my daughter's year seven camp, and there were no power points in the room, I was a bit freaked out about that (Ward, 2016, New Zealand, 135).”*

Participants experienced physical adverse effects from using CPAP therapy including swallowing air. One woman described: *“You have to expel all of this air and I feel like the first ten minutes while I’m waking, expelling this air… I guess it gets in your stomach or whatever, you have to get it back out but to me that’s a minor thing. If I belch all night, that’s a minor thing, you know, (Sawyer, 2007, United States, 93-94).”* Some had trouble breathing with the mask: *“I wear it, but sometimes I just feel like I’m running out of air (Dickerson & Akhu-Zaheya, 2007, United States, 245)”* and *“I couldn’t really breathe with the air pressure going on (Khan et al., 2019, United States, 1726).”* Complaints related to dry mouth or eyes, or sinus issues were common: *“I’m having a lot of sinus problems because of it. You doing all that sneezing. Last week my nose was driving me crazy, you know, and as soon as I put the mask on it seemed like it was so clogged up and it’s a lot of mucous built up and then for lack of a better word, you know, a lot of hard boogies and stuff in there. It’s just driving me crazy and it was very, very sore (Sawyer, 2007, United States, 93-94).”* Participants also voiced concerns about poor sleep quality due to poorly fitted masks: *“I don’t know if I’m waking up because of the air is (sic) blowing in my eyes, or if I’m waking up by myself and I am noticing that I have air blowing in my eyes (Ong et al., 2017, United States, 190).”* For many participants, the treatment was not physically comfortable: *“I just couldn’t get comfortable with [the PAP machine] (Khan et al., 2019, United States, 1726).”*

Emotional reactions to CPAP therapy such as claustrophobia were described: *“I am claustrophobic and I was very leery about using something over my face* (Dickerson & Akhu-Zaheya, 2007, United States, 245).” Claustrophobia was described as feeling trapped: *“You feel tied to your place, you feel trapped, like a caged animal! (Zarhin & Oksenberg, 2018, Israel, 234);”* but also, as being unable to move: *“I also found that lying down flat, and I couldn't move, that anything could have happened to me. I had no control over it, and being claustrophobic, that made it worse as well (Graco et al., 2019, Australia, supp.8).”* Some women expressed sadness: *“sad that I would have to wear this for the rest of my days (Bakker et al., 2014, New Zealand, 226).”* On the other hand, some women described relief and feeling safer *“I felt relief that we were finally going to get something done (Bakker et al., 2014, New Zealand, 226).”* To some participants CPAP therapy provided reassurance: *“Mine’s like a security blanket… I feel so secure with it (Bakker et al., 2014, New Zealand, 225)’’.*

Improvements of SDB Symptoms

Participants’ expectations were confirmed or rejected depending on their actual experiences initiating CPAP therapy: *“I wish I didn’t have to put it on … but the pay off, feeling OK when you wake up … it doesn’t really make it too questionable (Ward, 2016, New Zealand, 126).”* From a physical health perspective, women most commonly reported a reduction in their symptoms of SDB. They experienced better sleep quality, more energy, fewer headaches, and less snoring; all of which were considered facilitators to CPAP therapy uptake and usage. One participant cited: “*This helps me so much. It’s incredible. I am a completely different person. I feel like I was in a cemetery and moved to heaven . . . I accept it [the CPAP] with love (Zarhin & Oksenberg, 2017, Israel, 230).”* Similarly, another participant expressed “*I couldn’t believe what a difference in how I felt- I’ve never had such a good night’s sleep. I slept! I felt something different with that machine. Like a refresh-ness that I’ve never felt before, or at least in a long time. I felt better. More alert, you know? It’s like strength or something. I felt vibrant! (Henry & Rosenthal, 2013, United States, 53).”* For some participants in the included studies, changes were more gradual: "*Then I did notice gradual changes (Dickerson & Akhu-Zaheya, 2007, United States, 246).*" While most participants described positive changes upon initiation of their CPAP therapy, some women did not experience such effects: "*I don't find there's a difference. Like I still find I have the same energy. I'm still sleepy—I'm still taking naps, which they said that I wouldn't be taking naps (Alebraheem et al., 2017, Canada, 86).*"

Not Feeling (or Looking) Like Myself

This theme describes how the women viewed wearing their CPAP masks and the ways it influenced how they felt about their appearance. In most cases, these feelings hindered CPAP uptake and/or use. Participants in the included studies voiced feeling unattractive or being embarrassed: *"When I have it on and I'm in bed, I feel like a Martian, I feel very unattractive and very ugly (Graco et al., 2019, Australia, supp.9)."* Poorly fitted masks also caused marks on participants' faces *"I put it on so tight that I have marks on my face, and they don't go away (Dickerson & Akhu-Zaheya, 2007, United States, 244)."* They described purposely going to bed after their partners to avoid being seen with their CPAP mask on: "*I used to put it after he went to sleep and I went to bed with it. Nevertheless, I didn't feel at ease with it. It's not a pretty sight (Zarhin & Oksenberg, 2018, Israel, 237).*" Additionally, the device was also seen as unnatural by others: "*This is absurd, sleeping with this gear on my head, it is so unnatural…. (Dickerson & Kennedy, 2006, United States, 117).*" For some, feelings of embarrassment related to their appearance when using the machine dissipated with time: *"Once it's normal in your household then it's easier to feel less embarrassed about it with other people (Bakker et al., 2014, New Zealand, 225)."* Overall participants were not comfortable with the way they looked when wearing the CPAP mask: "*I usually put it only when we go to sleep, when it's dark. I do it quietly. It's not like he doesn't see me, but I avoid putting it back on for my own good feeling (Zarhin & Oksenberg, 2017, Israel, 1379).*"

Receiving Support

Receiving support consists of encouragement from three forms of support: 1) social, 2) spousal, and 3) provider. This was predominantly referred to as a facilitator for their CPAP therapy uptake and use.

Social support referred to support from family, friends, and experienced users (that participants meet in support groups) towards the treatment of SDB and CPAP therapy usage. One participant noted: "*Have somebody who's been through it and has used CPAP for a while come in to talk to somebody for 10 or 15 minutes that's about to start the process… can assure somebody that you do get used to it (Bakker et al., 2014, New Zealand, 225).*" Comments from family or friends regarding observable improvements in symptoms of SDB motivated women to continue using CPAP therapy as described by this participant: "*The people have told me that they see a big change in me (Lucken, 2019, United States, 89).*" Although social support facilitated CPAP therapy uptake and usage for most women, four quotes from two different studies highlighted how non-supportive relationships where poor communication and shaming acted as a barrier: "*They'll make fun of you: 'Oh! She has to wear a mask.' or '...You should see the thing that she has to wear and...' ....So then, you have to make like a joke of yourself... You know, it hurts. It hurts deep down (Ayow et al., 2009, Canada, 233).*"

Spousal support refers to the beliefs, attitudes, and support from spouses towards the treatment of SDB and CPAP therapy usage. Spousal support included physical assistance with the device: "*He helped me to figure it out… and he would be: hang on a minute it can't be this hard. And he'd be sitting there trying to do it (Ward, 2016, New Zealand, 143),*" and emotional support: "*I suppose he tries to make light by cracking jokes, but it doesn't necessarily make me feel any better (Ward, 2016, New Zealand, 111).*" Women described how statements from their spouse reassured them that their spouse approved of this treatment: "*I told him well maybe the machine might bother you, you know, the noise of the machine... he said "no I can deal with that" (Sawyer, 2007, United States, 90-91).*" Furthermore, spouses' statements reaffirmed the ultimate goals of using CPAP therapy*: "He didn't care [about the mask]. He just wanted to get back the person that he married that didn't fall asleep (Ward, 2016, New Zealand, 146)."*

The device provider's availability and engagement towards the women as they learned to wear the CPAP device and get used to it were reported as facilitators. For example, one participant stated "*They were great because [health professional name] rang me a few times just to check up. She was able to turn the pressure down from her end. And then I was able to use it so that was great (Graco et al., 2019, Australia, supp.10)."*

Choosing my Attitude

This theme encompasses how a woman's attitude affects their level of engagement with CPAP therapy, as well as their willingness to accept an imperfect treatment. According to the women, accepting to wear the CPAP mask, despite its inconveniences, was needed to feel better because there were no other treatment options for them: *"I just got in with it… I just adjusted myself to it, because I had to (Ward, 2016, New Zealand, 133)."* This theme also included references to making decisions about CPAP therapy use. Participants described engaging in a trade-off when choosing their attitude about using CPAP therapy: *"There is always a give and take to everything you have to do … (Dickerson & Akhu-Zaheya, 2007, United States, 247)"* and *"Then again, you can't have it all (Zarhin & Oksenberg, 2017, Israel, 1379)."* At times women expressed willingly choosing not to use the CPAP therapy: *"I feel too lazy to use the machine every day (Goyal et al., 2017, India, 1390)"* and: *"It was probably laziness or just forgetfulness, or, I'd be sleeping at my friends' houses for extended periods of time and purposely forget my machine so I didn't have to use it at their house (Prashad et al., 2013, United States, 1307)."* While others refused to give up despite difficulties: *"I refuse not to wear… I still wouldn't stop using it. I wouldn't stop. (Sawyer, 2007, United States, 93-94)."*

Summary

With the findings from the frequency analysis and qualitative content analysis, it is possible to conclude that barriers to CPAP therapy uptake and usage included the TDF domains of: *Skills, Emotions, Social/Professional Role and Identity,* and *Beliefs about Capabilities*; and the themes: *The burden of the technology, Not feeling (or looking) like myself, and Learning to use my CPAP machine.* In contrast, facilitators included the TDF domains of: *Reinforcement, Social Influences, Goals,* and *Optimism*; and the themes: *Improvements of SDB symptoms* and *Receiving support*. It is worth noting that some factors were identified as both barriers and facilitators such as the TDF domains of: *Behaviour Regulation* and *Beliefs in Consequences*; and the themes: *Expectations about CPAP* and *Choosing my attitude.* Appendix E provides a more extensive list of quotes included in each of the seven themes.

Chapter 6: Discussion

The purpose of my thesis was to identify and synthesize the existing qualitative peer-reviewed evidence on the facilitators and barriers to CPAP therapy uptake and use from the perspectives of women with SDB. In this final chapter, I summarize the research findings and discuss how they contribute to the broader theoretical and empirical literature. I also provide implications of the findings for nursing practice, policy, education, and research, as well as an overview of the strengths and limitations of the research.

Summary of Findings

I conducted a QES synthesizing the findings from 21 studies using deductive and inductive analysis. A total of 189 quotes were analyzed from 182 women, aged 11 to 89 years, which comprised six to 62 percent of the original study samples (n=1-28 women per study). The most frequently identified TDF domains were *Beliefs about Consequences* (n=30 barriers; n=38 facilitators), *Behavior Regulation* (n=26 barriers; n=37 facilitators), *Reinforcement* (n=12 barriers; n=46 facilitators), and *Social Influences* (n=16 barriers; n=31 facilitators). Barrier domains were *Skills, Emotions, Social/Professional Role and Identity,* and *Beliefs about Capabilities*; while facilitator domains were *Reinforcement, Social Influences, Goals,* and *Optimism*. *Behaviour Regulation* and *Beliefs about Consequences* were two domains which encompassed a more evenly distribution of both barriers and facilitators. Seven themes emerged from the qualitative content analysis of factors influencing CPAP uptake and usage: *1) Expectations about CPAP, 2) Learning to use my CPAP machine, 3) The burden of the technology, 4) Improvement of SDB symptoms, 5) Not feeling (or looking) like myself, 6) Receiving support, and 7) Choosing my attitude.*

Discussion

These findings bring me to three mains points of discussion. First, the limited state of scientific literature about the perspectives of women using CPAP therapy. Second, the usefulness of the TDF to understand women's perspectives about CPAP therapy uptake and usage. And third, how knowledge of the factors influencing CPAP therapy uptake and usage expressed by women can help design and develop future interventions to improve CPAP uptake and use.

State of Scientific Literature about the Perspectives of Women

Existing qualitative evidence on CPAP uptake and usage is limited in its consideration of women's perspectives. I was surprised to observe that, despite C2PAP therapy being available since 1981 and affecting at least nine percent of women (Matsumoto & Chin, 2019), the experience from the perspectives of women has not been qualitatively explored using a women-only study sample. In fact, of the 1721 records retrieved through the search, only two had an exclusive focus on women with samples comprised entirely of women. Unfortunately, these two records did not meet inclusion criteria for the following reasons: one study focused on the role of obesity in SDB in individuals with polycystic ovarian syndrome and did not explore CPAP therapy use (Gopal et al., 2002), and the second study was not available in French or English (Lee et al., 2015). Three reports reviewed at the full text level did not have women in their samples (Baron, 2007; Bulteel et al., 2019; McKnight, 2014), despite sex or gender not being an exclusion criterion. Of these three reports, one used a qualitative design and would have been eligible for this QES if the sample included women (Bulteel et al., 2019). Of note, I ran the initial search on December 16th, 2019 and on April 17th 2021, I repeated it in Medline to verify if any new records met the eligibility criteria. None did, hence the current qualitative evidence regarding the perspectives of women about their uptake and use of CPAP therapy is appropriately captured in this thesis.

I made interesting observations regarding how the representation of women's perspectives might have affected how the research was conducted, and how the findings were obtained in the 21 included studies. First, in the majority of the study samples (n=16 studies), there was a disproportionate gender distribution favouring men and male participants. Second, no authors reported gender differences in their findings. None of the included studies had this as a specific aim; however, there may have been the potential to highlight how women experienced CPAP therapy differently than men. For example, Prashad and colleagues (2013) recruited 21 teenagers to identify and explore the factors that influenced CPAP therapy usage in this age group. Participants were assigned to one of three groups depending on their degree of CPAP therapy use (no use, low use, and high use). In the high use group, there were no girls and seven boys. In the low use group, there were two girls and five boys. In the no use group, there were four girls and three boys. Non-binary gender groups were not considered. Unfortunately, the authors did not comment on or offer reasons for this disproportionate gender distribution across the three groups, nor how this might have influenced their results.

Third, all authors of the articles included in this QES failed to document their reflections on how gender norms affected their research. For example, Bakker and colleagues (2014), a study included in this review, used focus groups to explore Māori, Pacific, and New Zealand European patients' experience of CPAP treatment. The authors ensured that all three focus groups followed appropriate cultural protocols to welcome participants and promote sharing of experiences; however, there was no documented consideration for the potential impact of collecting data using focus groups composed of participants from different genders. This is relevant because the findings of my QES showed that women's experiences with their CPAP therapy are influenced by gender norms, such as the way the mask interfered with their perceptions of beauty, femininity, and their womanly roles. According to the participants in Henry and Rosenthal's study (2013), using CPAP therapy interfered with culturally prescribed ideals of "partnered sleep," particularly relating to gender, beauty, and couple-intimacy in bed. Therefore, it is plausible that participating women may not have been comfortable discussing how CPAP therapy affects their self-image in front of members from a different gender group. As Bakker and colleagues did not explore this issue at any point in their article, it is not clear how their results were affected by focus groups with participants from different genders.

It is important to consider gender while conducting, and reporting research because research generalizability and the clinical application of research findings is limited when gender differences are overlooked (Heidari et al., 2016). The Sex and Gender Equity in Research (SAGER) guidelines were designed to promote systematic reporting of sex and gender in research. They serve as a guide for authors and peer-reviewers, they are flexible enough to accommodate a wide range of research areas and disciplines, and they improve the communication of research findings (Heidari et al., 2016). The SAGER guidelines provide general principles and recommendations on how to report on sex and gender, including the need for authors to 1) avoid confusing the terms sex and gender, 2) clearly indicate if the results are limited by sex and/or gender, 3) explain whether sex and/or gender is an important variant in their context and whether differences are expected, 4) report how sex and/or gender was accounted for in the study design, 5) disaggregate results by sex and/or gender when appropriate, and 6) conduct a sex and/or gender analysis, or provide rationale for why not. Finally, the authors of the SAGER guidelines argue that using them makes for more rigorous and ethical science (Heidari et al., 2016).

It is also important to give greater voice to the perspective of women with CPAP therapy uptake and usage because women consistently use their CPAP devices less compared to men (Patel et al., 2020). Hence, there is a need to support the development and delivery of effective educational, behavioral, and troubleshooting interventions specifically targeting women using CPAP therapy. Increasing CPAP therapy usage in women is also important for researchers who study health outcomes in women. Pamidi and Kimoff (2018) discussed challenges related to limited CPAP usage during pregnancy and the resultant improvements (or lack of) in maternal-fetal outcomes (Pamidi & Kimoff, 2018). I identified two studies that reported CPAP therapy usage outcomes in pregnancy which illustrates the effect limited CPAP therapy usage can have on study outcomes (Chirakalwasan et al., 2018; Duong et al., 2020). Chirakalwasan et al. (2018), reported that 15 pregnant women (26-40 years old) randomised to CPAP therapy used their CPAP an average of 3.4 hours per night, with seven women using CPAP more than four hours per night. They also found no improvements in glucose levels, but insulin secretion improved in those who used CPAP therapy more than four hours per night. Whereas Duong et al. (2020), found that the 15 pregnant women (31-39 years old) randomised to CPAP therapy used their CPAP an average of 3.3 hours per night and showed significant reductions in nocturnal glucose levels between 3am and 6am when compared to the control group in pregnant women with gestational diabetes (Duong et al., 2020). CPAP therapy usage reported in these two studies are consistent with Patel et al.'s (2020) findings who found that women aged 18-30 years old used their CPAP on average 3.4 hours per night and women aged 31-40 years old used their CPAP an average of 3.9 hours per night. In a mixed sample of 26 women and 21 men, an average use of CPAP therapy of 4.6 hours per night for eight weeks did not improve glucose metabolism either (Weinstock et al., 2012). However, in a mixed sample of 10 women and 16 men, using CPAP therapy more than eight hours per night for 14 nights improved glucose metobolism significantly (Pamidi, Wroblewski, et al., 2015). These studies taken together suggest that the limited outcomes in glucose metobolism documented thus far in pregnancy is related to insufficient CPAP therapy use (i.e. 3.3-3.4 hours per night) and that increasing usage to 8 hours per night likely would have a better outcome on glucose metabolism. Therefore, before conducting larger studies requiring young women to use CPAP therapy, researchers and clinicians need to find interventions which will support women in using their CPAP therapy for close to eight hours each night. To achieve this, it may be useful to conduct qualitative studies with women to further understand their perspective reguarding using CPAP therapy which may help inform interventions specifically targeted for women. The barriers and facilitators to women's uptake and usage of CPAP therapy as identified in my thesis can be used to guide the development of interventions to best support women.

Usefulness of the TDF to Understand Women's Perspective

Using the TDF for data synthesis allowed me to organize data originating from numerous studies in a meaningful way. The aim of the TDF is to simplify and integrate a plethora of behaviour change theories and make the theory more accessible to, and usable by, other disciplines (Cane et al., 2012). The key theoretical constructs of behaviour and behaviour change from 33 behavioural change theories are clustered into 14 theoretical domains (Atkins et al., 2017). The TDF has been used to organise findings from various qualitative systematic reviews (Craig et al., 2016; Heslehurst et al., 2014; Rushforth et al., 2016; Tuti et al., 2017; White et al., 2020). In the field of SDB, the TDF has been used to describe SDB management practices in tetraplegia, and to explore factors influencing clinical practice (Graco, Berlowitz, et al., 2019). However, to my knowledge, this QES was the first study to use the TDF to synthesis barriers and facilitators to CPAP therapy uptake and usage from the patients' perspective.

Most of the included studies focused on overall patient experiences with CPAP therapy, as well as barriers and facilitators to CPAP therapy usage, in mixed samples of men and women (Ayow et al., 2009; Bakker et al., 2014; Dickerson & Akhu-Zaheya, 2007; Goyal et al., 2017; Henry & Rosenthal, 2013; Khan et al., 2019; Lucken, 2019; Mokleby & Mengshoel, 2019; Sawyer, 2007; Ward, 2016; Zarhin & Oksenberg, 2017). Three studies explored barriers and facilitators to using CPAP therapy in particular patient populations: following a stroke (Matthias et al., 2014), while living with tetraplegia (Graco, Berlowitz, et al., 2019), and by persons who have physical/sensory impairments (Fung et al., 2015). Two studies explored barriers and facilitators to CPAP usage in adolescents (Alebraheem et al., 2018; Prashad et al., 2013), while one study looked at older adults (Gibson et al., 2018). Four studies had specific goals, such as exploring the impact of social support group (Dickerson & Kennedy, 2006), the effect of technology as a possible cause of non-usage of CPAP therapy (Zarhin, 2018), the relationship between insomnia and CPAP therapy usage (Ong et al., 2017), and how SDB impacts daily life and occupational engagement (O'Donoghue & McKay, 2012). The breadth of data that resulted from diverse studies reflects the complexity of CPAP therapy uptake and usage. The TDF provided a framework to categorize all the data and manage data synthesis. Additionally, all data reflected at least one TDF domain, which validated its application for exploring CPAP therapy uptake and usage.

The TDF was useful to identify the domains most likely to influence CPAP therapy uptake and usage in women. Domains were not mutually exclusive because different parts of the quote could apply to different domains. Therefore, quotes were assigned one or more of the 14 theoretical domains of the TDF to a maximum of three domains per quote. In retrospect, I would have broken down quotes with multiple ideas into smaller data units to ensure domains were mutually exclusive. This would have avoided the necessity to analyse co-occurring domains. However, from a clinical perspective, assigning more than one domain per idea can shape nursing interventions. For example, it is valuable for nurses to know that the impact a physical side effect of CPAP therapy (*Reinforcement*) is dependent on the individual's beliefs related to the cause of the physical manifestation (*Beliefs in Consequences*). The least frequently coded domains do not prove absence of importance. In fact, I believe some domains were not frequently coded because the design, aims, and data collection tools (e.g., interview guides, surveys, etc.) of the included studies as they were not specifically guided by the TDF.

In their data analysis guidance, Atkins' et al. (2017) recommends generating belief statements for each TDF domain. However, given the data was diverse and lacked saturation, I decided not to generate belief statements for each TDF domain and instead I conducted a qualitative content analysis using the entire dataset. In the end, the resultant qualitative content analysis provided greater context and richer data to complement the frequency count of frequently cited barriers and facilitators mapped to the TDF domains which permitted me to fully explore the topic.

Using the TDF also allowed the identification of the relevant domains to target when developing interventions, which is a key step to design behavioral change interventions (Nilsen & Birken, 2020). The Behaviour Change Wheel (BCW) approach was designed to link the TDF domains to appropriate behaviour change techniques to inform interventions (Nilsen & Birken, 2020). This QES is equivalent to conducting a behavioural diagnosis using the TDF because it involves using theory to understand the influences on the target behaviour, and therefore identifies what might need to change in order to achieve the desired outcomes (Nilsen & Birken, 2020). The steps described in the BCW approach can be followed to design an intervention that uses behavioural change techniques (BCT) to target the main barriers identified in this QES (Nilsen & Birken, 2020). This QES identified four barrier domains (S*kills, Emotions, Beliefs about Capabilities,* and *Social/Professional Role and Identity)* with two domains which acted as both barrier and facilitator (*Behaviour Regulation* and *Beliefs about Consequences*). Therefore, I would recommend a multi-faceted intervention plan comprised of BCTs which target all six domains. BCT associated with the domain of *Skills* include *behaviour rehearsal/practices* (Nilsen & Birken, 2020). For example, this could include practicing adjusting CPAP mask leaks lying down in bed during the daytime or rehearsing changing position in bed during the daytime. To reduce the barriers captured by the domain of *Emotions*, I would recommend *emotional social support* as this is a BCT associated with this domain (Nilsen & Birken, 2020). Barriers within the domain of *Beliefs about Capabilities* can be addressed by focusing on past successes and improving self-efficacy (Nilsen & Birken, 2020). Several BCT are available to address barriers found in the domain of *Beliefs about Consequences* such as helping the CPAP therapy user identify the benefits and the emotional/social/environmental consequences of using compared to not using the CPAP therapy (Nilsen & Birken, 2020). Self-monitoring of CPAP therapy is a BCT effective to overcome the barriers under the domain of *Behaviour Regulation* (Nilsen & Birken, 2020). Self-monitoring of CPAP therapy tasks could include keeping a diary of symptoms or side-effect in order to track patterns to address and smartphone applications linked with CPAP devices to provide feedback on the users' performance. Nilsen and Birken (2020) did not propose BCTs to overcome barriers falling under the domain of *Social/Professional Role and Identity* (Nilsen & Birken, 2020); however, I believe BCTs under the grouping of *Identity* could help (Nilsen & Birken, 2020). Some of these BCTs include helping the person identify as a role model for others and framing/reframing beliefs such as viewing CPAP therapy as a tool to avoid the humiliation for falling asleep in public rather than the embarrassment of wearing the CPAP mask in front of their spouse (Nilsen & Birken, 2020).

Designing Interventions for Women Based on the Barriers and Facilitators Identified

This next section discusses the barriers and facilitators identified in this QES' content analysis, how they relate to the existing literature, and how women using CPAP can be best supported.

Barriers

The themes of *Learning to use my CPAP machine*, *The burden of the technology,* and *Not feeling (or looking) like myself* were identified as barriers. In *Learning to use my CPAP machine*, women expressed issues related to learning the skills to use CPAP therapy and highlighted the time needed to troubleshoot issues by trial and error. The results showed that trying different masks and learning how to position the equipment while sleeping required time and perseverance, after which using CPAP therapy becomes part of the bedtime routine. These findings are similar to the work from Broström and colleagues (2010). Broström and colleagues (2010) conducted semi-structured interviews with 23 patients (10 women) to explore their experiences with CPAP therapy. Participants in Broström's study described their experiences encompassing practical problems such as difficulties adjusting the mask, and difficulties changing sleeping positions during the night. *Learning to use my CPAP machine* is not unique to women. In fact, Bulteel and colleagues (2019) also observed the same barriers with their men-only participants. Bulteel et. al (2019) conducted semi-structured interviews to explore the factors influencing CPAP therapy usage with 17 men with spinal cord injury using (or who used) CPAP therapy for SDB. The authors found that for the men who had a positive experience on their first night of CPAP, future usage was more likely despite other perceived constraints. Yet, for the men who had a negative experience on their first night of CPAP, future usage was less likely. Even though the experience of the first night appears to influence long term usage, most regular users described an adaptation period to sleeping with the device.

For the women in this QES, knowing how to use the CPAP machine and taking the time to troubleshoot issues was important. We can look to other medical conditions that require users to learn how to use technology for their treatment to better assist women to adapt to the CPAP machine. For example, patients on home total parenteral nutrition must learn how to operate their infusion pumps (Pironi et al., 2020), or patients with left ventricular assist devices who must learn how to care for and troubleshoot their equipment (Joyce & Joyce, 2019). One technology that shares similarities with CPAP therapy is home mechanical insufflation-exsufflation devices. This technology simulates cough to improve airway clearance of individuals with neuromuscular respiratory insufficiency. These devices use a mask that is very similar to a CPAP mask and are used about four times per day for a few minutes per session. A recent qualitative study conducted in Canada showed that mechanical insufflation-exsufflation device users viewed the one to two hour home hands-on practice session and teaching to caregivers was more beneficial than written materials to familiarise themselves with the equipment (Dale et al., 2020). By extending this finding to CPAP therapy initiation, it is possible that users would benefit from guided practice with health care professionals. To address the barrier related to changing sleeping position while wearing the CPAP mask, I would also suggest doing guided practice sessions in the user's sleeping environment as an opportunity to rehearse the tasks users have to repeat as part of their own at bedtime routine.

The second major barrier identified was *The burden of the technology* which highlighted the added responsibilities and disruptions the CPAP machine caused to participants' daily lives. These burdens were felt financially, physically and emotionally. Women talked about the financial and material resources needed to maintain this treatment. These resources were not only direct costs, but things like having an adequate power source to operate the CPAP machine all night, especially when travelling. Women also experienced physical and emotional discomforts when using the technology. Women needed to adjust their CPAP therapy devices to troubleshoot side-effects such as nasal congestions, dry mouth, and feelings of claustrophobia. Participants in Broström and colleagues' (2010) study also described experiences of side-effects of the CPAP treatment which were expressed as: blocked up nose, dry throat, irritated eyes, anxiety due to problems to exhale, and sleep problems. Broström described barriers such as claustrophobic thoughts and being afraid something would go wrong while asleep with the machine on at night (Bröstrom et al., 2010). The authors categorized these barriers as negative psychological effects of the equipment (Bröstrom et al., 2010). Once more, the barriers related to *The burden of the technology* are not unique to women. In fact, Bulteel and colleagues (2019) who conducted a male-only study, also observed the same barriers. The most common perceived constraints by their men-only participants were device-related discomfort due to the mask, difficulties falling asleep with the CPAP device, noise, and nighttime manipulations of the CPAP device (Bulteel et al., 2019). Men in Bulteel's study also echoed what women reported in this QES regarding the constraints of travelling with the CPAP device.

Effective interventions to overcome barriers related to the physical discomforts of CPAP therapy are troubleshooting interventions (Wozniak et al., 2014). The common feature of this type of interventions is that individuals are encouraged to provide feedback on their experience of CPAP therapy on an ongoing basis, so that barriers to or difficulties with treatment can be addressed in a timely fashion (Wozniak et al., 2014). Dale and colleagues' (2020) findings showed that their participants found that discussions with an educator was helpful in surmounting early frustrations such as air leaks when using the mask interface. Women in this QES also described their appreciation to receiving phone calls from their health professional for follow-up and troubleshooting, as expressed by a woman whose CPAP device pressure setting was lowered remotely following a call from the health professional (Graco et al.,2019). Overcoming emotional discomforts can be done by using behavioral interventions, where the pros and cons of receiving treatment and the consequences of not using CPAP therapy are discussed (Weaver, 2019). Behavioural interventions can be delivered by advance practice nurses or psychologists trained in cognitive behavioral therapy and/or motivational enhancement therapy (Weaver, 2019). Overcoming barriers related to the cost, power source, and travelling are more challenging to address because they are often unmodifiable. However, compact devices with optional battery pack are available. Suppliers also offer payment plans, while others might be covered through government funding.

The last major barrier identified in the QES was portrayed in the theme of *Not feeling (or looking) like myself*. Women were not comfortable with the way they looked when wearing the CPAP mask, at times only applying their CPAP machine once their spouse had fallen asleep. These barriers were identified by Broström et al. (2010), their participants expressed feeling ashamed of using the CPAP device in front of others. The cosmetic impact of using CPAP therapy was also brought up by the men interviewed by Bulteel and colleagues (2019). As per the authors, self-image and relationship with the partner was expressed without seemingly having an impact on CPAP therapy usage (Bulteel et al., 2019). Behavioural interventions can also address the barriers identified in the theme of *Not feeling (or looking) like myself*. As per Weaver (2019), behavioural interventions correct the patient's beliefs that are incorrect or unfounded, as they elicit the patient's thought processes and reinforce their own motivating statements.

None of the barriers identified in my QES appear to be unique to women, however this thesis was not designed to compare the barriers and facilitators from the perspective of men versus women. In addition, the primary studies included in this QES did not consider the influence of gender on their methods and results, only one study captured quotes for each TDF domains (Dickerson & Akhu-Zaheya, 2007), and data saturation was not reached in any themes. It is therefore not possible to conclude that the barriers and facilitators to CPAP therapy uptake and usage are the same or different between men and women from the findings of this QES.

Facilitators

The themes of *Improvements of SDB symptoms* and *Receiving support* were facilitators. In this QES, the reduction of SDB symptoms with CPAP therapy usage reinforced its usage. The perception of physical benefits acting as a facilitator to CPAP therapy usage is well described by Bröstrom and colleagues (2010) under their description of how their participants experienced physical improvements from the CPAP treatment which encouraged users to continue using their CPAP therapy devices. Dale and colleagues (2020) also identified that perceived benefits of using cough assist devices was a facilitator for their participants.

The second facilitator identified in the QES was *Receiving support*. Support from the community, family, bed partner, and health care team were prominent factors identified in the QES. For the most part, support offered encouragement to pursue CPAP therapy. These factors were also identified by Bröstrom et. al. (2010) and were labeled as: trust in healthcare personnel and a sense of engagement from the next of kin. According to Weaver (2019), multidisciplinary teams supporting CPAP therapy usage are composed of the physician, technologist, advanced practice nurse, psychologist, and importantly, the partner or other person with whom the patient has formed a relationship. Weaver (2019) goes on to describe that the purpose of an effective team is to solve problems related to CPAP therapy usage, with each member bringing their own perspective. Moreover, Ye et. al (2017) explained that CPAP therapy usage is enhanced when partners contribute to the diagnosis and treatment of SDB, engage jointly with the patient in coping and problem-solving CPAP therapy issues, motivate the patient to use CPAP therapy, and when both the patient and the partner perceived benefits of using CPAP therapy. Findings from this QES showed that the presence of positive social influences is an important factor facilitating CPAP therapy uptake and usage.

Additional facilitators to CPAP therapy usage were identified by Bröstrom and colleagues (2010). These include: the desire to avoid symptoms of SDB, knowledge about the risk for medical consequences, fear of negative social consequences and disturbing the sleep of significant others. Quotes from women included in the QES reference these themes, however these quotes were captured in the theme *Expectations about CPAP* which I discuss in the next section as it was identified as both barrier and facilitator.

Factors Identified and Both Barriers and Facilitators

The themes of *Expectations about CPAP* and *Choosing my attitude* revealed both barriers and facilitators. Whether factors in these themes acted as barriers or facilitators depended on the individual's circumstances. Beliefs regarding the cause of their symptoms, beliefs that CPAP therapy will help resolve debilitating symptoms and prevent the consequences of untreated SDB were unique to each woman. Bröstrom et. al. (2010) also identified themes which were both barriers and facilitators depending on the person and their context. Specifically, Bröstrom et.al. (2010) revealed attitudes towards CPAP therapy were either positive or negative, support from healthcare personnel was either trustworthy or insufficient, and support from next of kin was described as either fully engaged or insufficient.

When designing interventions to support women with CPAP therapy, the consideration and integration of influencing factors should remain neutral because it is not possible to presume how or in which direction the factor will influence CPAP therapy related behaviour at the individual level.

Implications for Nursing

In this next section, I will discuss the implications for nursing practice, policy, education, and research as they pertain to the role of nurses, including Advanced Practice Nurses (APNs). I will discuss how nurses can utilize the findings from this thesis to improve care for women living with SDB.

Practice

Recognition of SDB. With a prevalence of SDB in at least 24 % in men, at least 9% in women (Matsumoto & Chin, 2019), and with only 3% of Canadians with a confirmed diagnosis (Public Health Agency of Canada, 2010), many nurses working in direct clinical care may be providing care to undiagnosed individuals with SDB on a regular basis. Women, more frequently than men, present with fatigue, mood disturbances, insomnia, and depression, and they may be treated for psychological conditions rather than investigated for SDB (Ye et al., 2009). Nurses should recognise the signs and symptoms of SDB, including associated complications of SBD (e.g., cardiovascular disease, hyperlipidemia, diabetes, asthma, hypothyroidism, arthropathy, reflux/gastritis, and cognitive impairment or dementia), in both men and women and advocate for investigation when they are present.

Caring for women with SDB. There are implications for nursing practice when caring for women with SDB. Family roles and responsibilities influence access to health care because women are expected to care for and prioritise the needs of family members at the expense of their own health (Heise et al., 2019). When applied to CPAP therapy uptake and usage, reduced income, limited availability to meet with CPAP therapy supplier and nocturnal awakening from young children may limit women’s uptake and usage of CPAP therapy more than men. For these reasons and other not listed here, family roles and responsibilities should be part of the discussion nurses have with women prescribed CPAP therapy for the treatment of their SDB. Quotes from women in this QES identified gender norms as a barrier to CPAP therapy uptake and usage. For example, the perceived stigma of wearing a CPAP mask to sleep was disruptive to their body image and many women expressed how this treatment was not a natural way to sleep. Nurses should assess CPAP therapy uptake and usage regularly and offer support when needed. The literature review (Chapter 2), theoretical framework (Chapter 3), and results from this QES, as demonstrated by theme of *Receiving Support* (Chapter 5), indicate that support is an important component of success with this therapy. Nurses are well-positioned to foster a supportive environment to ensure patients feel supported to use their CPAP therapy. When recommending evidenced-based interventions to support women with CPAP therapy uptake and usage, nurses should also be mindful that the current qualitative evidence is male focused. Hence, nurses should refrain from generalizing results and seek to explore the women’s perspective.

Policy

APNs contribute to the effective functioning of health systems through advocacy, promoting innovative client care and facilitating equitable, client-centered health care (Canadian Nurses Association, 2019). As leaders within their organization and their community, APNs are tasked to identify problems, including gender inequities and gender biases, and initiate change to address challenges at the clinical, organisational or system level (Canadian Nurses Association, 2019). APNs are in a position to advocate for minorities and support the development of an inclusive environment for all, including women with SDB. For example, there is a lack of institutional policy in Canadian health care institutions to guide perioperative management of individuals with suspected undiagnosed SDB (Cordovani et al., 2016). Furthermore, 50% of surveyed Canadian anesthesiologists disclosed that they rely on clinical suspicion rather than on a systematic screening to preoperatively identify individuals who may have undiagnosed SDB (Cordovani et al., 2016). Women going for preoperative evaluation may not be identified at risk for undiagnosed SDB because of gender norms and different clinical presentation of SDB in women compared to men. However, a systematic screening could identify a women's risk and ensure she receives optimal care. APNs can contribute to improvements in health care by working collaboratively in establishing an institutional policy to improve the management of individuals with high risk of post-operative complications due to SDB regardless of sex and/or gender.

Education

APNs can contribute to increasing nurses' knowledge of SDB in several ways. First, educators could consider including SDB pathophysiology and management into the undergraduate nursing curriculum to the same level diabetes, congestive heart failure, and chronic obstructive pulmonary disease given the increasing prevalence of SDB in the general population, and in high-risk population. An emphasis on women is important to reduce gender norms and gendered-biases health care delivery. Second, APNs can incorporate SDB and CPAP therapy in the general orientation nurses receive upon starting work in their institutions. Several areas to include SDB and CPAP therapy for general nursing care include area when individuals with SDB may be more at risk of complications due to medical interventions: peri-operative care, opiates administration, oxygen therapy administration (Chung et al., 2008). Care areas with higher prevalence of SDB include cardiology, endocrinology, neurology, respirology, and bariatric centers. Finally, women's health care areas like prenatal care, high-risk pregnancy care as well as gynecological care should also be targeted for specialized education. APNs can use multiple approaches to provide continuing education to nurses, from formal teaching sessions, nursing rounds, engaging in peer reviewed literature via journal clubs or by engaging in collaborative partnership, writing journal articles, and participating in seminars and courses. As leaders in their institution, APNs can also focus their teaching on multidisciplinary teams (physician, residents, nurses, students, physiotherapy, occupational therapy, etc.) in higher prevalence areas. Finally, APNs can engage with community groups and key stakeholders to work on initiatives (e.g., awareness campaign) to disrupt and reduce gender norms in SDB-related care.

Research

Since APNs have the competency to generate research evidence, there is an opportunity for them to conduct and support research as either primary investigator or as a collaborator in the field of SDB and CPAP therapy (Canadian Nurses Association, 2019). The results of my QES demonstrated that qualitative research on how women cope and engage with SDB and CPAP therapy is urgently needed to improve CPAP therapy in this population. The current suboptimal rates of CPAP therapy usage in women have the potential to jeopardise outcomes of future studies conducted in women. Optimal CPAP therapy usage is paramount to demonstrate its benefit in effectiveness research.

APNs have a responsibility not to perpetuate gender inequities. As per Gupta and colleagues (2019), gender bias and inequalities are deeply embedded in research and the impacts of gender norms can be evaluated by applying innovative research methods thereby illustrating sex differences and gender inequalities (Gupta et al., 2019). I did observe that the gender of the participants providing the quotes was reported in the more recently published studies included in this QES. This strategy is one example of how sex or gender differences can be illustrated in research. Another way researchers can avoid perpetuating gender inequities while conducting qualitative research is to implement the previously discussed SAGER guidelines (Heidari et al., 2016). APNs should keep these approaches in mind when designing, conducting, and reporting their research.

Lastly, the scarce number of quotes referring to CPAP therapy uptake in this review also warrants more research on this process. The identification of different domains for CPAP therapy uptake in my QES suggests that CPAP therapy uptake is a process independent from CPAP therapy usage and that research should investigate this process separately.

Strengths and Limitations

Strengths

There are a number of strengths to this research. First, a substantial part of designing this QES was spent on creating a rigorous and thorough search strategy with the support of three academic librarians, along with the peer reviewing of the search strategy. Additionally, I used a qualitative search filter proposed by Dejean et. al (2016) which demonstrated high sensitivity across databases and topics and minimized the resource-intensive process of sifting through false positives. Translating the search to six databases was labor intensive yet rewarding. It ensured I captured as many records as possible, including three doctoral dissertations. Following ascribed systematic review methods ensured that all steps, from study screening to data extraction, were performed independently by two reviewers. All conflicts were resolved with discussion and the third reviewer was not solicited. Reaching out to authors permitted the inclusion of eight additional studies as well as the authentication of 38% of all coding. This level of cooperation demonstrates the generosity of the scientific community and supported the accuracy of the data synthesis. Finally, the conduct and reporting of the study is done in accordance with PRISMA 2020 (Page et al., 2021) and the Enhancing Transparency in Reporting the Synthesis of Qualitative Research statement (Tong et al., 2012) which provides the reader with the information to form their own conclusions about how well a review was carried out and whether the findings are applicable (transferable) to their own setting.

Limitations

Although the TDF proved compatible to classify quotes into its 14 domains, I had to create a study-specific codebook as I was not able to locate a study using the TDF for this topic. I used existing TDF-based codebooks from other fields and adapted them for CPAP therapy uptake and usage based on domain definitions, the *Bargaining and Balancing Life with CPAP* theory, and my clinical experience. The codebook required three revisions to clarify domain definitions because some domains were difficult to distinguish from one another, for example *Beliefs about Consequences* and *Reinforcement*. The eligibility criteria were tailored to capture the perspective of CPAP therapy uptake and usage only, not living with SDB. This could explain why the domains of *Knowledge, Intentions, Optimism, Goals, Memory/Attention/Decision making* were not often coded. I expected those domains to influence decisions about seeking medical consultation and possibly CPAP therapy uptake. However, given that no qualitative study intentionally explored CPAP therapy uptake as an independent process, it is unlikely that relevant studies reflecting this perspective was missed.

These findings are limited to the published quotes and supplemental information available, which means the data is restricted to the quotes the publishing author judged to best depict their findings. Authors may have selected a quote from a man to represent their findings even if quotes from women were available to choose from. Additionally, some data items were difficult to categorize as barriers or facilitators without the original transcripts. Reaching out to authors for their input allowed to resolve some uncertainty, but it remains that I received feedback from nine authors (out of 21).

Conclusion

To my knowledge this is the first QES to identify and synthesize the existing qualitative evidence on the factors that influence CPAP therapy uptake and use from the perspective of women with SDB. The perspective of women regarding this topic remains to be fully captured with scientific research which considers gender equity, an important knowledge gap. Since this was a secondary analysis of already published research, no new barrier or facilitator to CPAP therapy uptake or usage was identified. However, identifying the factors that can act as both barriers and facilitators suggests that they should be considered at the individual level. This is an important finding to inform the design and development of interventions to support women with CPAP therapy uptake and usage.

The TDF proved useful to categorise data items. I observed differences in the domains relevant for CPAP therapy uptake compared to usage, suggesting an independent but related process.

The most remarkable finding from this QES was that the current state of literature on this topic is very limited; I was not able to identify a single study eligible for this synthesis with a sample comprised of women only. In addition, the perspective of women as represented in the current literature is male dominated. This represents an important knowledge gap within the scientific community. Research on women’s experiences with CPAP therapy uptake and usage guided by the SAGER guidelines is urgently needed.

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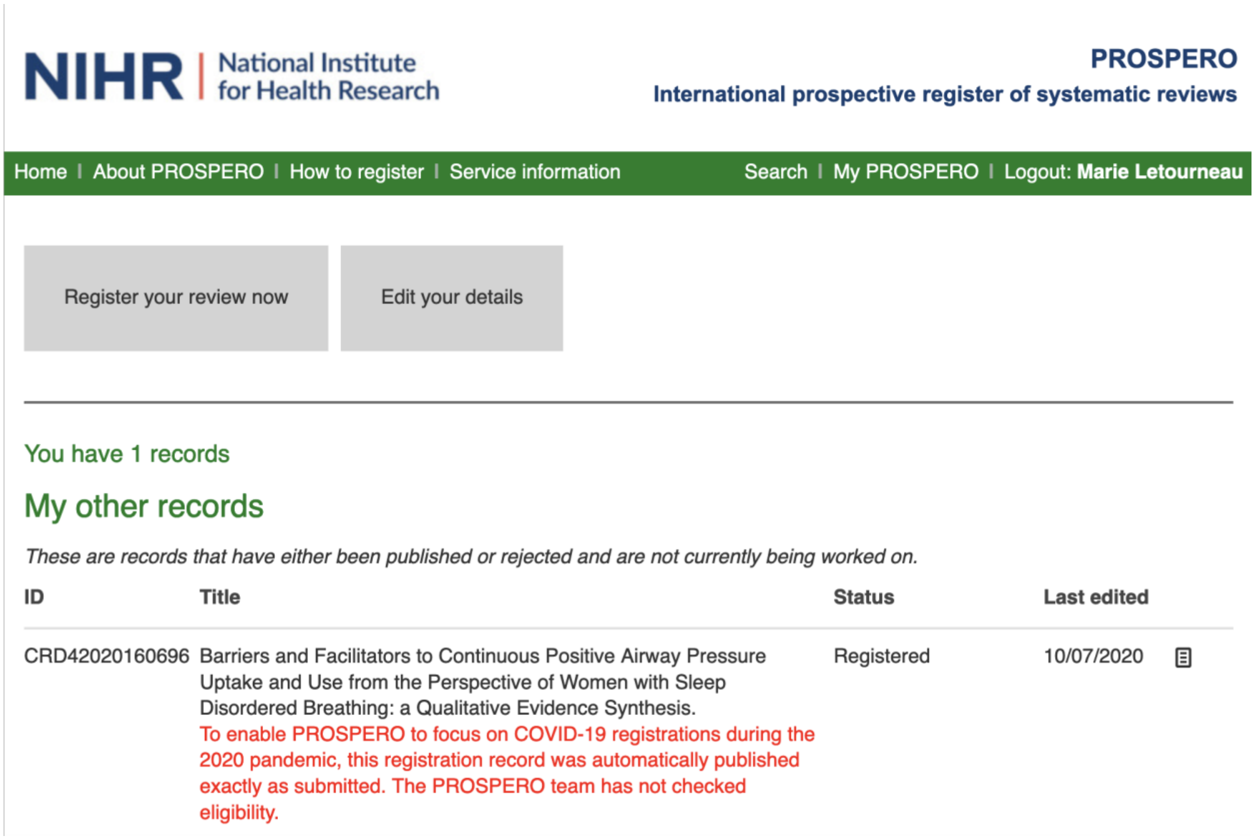
Appendix A – PROSPERO Registration



You have 1 records

My other records

These are records that have either been published or rejected and are not currently being worked on.

ID	Title	Status	Last edited
CRD42020160696	Barriers and Facilitators to Continuous Positive Airway Pressure Uptake and Use from the Perspective of Women with Sleep Disordered Breathing: a Qualitative Evidence Synthesis. To enable PROSPERO to focus on COVID-19 registrations during the 2020 pandemic, this registration record was automatically published exactly as submitted. The PROSPERO team has not checked eligibility.	Registered	10/07/2020

Appendix B – Search Strategy

Search Strategy Medline

Database: Ovid MEDLINE(R) ALL <1946 to December 13, 2019>
Search Strategy:
----
1 exp Sleep Apnea Syndromes/ (34314)
2 ((sleep adj2 apn*) or hypopn* or (sleep adj2 disorder* adj2 breath*) or SDB or OSA or OSAS).ti,ab. (41658)
3 (Sleep adj3 (Hypoventilat* or hypoxemia or hypoxia or anoxemia or anoxia or oxygen)).ti,ab. (1957)
4 1 or 2 or 3 (48077)
5 positive-pressure respiration/ or continuous positive airway pressure/ (23426)
6 ((positive adj2 airway adj2 pressure) or cpap or ncpap or npap or pap).ti,ab. (32067)
7 5 or 6 (47286)
8 (accept? or acceptance or adapt* or adhere? or adherence or attitude* or buy or bought or coping or cope? or complian* or experienc* or perception* or perceive? or perspective* or purchas* or feel or feeling* or need? or needed or needing or facilitator* or barrier* or usage or decline? or refuse? or refusal? or abandon* or tolerat*or Facilitating or Facilitate? or Cost? or Prohibit* or Burden* or Point-of-view or Accepting or Noncomplian* or non-complian* or Nonadher* or non-adher*).ti,ab. (5076714)
9 exp Attitude to Health/ (403172)
10 8 or 9 (5235438)
11 exp women/ (35483)
12 women's health services/ (3798)
13 exp menopause/ (55858)
14 sex factors/ (257420)
15 female/ (8476600)
16 (women* or woman* or female* or gender* or menopaus* or premenopaus* or pre-menopaus* or sex factor?).ti,ab. (2108746)
17 11 or 12 or 13 or 14 or 15 or 16 (8871346)
18 10 or 17 (12063443)
19 4 and 7 and 18 (6336)
20 Qualitative Research/ or Interview/ or Nursing Methodology Research/ (91531)
21 (account or accounts or unstructured or openended or open ended or text$ or narrative$ or action research or cooperative inquir$ or co operative inquir$ or co-operative inquir$ or cluster sampl$ or ethnograph$ or ethnological research or humanistic or existential or experiential or paradigm$ or life stor$ or women* stor$ or life world or life-world or ((lived or life) adj experience$) or conversation analys?s or personal experience$ or theoretical saturation or social construct$ or postmodern$ or post-structural$ or post structural$ or poststructural$ or post modern$ or post-modern$ or feminis$ or interpret$ or theme$ or thematic or questionnaire$).mp. (1984577)
22 ((constant adj (comparative or comparison)) or content analysis or narrative analys?s or observational method$ or theoretical sampl$ or qualitative or ethnonursing or phenomenol$ or emic or etic or hermeneutic$ or heuristic$ or semiotic$ or (purpos$ adj4 sampl$) or (focus adj group$) or (grounded adj (theor$ or study or studies or research or analys?s))).af. (312753)
23 (biographical method or human science or participant observ$ or (data adj1 saturat$) or (field adj (study or studies or research)) or ((discourse$ or discurs$) adj3 analys?s) or heidegger$ or colaizzi$ or

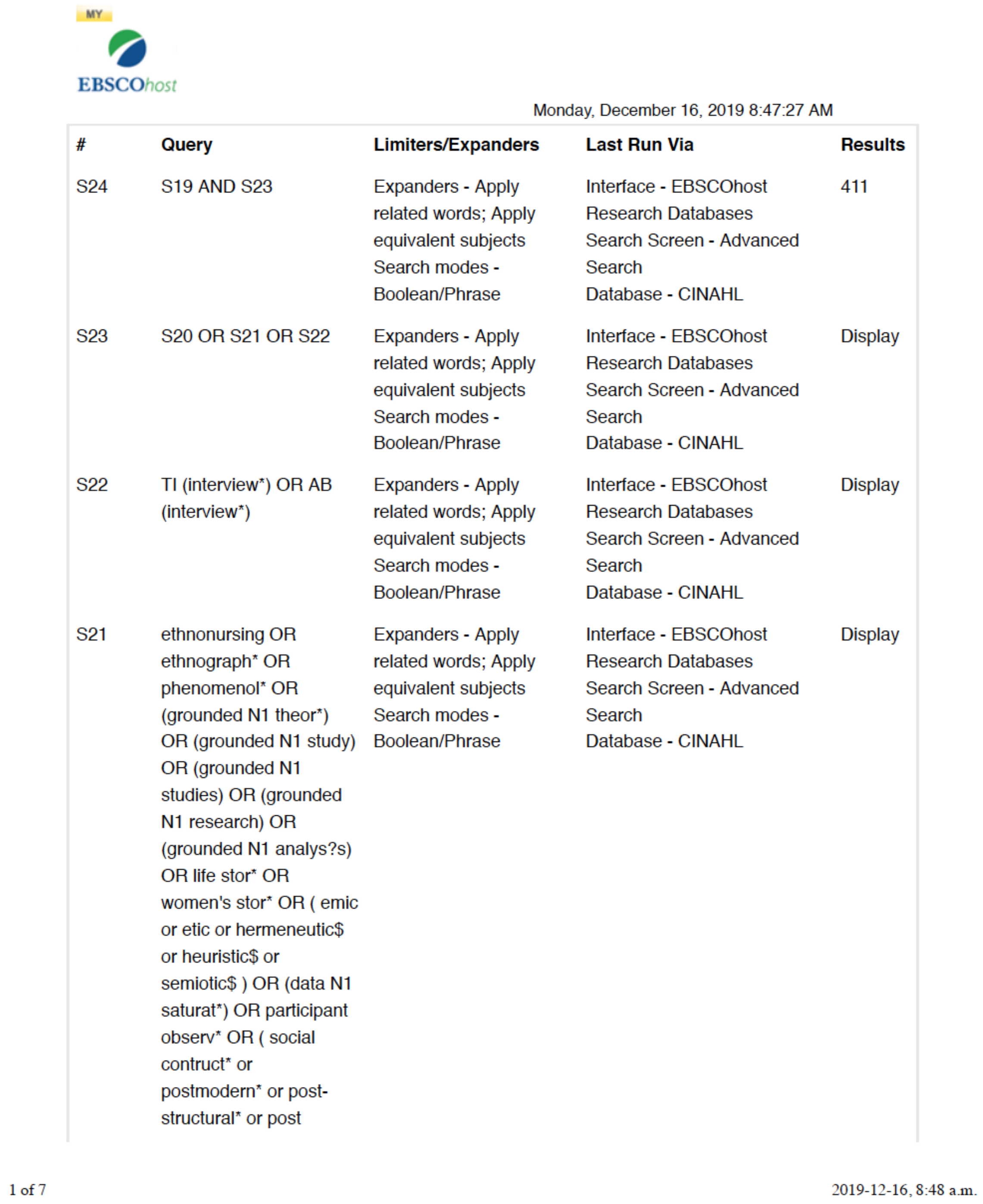
spiegelberg$ or (van adj manen$) or (van adj kaam$) or (merleau adj ponty$) or husserl$ or foucault$ or (corbin$ adj2 strauss$) or glaser$).tw. (27514)

24 interview*.ti,ab. (341599)

25 20 or 21 or 22 or 23 or 24 (2351043)

26 19 and 25 (1066)

Search Strategy CINAHL



Monday, December 16, 2019 8:47:27 AM

#	Query	Limiters/Expanders	Last Run Via	Results
S24	S19 AND S23	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	411
S23	S20 OR S21 OR S22	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S22	TI (interview*) OR AB (interview*)	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S21	ethnonursing OR ethnograph* OR phenomenol* OR (grounded N1 theor*) OR (grounded N1 study) OR (grounded N1 studies) OR (grounded N1 research) OR (grounded N1 analys?s) OR life stor* OR women's stor* OR (emic or etic or hermeneutic$ or heuristic$ or semiotic$) OR (data N1 saturat*) OR participant observ* OR (social contruct* or postmodern* or post-structural* or post	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display

1 of 7

2019-12-16, 8:48 a.m.

structural* or postructural* or post modern* or post-modern* or feminis* or interpret*) OR (action research or cooperative inquir* or co operative inquir* or co-operative inquir*) OR (humanistic or existential or experiential or paradigm*) OR (field N1 stud*) OR (field N1 research) OR human science OR biographical method OR (theoretical sampl* or (purpos* N4 sampl)* or (focus N1 sampl*)) OR (account or accounts or unstructured or open-ended or open ended or text* or narrative*) OR (life world or life-world or conversation analys?s or personal experience* or theoretical saturation) OR (lived experience* or life experience* or cluster sampl* or theme* or thematic or observational method* or questionnaire*) OR content analysis OR (discourse* N3 analys?s) OR (discurs* N3 analys?s) OR (constant N1 comparative) OR (constant N1 comparison) OR narrative analys?s OR

	heidegger* OR colaizzi* OR (spiegelberg* or (van N1 manen*) or (van N1 Kaam*) OR (merleau N1 ponty)* or husserl* or foucault) OR ((corbin* N2 strauss)* or (strauss* N2 corbin*) or glaser*)			
S20	(MH"interview+") OR (MH "audiorecording") OR (MH "Interviews") OR (MH "Grounded theory") OR (MH "qualitative studies") OR (MH "research, nursing" OR (MH "Questionnaires+") OR (MH "focus groups") OR (MH "Discourse Analysis") OR (MH "content analysis") OR (MH "ethnographic research") OR (MH "ethnological research") OR (MH "ethnonursing research") OR (MH "constant comparative method") OR (MH "qualitative validity+") OR (MH "purposive sampling") OR (MH "observational methods+") OR (MH "field studies") OR (MH "theoretical sample") OR (MH "phenomenology") OR (MH "phenomenological research") OR (MH "life experiences+") OR (MH "cluster sample+")	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display

S19	S4 AND S7 AND S18	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S18	S10 OR S17	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S17	S11 OR S12 OR S13 OR S14 OR S15 OR S16	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S16	TI (women* or woman* or female* or gender* or menopaus* or premenopaus* or pre-menopaus* or sex factor#) OR AB (women* or woman* or female* or gender*or menopaus* or premenopaus* or pre-menopaus* or sex factor#)	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S15	(MH "Female")	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S14	(MH "Sex Factors")	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S13	(MH "Menopause") OR (MH "Premenopause")	Expanders - Apply related words; Apply	Interface - EBSCOhost Research Databases	Display

		equivalent subjects Search modes - Boolean/Phrase	Search Screen - Advanced Search Database - CINAHL	
S12	(MH "Women's Health Services")	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S11	(MH "Women")	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S10	S8 OR S9	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S9	(MH "Attitude to Health") OR (MH "Patient Satisfaction+") OR (MH "Patient Compliance+") OR (MH "Treatment Refusal") OR (MH "Attitude to Illness")	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S8	TI (accept# or acceptance or adapt* or adhere# or adherence or attitude* or buy or bought or coping or cope# or complian* or experienc* or perception* or perceive# or perspective* or purchas* or feel or feeling* or need# or needed or needing or facilitator* or barrier* or usage or decline# or	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display

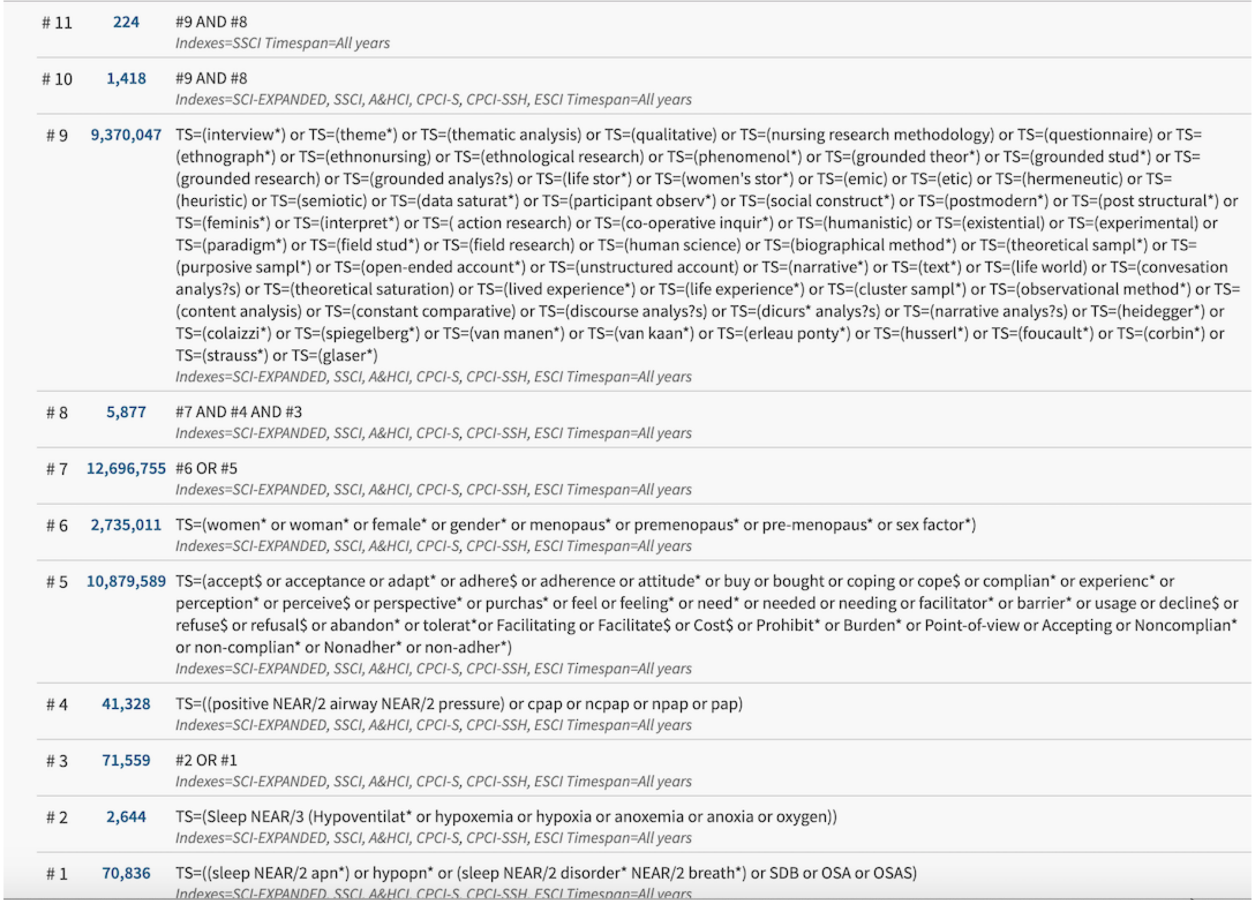
	refuse# or refusal# or abandon* or tolerat*or Facilitating or Facilitate# or Cost# or Prohibit* or Burden* or Point-of-view or Accepting or Noncomplian* or non-complian* or Nonadher* or non-adher*) OR AB (accept# or acceptance or adapt* or adhere# or adherence or attitude* or buy or bought or coping or cope# or complian* or experience* or perception* or perceive# or perspective* or purchas* or feel or feeling* or need# or needed or needing or facilitator* or barrier* or usage or decline# or refuse# or refusal# or abandon* or tolerat*or Facilitating or Facilitated or Facilitates or Cost# or Prohibit* or Burden* or Point-of-view or Accepting or Noncomplian* or non-complian* or Nonadher* or non-complian*)			
S7	S5 OR S6	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S6	TI ((positive N2 airway N2 pressure) or cpap or ncpap or npap or pap)	Expanders - Apply related words; Apply equivalent subjects	Interface - EBSCOhost Research Databases Search Screen - Advanced	Display

	OR AB ((positive N2 airway N2 pressure) or cpap or ncpap or npap or pap)	Search modes - Boolean/Phrase	Search Database - CINAHL	
S5	(MH "Positive Pressure Ventilation") OR (MH "Continuous Positive Airway Pressure")	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S4	S1 OR S2 OR S3	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S3	TI ((Sleep N3 (Hypoventilat* or hypoxemia or hypoxia or anoxemia or anoxia or oxygen))) OR AB ((Sleep N3 (Hypoventilat* or hypoxemia or hypoxia or anoxemia or anoxia or oxygen)))	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S2	TI ((sleep N2 apn*) or hypopn* or (sleep N2 disorder* N2 breath*) or SDB or OSA or OSAS) OR AB ((sleep N2 apn*) or hypopn* or (sleep N2 disorder* N2 breath*) or SDB or OSA or OSAS)	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display
S1	(MH "Sleep Apnea Syndromes")	Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL	Display

Search Strategy Scopus

(((TITLE-ABS ((sleep W/2 apn*) OR hypopn* OR (sleep W/2 disorder* W/2 breath*) OR sdb OR osa OR osas)) OR (TITLE-ABS (sleep W/3 (hypoventilat* OR hypoxemia OR hypoxia OR anoxemia OR anoxia OR oxygen)))) AND (TITLE-ABS ((positive W/2 airway W/2 pressure) OR cpap OR ncpap OR npap OR pap)) AND (((accept* OR acceptance OR adapt* OR adhere* OR adherence OR attitude* OR buy OR bought OR coping OR cope* OR complian* OR experienc* OR perception* OR perceive* OR perspective* OR purchas* OR feel OR feeling* OR need# OR needed OR needing OR facilitator* OR barrier* OR usage OR declin* OR refuse* OR refusal* OR abandon* OR tolerat*or AND facilitating OR facilitat* OR cost* OR prohibit* OR burden* OR point-of-view OR accepting OR noncomplian* OR non-complian* OR nonadher* OR non-adher*)) OR ((women* OR woman* OR female* OR gender*or AND menopaus* OR premenopaus* OR pre-menopaus* OR sex AND factor*)))) AND (((account OR accounts OR unstructured OR openended OR open AND ended OR text* OR narrative* OR action AND research OR cooperative AND inquir* OR co AND operative AND inquir* OR co-operative AND inquir* OR cluster AND sampl* OR ethnograph* OR ethnological AND research OR humanistic OR existential OR experiential OR paradigm* OR life AND stor* OR women* AND stor* OR life AND world OR life-world OR ((lived OR life) W/1 experience*) OR conversation AND analys*s OR personal AND experience* OR theoretical AND saturation OR social AND construct* OR postmodern* OR post-structural* OR post AND structural* OR poststructural* OR post AND modern* OR post-modern* OR feminis* OR interpret* OR theme* OR thematic OR questionnaire*)) OR ((constant W/1 (comparative OR comparison)) OR content AND analysis OR narrative AND analys*s OR observational AND method* OR theoretical AND sampl* OR qualitative OR ethnonursing OR phenomenol* OR emic OR etic OR hermeneutic* OR heuristic* OR semiotic* OR (purpos* W/4 sampl*) OR (focus W/1 group*) OR (grounded W/1 (theor* OR study OR studies OR research OR analys*s))) OR (TITLE-ABS (biographical AND method OR human AND science OR participant AND observ* OR (data W/1 saturat*) OR (field W/1 (study OR studies OR research)) OR ((discourse* OR discurs*) W/3 analys*s) OR heidegger* OR colaizzi* OR spiegelberg* OR (van W/1 manen*) OR (van W/1 kaam*) OR (merleau W/1 ponty*) OR husserl* OR foucault* OR (corbin* W/2 strauss*) OR glaser*)) OR (TITLE-ABS (interview*)))

Search Strategy Web of Science



# 11	224	#9 AND #8 *Indexes=SSCI Timespan=All years*
# 10	1,418	#9 AND #8 *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*
# 9	9,370,047	TS=(interview*) or TS=(theme*) or TS=(thematic analysis) or TS=(qualitative) or TS=(nursing research methodology) or TS=(questionnaire) or TS=(ethnograph*) or TS=(ethnonursing) or TS=(ethnological research) or TS=(phenomenol*) or TS=(grounded theor*) or TS=(grounded stud*) or TS=(grounded research) or TS=(grounded analys?s) or TS=(life stor*) or TS=(women's stor*) or TS=(emic) or TS=(etic) or TS=(hermeneutic) or TS=(heuristic) or TS=(semiotic) or TS=(data saturat*) or TS=(participant observ*) or TS=(social construct*) or TS=(postmodern*) or TS=(post structural*) or TS=(feminis*) or TS=(interpret*) or TS=(action research) or TS=(co-operative inquir*) or TS=(humanistic) or TS=(existential) or TS=(experimental) or TS=(paradigm*) or TS=(field stud*) or TS=(field research) or TS=(human science) or TS=(biographical method*) or TS=(theoretical sampl*) or TS=(purposive sampl*) or TS=(open-ended account*) or TS=(unstructured account) or TS=(narrative*) or TS=(text*) or TS=(life world) or TS=(convesation analys?s) or TS=(theoretical saturation) or TS=(lived experience*) or TS=(life experience*) or TS=(cluster sampl*) or TS=(observational method*) or TS=(content analysis) or TS=(constant comparative) or TS=(discourse analys?s) or TS=(dicurs* analys?s) or TS=(narrative analys?s) or TS=(heidegger*) or TS=(colaizzi*) or TS=(spiegelberg*) or TS=(van manen*) or TS=(van kaan*) or TS=(erleau ponty*) or TS=(husserl*) or TS=(foucault*) or TS=(corbin*) or TS=(strauss*) or TS=(glaser*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*
# 8	5,877	#7 AND #4 AND #3 *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*
# 7	12,696,755	#6 OR #5 *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*
# 6	2,735,011	TS=(women* or woman* or female* or gender* or menopaus* or premenopaus* or pre-menopaus* or sex factor*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*
# 5	10,879,589	TS=(accept$ or acceptance or adapt* or adhere$ or adherence or attitude* or buy or bought or coping or cope$ or complian* or experienc* or perception* or perceive$ or perspective* or purchas* or feel or feeling* or need* or needed or needing or facilitator* or barrier* or usage or decline$ or refuse$ or refusal$ or abandon* or tolerat*or Facilitating or Facilitate$ or Cost$ or Prohibit* or Burden* or Point-of-view or Accepting or Noncomplian* or non-complian* or Nonadher* or non-adher*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*
# 4	41,328	TS=((positive NEAR/2 airway NEAR/2 pressure) or cpap or ncpap or npap or pap) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*
# 3	71,559	#2 OR #1 *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*
# 2	2,644	TS=(Sleep NEAR/3 (Hypoventilat* or hypoxemia or hypoxia or anoxemia or anoxia or oxygen)) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*
# 1	70,836	TS=((sleep NEAR/2 apn*) or hypopn* or (sleep NEAR/2 disorder* NEAR/2 breath*) or SDB or OSA or OSAS) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*

Search Strategy PsycINFO

Database: PsycINFO <1806 to December Week 2 2019>
Search Strategy:
----
1 exp Sleep Apnea Syndromes/ (0)
2 ((sleep adj2 apn*) or hypopn* or (sleep adj2 disorder* adj2 breath*) or SDB or OSA or OSAS).ti,ab. (5361)
3 (Sleep adj3 (Hypoventilat* or hypoxemia or hypoxia or anoxemia or anoxia or oxygen)).ti,ab. (257)
4 1 or 2 or 3 (5434)
5 ((positive adj2 airway adj2 pressure) or cpap or ncpap or npap or pap).ti,ab. (2383)
6 (accept? or acceptance or adapt* or adhere? or adherence or attitude* or buy or bought or coping or cope? or complian* or experienc* or perception* or perceive? or perspective* or purchas* or feel or feeling* or need? or needed or needing or facilitator* or barrier* or usage or decline? or refuse? or refusal? or abandon* or tolerat*or Facilitating or Facilitate? or Cost? or Prohibit* or Burden* or Point-of-view or Accepting or Noncomplian* or non-complian* or Nonadher* or non-adher*).ti,ab. (2085178)
7 exp Health Attitudes/ (10088)
8 6 or 7 (2087448)
9 exp Human Females/ (143464)
10 menopause/ (3697)
11 (women* or woman* or female* or gender* or menopaus* or premenopaus* or pre-menopaus* or sex factor?).ti,ab. (662698)
12 9 or 10 or 11 (698425)
13 8 or 12 (2428412)
14 4 and 5 and 13 (530)
15 exp qualitative methods/ or exp interviews/ (26543)
16 (account or accounts or unstructured or openended or open ended or text$ or narrative$ or action research or cooperative inquir$ or co operative inquir$ or co-operative inquir$ or cluster sampl$ or ethnograph$ or ethnological research or humanistic or existential or experiential or paradigm$ or life stor$ or women* stor$ or life world or life-world or ((lived or life) adj experience$) or conversation analys?s or personal experience$ or theoretical saturation or social construct$ or postmodern$ or post-structural$ or post structural$ or poststructural$ or post modern$ or post-modern$ or feminis$ or interpret$ or theme$ or thematic or questionnaire$).mp. (1148375)
17 ((constant adj (comparative or comparison)) or content analysis or narrative analys?s or observational method$ or theoretical sampl$ or qualitative or ethnonursing or phenomenol$ or emic or etic or hermeneutic$ or heuristic$ or semiotic$ or (purpos$ adj4 sampl$) or (focus adj group$) or (grounded adj (theor$ or study or studies or research or analys?s))).af. (586234)
18 (biographical method or human science or participant observ$ or (data adj1 saturat$) or (field adj (study or studies or research)) or ((discourse$ or discurs$) adj3 analys?s) or heidegger$ or colaizzi$ or spiegelberg$ or (van adj manen$) or (van adj kaam$) or (merleau adj ponty$) or husserl$ or foucault$ or (corbin$ adj2 strauss$) or glaser$).tw. (37077)

19 interview*.ti,ab. (315010)
20 15 or 16 or 17 or 18 or 19 (1600546)
21 14 and 20 (173)

Search Strategy ProQuest Dissertation and Theses

(((TI((sleep NEAR/2 apn*) OR hypopn* OR (sleep NEAR/2 disorder* NEAR/2 breath*) OR SDB OR OSA OR OSAS) OR AB((sleep NEAR/2 apn*) OR hypopn* OR (sleep NEAR/2 disorder* NEAR/2 breath*) OR SDB OR OSA OR OSAS)) OR (TI ((Sleep NEAR/3 (Hypoventilat* OR hypoxemia OR hypoxia OR anoxemia OR anoxia OR oxygen))) OR AB ((Sleep NEAR/3 (Hypoventilat* OR hypoxemia OR hypoxia OR anoxemia OR anoxia OR oxygen))))) AND (TI((positive NEAR/2 airway NEAR/2 pressure) OR cpap OR ncpap OR npap OR pap) OR AB((positive NEAR/2 airway NEAR/2 pressure) OR cpap OR ncpap OR npap OR pap)) AND ((TI(accept* OR acceptance OR adapt* OR adhere* OR adherence OR attitude* OR buy OR bought OR coping OR cope OR complian* OR experienc* OR perception* OR perceive* OR perspective* OR purchas* OR feel OR feeling* OR need# OR needed OR needing OR facilitator* OR barrier* OR usage OR declin* OR refuse* OR refusal* OR abandon* OR tolerat*or Facilitating OR Facilitat* OR Cost* OR Prohibit* OR Burden* OR Perceive* OR Point-of-view OR Accepting OR Noncomplian* OR Nonadher*) OR AB(accept* OR acceptance OR adapt* OR adhere* OR adherence OR attitude* OR buy OR bought OR coping OR cope OR complian* OR experienc* OR perception* OR perceive* OR perspective* OR purchas* OR feel OR feeling* OR need# OR needed OR needing OR facilitator* OR barrier* OR usage OR declin* OR refuse* OR refusal* OR abandon* OR tolerat*or Facilitating OR Facilitat* OR Cost* OR Prohibit* OR Burden* OR Point-of-view OR Accepting OR Noncomplian* OR non-complian* OR Nonadher* OR non-adher*)) OR (TI(women* OR woman* OR female* OR gender* OR menopaus* OR premenopaus* OR pre-menopaus* OR sex factor*) OR AB(women* OR woman* OR female* OR gender*or menopaus* OR premenopaus* OR pre-menopaus* OR sex factor*)))) AND ((account OR accounts OR unstructured OR openended OR open ended OR text* OR narrative* OR action research OR cooperative inquir* OR co operative inquir* OR co-operative inquir* OR cluster sampl* OR ethnograph* OR ethnological research OR humanistic OR existential OR experiential OR paradigm* OR life stor* OR women* stor* OR life world OR life-world OR ((lived OR life) NEAR/1 experience*) OR conversation analys*s OR personal experience* OR theoretical saturation OR social construct* OR postmodern* OR post-structural* OR post structural* OR poststructural* OR post modern* OR post-modern* OR feminis* OR interpret* OR theme* OR thematic OR questionnaire*) OR ((constant NEAR/1 (comparative OR comparison)) OR content analysis OR narrative analys*s OR observational method* OR theoretical sampl* OR qualitative OR ethnonursing OR phenomenol* OR emic OR etic OR hermeneutic* OR heuristic* OR semiotic* OR (purpos* NEAR/4 sampl*) OR (focus NEAR/1 group*) OR (grounded NEAR/1 (theor* OR study OR studies OR research OR analys*s))) OR (TI(biographical method OR human science OR participant observ* OR (data NEAR/1 saturat*) OR (field NEAR/1 (study OR studies OR research)) OR ((discourse* OR discurs*) NEAR/3 analys*s) OR heidegger* OR colaizzi* OR spiegelberg* OR (van NEAR/1 manen*) OR (van NEAR/1 kaam*) OR (merleau NEAR/1 ponty*) OR husserl* OR foucault* OR (corbin* NEAR/2 strauss*) OR glaser*) OR AB(biographical method OR human science OR participant observ* OR (data NEAR/1 saturat*) OR (field NEAR/1 (study OR studies OR research)) OR ((discourse* OR discurs*) NEAR/3 analys*s) OR heidegger* OR colaizzi* OR spiegelberg* OR (van NEAR/1 manen*) OR (van NEAR/1 kaam*) OR (merleau NEAR/1 ponty*) OR husserl* OR foucault* OR (corbin* NEAR/2 strauss*) OR glaser*)) OR (TI(interview*) OR AB(interview*)))

Appendix C – Record Screening Tool

Step 1-Title and abstract screening

Instructions to reviewers

If you are unsure about eligibility, please include the study to allow it to move to next step, avoid using the 'maybe' label in Covidence as this automatically generates a conflict that must be resolved prior to moving forward to step 2.

Essentially, keep all studies unless you can exclude it.

Criteria		**Include**	**Exclude**
1.Study Design	Study design reports qualitative data on the barriers or facilitators to CPAP therapy use?	Yes	No
2. Population	Are there females/women in the sample?	Yes	No
3. Context	Is CPAP therapy used to treat chronic SDB?	Yes	No
	Is the study about using CPAP therapy at home?	Yes	No
4. Outcomes	Does the study look at barriers and / or facilitators to CPAP use?	Yes	No
	Are views expressed from the women's perspectives?	Yes	No
	Are views expressed from the family or health professionals' perspective?	No	Yes

Step 2- Full text screening

Instructions to reviewers

If you are unsure about eligibility, please include the study to allow it to move to next step, avoid using the ‘maybe’ label in Covidence as this automatically generates a conflict that must be resolved prior to moving forward to step 2.

Essentially, keep all studies unless you can exclude it.

Criteria		**Include**	**Exclude**
1.Study Design	Study design reports qualitative data on the barriers or facilitators to CPAP therapy use?	Yes	No
2. Population	Are there females/women in the sample?	Yes	No
3. Context	Is CPAP used to treat chronic SDB?	Yes	No
	Is the study about using CPAP therapy at home?	Yes	No
4. Outcomes	Does the study look at barriers and / or facilitators to CPAP use?	Yes	No
	Are there participant quotes from women or female participants in the results?	Yes	No
	Does the author report findings about women or female participants?	Yes	No
	Are views expressed from the women/females’ perspectives?	Yes	No
	Are views expressed from the family or health professionals’ perspective?	No	Yes

Appendix D – Coding Guide

Coding Guide

TDF Domain	**Constructs as per TDF (Cane et al., 2012)**	**Definitions adapted to CPAP uptake and usage represented in this study and inspired by (Presseau et al., 2017)**
Knowledge	• Knowledge about condition/scientific rationale • Schemas+mindsets+illness representations • Procedural knowledge	• Discussion about evidence related to the use CPAP (or lack thereof) • Awareness of guidelines, or lack of guidelines • Descriptions of evidence that would convince them to use CPAP • Procedural knowledge (e.g., knowing how to clean, how to place mask, machine) • Knowledge related to pathophysiology of SDB, • Consequences of SDB • Knowledge about time device should be used per night • Knowledge of what to do to clean or use CPAP • What do patients know about CPAP? • How does what they know about CPAP, influence what they do?
Skills	• Competence/ability/skill assessment • Competence/ability/skill assessment • Practice/skills development • Interpersonal skills • Coping strategies	Execution of procedural knowledge • Mention of executing Skills needed to operate CPAP • Cleaning CPAP • Positioning in bed to troubleshoot issues • Troubleshooting mask leaks • Skin problems
Social/Professional Role and Identity	• Professional identity/boundaries/role • Group/social identity • Alienation/organisational commitment	How the person perceive they need to do to 'fit' in the group or class The set of behavioral or personal characteristics by which an individual is recognizable [and portrays] as a member of a social group (social , family, personal, professional groups)

TDF Domain	Constructs as per TDF (Cane et al., 2012)	Definitions adapted to CPAP uptake and usage represented in this study and inspired by (Presseau et al., 2017)
		An individual's sense of self defined by a) a set of physical and psychological characteristics that is not wholly shared with any other person and b) a range of social and interpersonal affiliations (e.g., ethnicity) and social roles. Inappropriate coding into this domain • How the social group or class is influencing the person to use, code as social influences.
Beliefs about Capabilities	• Control of behaviour and material and social environment • Perceived competence • Self-confidence/professional confidence • Empowerment • Self-esteem • Perceived behavioural control	• Descriptions of how easy or difficult it will/would be to do the behavior • Descriptions of how confident a participant feels that they can use CPAP • Anticipated comfort issues (CPAP or sleeping position, could also be coded into optimism at the same time) • How past experiences influence their current or future ability to use CPAP • Do patients think they can do what is expected of them – and how does this influence whether or not they use the CPAP?
Optimism	• Optimism/pessimism	• Participants' descriptions of their level of optimism regarding the hypothetical effectiveness of CPAP • Optimistic or pessimism for anticipated outcome • Anticipated comfort issues (CPAP or sleeping position, could also be coded into beliefs about capabilities at the same time)
Beliefs about Consequences	• Anticipated regret • Appraisal /evaluation/review • Consequents • Attitudes • Contingencies • Reinforcement/punishment/consequences • Incentives/rewards • Beliefs	• Positive and negative outcomes for getting or using CPAP • Beliefs about treatment outcomes – both theoretical and based on experience due to using CPAP • Descriptions/explanations of how CPAP is beneficial • Potential long-term outcomes of using CPAP • Descriptions of factors that influence using CPAP (Also code at 'Environmental Context and Resources' if appropriate) • Describing learning curves, or getting in the habit (also code behavior regulation in the case if appropriate)

TDF Domain	Constructs as per TDF (Cane et al., 2012)	Definitions adapted to CPAP uptake and usage represented in this study and inspired by (Presseau et al., 2017)
	• Unrealistic optimism • Salient events/sensitisation/critical incidents • Characteristics of outcome expectancies–physical, social, emotional; • Sanctions/rewards, proximal/distal, • Valued/not valued, probable/improbable, salient/not salient, • Perceived risk/threat	• What are the good and bad things that can happen from using CPAP/from not using the CPAP? Note: Actual Comfort issues can also be coded here
Reinforcement	• Rewards (proximal/distal, valued/not valued, • probable/improbable) • Incentives • Punishment • Consequents • Sanctions • Contingencies	• Reinforcement/reward of using CPAP based on experience. • Consider social reinforcement punishment, as well as intrinsic reward • Rewards (less sleepy, better mood), Punishment (must move to another room to sleep), • Consequences (snoring, tension in relationship, side effects of therapy), • Sanctions (loss of driving privileges, loss of employment) • Takes time to feel benefits of therapy
Intentions	• Intrinsic motivation • Commitment • Distal and proximal goals • Transtheoretical model and stages of change	• Participant’s descriptions of how motivated they are to get or use CPAP • Participant’s inclinations to get or use CPAP all nights • Participants’ descriptions of when they are and are not inclined to use CPAP • How inclined are they to use CPAP/to do what they are supposed to do Also, code to other domains as necessary (i.e., ‘Beliefs about Consequences’) **Note:** Indicator of intention must be explicit and not inferred Inappropriate coding to this domain:

TDF Domain	Constructs as per TDF (Cane et al., 2012)	Definitions adapted to CPAP uptake and usage represented in this study and inspired by (Presseau et al., 2017)
		• this is different from how effective they think CPAP will be ('Beliefs About Consequences') • and different from how much of a priority getting or using CPAP is for them ('Goals'). Be careful not to code the reasons for the intention (focus on statements that directly reflect their intention and motivation)
Emotion	• Affect • Stress • Anticipated regret • Fear • Burn-out • Cognitive overload/tiredness • Threat • Positive/negative affect • Anxiety/depression	Descriptions of emotions experienced by the patient (can be positive or negative) This is not limited to just how patients are feeling about the condition/CPAP, but also how the patients feel about what they are doing/their behaviors in relation to the condition/treatment, and how do those feelings influence whether or not they are using CPAP?
Goals	• Goals (autonomous, controlled) • Goal target/setting • Goal priority	• Descriptions of whether or not getting or using CPAP is a priority • What goals/outcomes/standards is the patient trying to achieve,
Memory, Attentions and Decision Processes	• Attention • Attention control • Decision making	• When/why would it be easy to forget. • Attention or memory issues while getting instructions for using CPAP • How does their ability to focus/pay attention to what they are supposed to do? • How much of a role does their forgetfulness or remembering play in whether or not they use CPAP? • Descriptions of decision processes regarding CPAP Inappropriate coding into this domain • Thinking back in time • Reminiscing about the past
Environmental Context and Resources	• Environmental stressors • Person x environment interaction	• Descriptions of CPAP type • Description of CPAP machine • Availability of material and professional resources including presence of

TDF Domain	Constructs as per TDF (Cane et al., 2012)	Definitions adapted to CPAP uptake and usage represented in this study and inspired by (Presseau et al., 2017)
	• Knowledge of task environment	healthcare workers (meeting, phone call, assistance with troubleshooting by healthcare provider) • Discussion about limitations of CPAP machines • Descriptions of software used • Context of the home environment itself that would/does influence whether CPAP is used • Anything and everything in their environment that influences what they do, and how those things influence whether or not they use • Descriptions of how more time will be required for sleep • Descriptions of how environmental/contextual factors can influence the quality of sleep (Also code these descriptions at 'Beliefs about Consequences') • Costs of therapy or supplies • Delays to meet with provider, time needed to meet provider • Delays to get approval for CPAP from insurances
Social Influences	• Social/group norms • Organisational development • Leadership • Team working • Group conformity • Organisational climate/culture • Social pressure • Power/hierarchy • Professional boundaries/roles • Management commitment • Supervision • Inter-group conflict • Champions • Social comparisons • Identity; group/social identity • Organisational	• Discussion about how others influence whether or not a CPAP is available or used. • How does others' thinking/judgement influence whether or not the patient uses CPAP? • Includes patient influence and influence (attitudes, comments, behaviors), of other healthcare professionals, family, friends. • What do others think? • What do others think about what the patient does? Inappropriate coding into this domain • Lack of availability or interventions from health care provider (code as environmental context & resources)

TDF Domain	Constructs as per TDF (Cane et al., 2012)	Definitions adapted to CPAP uptake and usage represented in this study and inspired by (Presseau et al., 2017)
	commitment/alienation • Feedback • Conflict—competing demands, conflicting roles • Change management • Crew resource management • Negotiation • Social support: personal/professional/organisational, intra/ • interpersonal, society/community • Social/group norms: subjective, descriptive, injunctive norms Learning and modelling	
Behavioral Regulation	• Goal / target setting • Implementation intention • Action planning • Self-monitoring • Goal priority • Generating alternatives • Feedback • Moderators of intention-behaviour gap • Project management • Barriers and facilitators	• Self-regulatory strategies already in place that would influence the uptake or use of CPAP • Focus on self-regulatory strategies only (not all strategies) • Coping plans, problem solving • What self-regulatory strategies do the patients think would help them do what they are supposed to do? • What self-regulatory strategies have helped them do what they are supposed to do? (Past or present?) • Are there any strategies already in place that help them do what they are supposed to do? • Self-monitoring (feedback from CPAP) • Breaking habit (gradual increase in CPAP use) • Actual Comfort with CPAP • Actual Comfort with sleeping position • I don’t like it

Appendix E – Themes

Theme	Quote
Expectations about CPAP	Maybe I'll sleep better with it. Maybe the 4 hours I do sleep will be of better quality (Zarhin & Oksenberg, 2017, Israel, 1380) For me the main reason I am using CPAP is], so I'll have better days, physically and mentally (Graco et al., 2019, Australia, 250) I want to be healthy; I want to live. I'm going to get a new grandbaby and I want to live. I don't want to sit in a chair the rest of my life (Khan et al., 2019, United States, 1726) I have a feeling you become addicted to it. I don't want to become dependent on something external . . . on a device. So . . . When I started thinking about it, I said, "How will I travel abroad? What will I do? How will I go on vacations?" What, I will be like some geriatric person at home with an oxygen mask? I don't want it [. . .] I want to be a free person, not dependent on devices. (Zarhin & Oksenberg, 2018, Israel, 235)
Learning to use my CPAP machine	I don't know what to do with the hose and stuff." (Khan et al., 2019, United States, 1726) I wonder how this is actually working. Is there a… well there is a medical reason why we're doing it, but how does the process actually work? (Gibson et al., 2018, New Zealand, 145) I just don't know how to work it (Khan et al., 2019, United States, 1726) If I am laying on left side, it is hanging at the edge of the bed; if I am laying on my right side, I just pull it up over the pillows and make sure that everything is still flowing properly (Lucken, 2019, United States, 98) I had a kind of rough spell getting adjusted, trying different nose pieces (Dickerson & Akhu-Zaheya, 2007, United States, 245) There were a few nights where I just couldn't work it out. I bumped it or something, and the dial went off and I'd freak out (Ward, 2016, New Zealand, 143) If it's too loose it slips off your nose and air is blowing everywhere else and you wake up from the noise (Dickerson & Kennedy, 2006, United States, 119) Pouring [water into the water chamber] is very hard…That's a challenge because it's a small hole (Fung et al., 2015, United States, 6). Gurgling [from the humidifier] [and] you have to lift up the tube and empty that out and go back to sleep (Dickerson & Akhu-Zaheya, 2007, United States, 245) I learned that] having the proper equipment, wearing your equipment the right way, and cleaning it the right way is vital (Khan et al., 2019, United States, 1728)
The burden of the technology	It is an expensive machine, and I am not sure I can afford it if the insurance doesn't pay (Dickerson & Akhu-Zaheya, 2007, United States, 247) You have all this equipment, you have to take care of it, clean it, wear it.…It's a nuisance. I have to plug it in, fill it, and make sure it is clean (Dickerson & Kennedy, 2006, United States, 117)

Theme	Quote
	I fear that if the electric goes off, the machine would go off (Dickerson & Akhu-Zaheya, 2007, United States, 248) If we ever stay anywhere like a hotel I'm always checking which side the plug's on. …When I went on my daughter's year seven camp, and there were no power points in the room, I was a bit freaked out about that. (Ward, 2016, New Zealand, 135) You have to expel all of this air and I feel like the first ten minutes while I'm waking, expelling this air… I guess it gets in your stomach or whatever, you have to get it back out but to me that's a minor thing. If I belch all night, that's a minor thing, you know (Sawyer, 2007, United States, 93-94) I wear it, but sometimes I just feel like I'm running out of air." (Dickerson & Akhu-Zaheya, 2007, United States, 245) I couldn't really breathe with the air pressure going on(Khan et al., 2019, United States, 1726) I don't know if I'm waking up because of the air is (sic) blowing in my eyes, or if I'm waking up by myself and I am noticing that I have air blowing in my eyes (Ong et al., 2017, United States, 190) It would push air so fiercely through the nose into my throat and it was um, actually going through my mouth, blowing out through my mouth. (Lucken, 2019, United States, 91) I'm having a lot of sinus problems because of it, you doing all that sneezing. Last week my nose was driving me crazy, you know, and as soon as I put the mask on it seemed like it was so clogged up and it's a lot of mucous built up and then for lack of a better word, you know, a lot of hard boogies and stuff in there. It's just driving me crazy and it was very, very sore (Sawyer, 2007, United States, 93-94) My mouth gets very dry (Graco et al., 2019, Australia, supp.7) And then the headpiece that goes around your head, I just found that it messed up a lot of my hair (Alebraheem et al., 2017, Canada, 86) I just couldn't get comfortable with [the PAP machine] (Khan et al., 2019, United States, 1726) It is very uncomfortable (Dickerson & Kennedy, 2006, United States, 119) Mine's like a security blanket… I feel so secure with it (Bakker et al., 2014, New Zealand, 225) I am claustrophobic and I was very leery about using something over my face. (Dickerson & Akhu-Zaheya, 2007, United States, 245) A part of it the reason it was a problem for me is I am claustrophobic. Extremely claustrophobic (Lucken, 2019, United States, 91) You feel tied to your place, you feel trapped, like a caged animal!" (Zarhin & Oksenberg, 2018, Israel, 234) I would panic." (Lucken, 2019, United States, 93) sad that I would have to wear this for the rest of my days (Bakker et al., 2014, New Zealand, 226) I felt relief that we were finally going to get something done (Bakker et al., 2014, New Zealand, 226)
Improvements in	I wish I didn't have to put it on … but the payoff feeling OK when you

Theme	Quote
SDB symptoms	wake up … it doesn't really make it too questionable (Ward, 2016, New Zealand, 126) This helps me so much. It's incredible. I am a completely different person. I feel like I was in a cemetery and moved to heaven . . . I accept it [the CPAP] with love (Zarhin & Oksenberg, 2017, Israel, 230) I couldn't believe what a difference in how I felt- I've never had such a good night's sleep. I slept! I felt something different with that machine. Like a refresh-ness that I've never felt before, or at least in a long time. I felt better. More alert, you know? It's like strength or something. I felt vibrant! (Henry & Rosenthal, 2013, United States, 53) Then I did notice gradual changes (Dickerson & Akhu-Zaheya, 2007, United States, 246) With the CPAP I have a complete sleep is the best I can describe it (Lucken, 2019, United States, 89) Better focus (Lucken, 2019, United States, 97) I don't wake up with headaches (Lucken, 2019, United States, 89-90) Oh, [PAP] immediately changed me. [The first] morning, I woke up and felt like a different person... it makes you feel so much better (Khan et al., 2019, United States, 1726) I don't feel as tired (Khan et al., 2019, United States, 1726) With the CPAP I'm finding that I'm more alert and I don't need a nap. I can stay awake in the afternoon (Graco et al., 2019, Australia, supp.6) I have more energy (Lucken, 2019, United States, 89) The snoring has] calmed so much (Khan et al., 2019, United States, 1726) I don't find there's a difference. Like I still find I have the same energy. I'm still sleepy—I'm still taking naps, which they said that I wouldn't be taking naps (Alebraheem et al., 2017, Canada, 86) I am still tired in the morning, and I am not any less tired than not using it.… (Dickerson & Akhu-Zaheya, 2007, United States, 248) I was so energized that day, I wanted to feel that way again…. I never did feel like that again." (Dickerson & Akhu-Zaheya, 2007, United States, 245)
Not feeling (or looking) like myself	I used to put it after he went to sleep and I went to bed with it. Nevertheless, I didn't feel at ease with it. It's not a pretty sight (Zarhin & Oksenberg, 2018, Israel, 237) When I have it on and I'm in bed, I feel like a Martian, I feel very unattractive and very ugly (Graco et al., 2019, Australia, supp.9) I put it on so tight that I have marks on my face, and they don't go away (Dickerson & Akhu-Zaheya, 2007, United States, 244) Mask doesn't make me feel like I look nice [for my husband] (Ward, 2016, New Zealand, 126) Once it's normal in your household then it's easier to feel less embarrassed about it with other people (Bakker et al., 2014, New Zealand, 225) I've wondered what I would do if I wasn't in such a loving relationship. It's very un-sexual (Henry & Rosenthal, 2013, United States, 54)

Theme	Quote
	I usually put it only when we go to sleep, when it's dark. I do it quietly. It's not like he doesn't see me, but I avoid putting it back on for my own good feeling (Zarhin & Oksenberg, 2017, Israel, 1379) You don't like to see yourself with this contraption on your face...I have to make sure that all the lights are off, that I'm in bed probably asleep before my husband comes to bed.(Ayow et al., 2009, Canada, 233) This is absurd, sleeping with this gear on my head, it is so unnatural.… (Dickerson & Kennedy, 2006, United States, 117).
Receiving support	Have somebody who's been through it and has used CPAP for a while come in to talk to somebody for 10 or 15 minutes that's about to start the process… can assure somebody that you do get used to it (Bakker et al., 2014, New Zealand, 225) The people have told me that they see a big change in me (Lucken, 2019, United States, 89) They'll make fun of you: 'Oh! She has to wear a mask.' or '...You should see the thing that she has to wear and...' ....So then, you have to make like a joke of yourself... You know, it hurts. It hurts deep down (Ayow et al., 2009, Canada, 233) He helped me to figure it out… and he would be: hang on a minute it can't be this hard. And he'd be sitting there trying to do it (Ward, 2016, New Zealand, 143) I suppose he tries to make light by cracking jokes, but it doesn't necessarily make me feel any better (Ward, 2016, New Zealand, 111) I told him well maybe the machine might bother you, you know, the noise of the machine... he said "no I can deal with that (Sawyer, 2007, United States, 90-91) He didn't care [about the mask]. He just wanted to get back the person that he married that didn't fall asleep (Ward, 2016, New Zealand, 146) Like your husband [says] 'you've been really shitty the last couple of days, is your machine not working properly?' (Ward, 2016, New Zealand, 138) They were great because [health professional name] rang me a few times just to check up. She was able to turn the pressure down from her end. And then I was able to use it so that was great (Graco et al., 2019, Australia, supp.10) I have to send it [compliance card] to make sure you use it like a big brother; I don't like being watched (Dickerson & Akhu-Zaheya, 2007, United States, 247)
Choosing my attitude	The weekends to me is like a break from school and stuff, so I just don't wear it (Prashad et al., 2013, United States, 1307) I feel too lazy to use the machine every day (Goyal et al., 2017, India, 1390) I don't wanna put it on that night, so I don't put it on. (Prashad et al., 2013, United States, 1307) It was probably laziness or just forgetfulness, or, I'd be sleeping at my friends' houses for extended periods of time and purposely forget my machine so I didn't have to use it at their house." (Prashad et al., 2013,

Theme	Quote
	United States, 1307)
	Because sometimes I do forget to put it on, or I just fall asleep (Prashad et al., 2013, United States, 1307)
	I said I would try other options first and then we'll see (Zarhin & Oksenberg, 2017, Israel, 1380)
	I don't know what to do. I don't know. I am still thinking about it (Zarhin & Oksenberg, 2017, Israel, 1380)
	I refuse not to wear… I still wouldn't stop using it. I wouldn't stop (Sawyer, 2007, United States, 93-94)
	I just got in with it… I just adjusted myself to it, because I had to (Ward, 2016, New Zealand, 133)
	I felt like it was a double-edged sword. (Bakker et al., 2014, New Zealand, 226)
	It is a trade off (Dickerson & Kennedy, 2006, United States, 118)
	There is always a give and take to everything you have to do (Dickerson & Akhu-Zaheya, 2007, United States, 247)
	Then again, you can't have it all (Zarhin & Oksenberg, 2017, Israel, 1379).