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Increasing Access and Adherence to Cognitive Behavioral Therapy for Insomnia (CBTi) for

Adults: A Quality Improvement Project

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Abstract

BACKGROUND: Insomnia is a sleep disorder that is becoming more prevalent. It can significantly impact a person's quality of life and it contributes to a substantial economic financial burden. Cognitive behavioral therapy for insomnia (CBTi) is the primary treatment for insomnia, but patients are rarely referred for this treatment. This quality improvement project focused on implementing motivational interviewing to increase patient utilization of CBTi. It also encouraged utilization of CBTi Coach, a free phone application that has all of the CBTi components, a rigid sleep behavioral plan and frequent follow-up appointments to improve sleep quantity and quality.

INTERVENTION: Patients that met the inclusion and exclusion criteria were scheduled three follow-up appointments at two-week intervals. The clinician employed motivational interviewing to help patients identify ambivalence about CBTi and helped the patients set two short-term goals at each visit and one long-term goal at the initial consult. Patients were given a sleep prescription and encouraged to utilize CBTi Coach. Patients were asked to fill out a daily sleep diary and weekly insomnia severity index scale.

RESULTS: Motivational interviewing was measured by whether or not a patient met their goals. All patients fully met their first goal at every follow-up appointment. At the first follow-up appointment only one patient met their second goal, two partially met their goal and one patient did not meet their goal. At the second follow-up appointment two patients fully met their second goal and two patients partially met their goal. At the third and final follow-up appointment all patients met their second goal. All patients met their long-term goal.

A trend analysis was used to measure sleep diary indicators and the insomnia severity index. There were downward trends for sleep onset latency, total nightly awakenings, and time spent awake after sleep onset. There were upward trends for total sleep time and sleep efficiency. There was a downward trend for the insomnia severity index tool.

CONCLUSIONS: Motivation interviewing was established to be effective to encourage patients to utilize CBTi therapy. Following a sleep behavioral plan with a sleep prescription, tracking a nightly sleep diary and attending frequent follow-up appointments demonstrated an enhancement in sleep quality and quantity.

Keywords: insomnia, cognitive behavioral therapy for insomnia, quality improvement, motivational interviewing, CBTi coach

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Introduction

Insomnia is defined as a sleep disorder in which a person has trouble initiating sleep, maintaining sleep, or both. Evidence based guidelines for an insomnia diagnosis requires associated daytime dysfunction in addition to self reported poor quality of sleep, which is a subjective perception of difficulty with sleep initiation, duration, consolidation, or restoration that occurs despite adequate opportunity for sleep (Schutte-Rodin et al., 2008). Insomnia is primarily diagnosed through clinical evaluation. Tools that can be helpful in the diagnosis process may include questionnaires, the Epworth Sleepiness Scale, sleep diary home logs, symptom checklists, psychological screening tests and bed partner reviews (American Academy of Sleep Medicine, 2022). In lab or home polysomnograms are not indicated for an insomnia diagnosis. However, polysomnograms can be used to rule out other sleep disorders. Insomnia can present as acute or chronic. Acute insomnia can last for days or weeks and chronic insomnia persists longer than three months. Insomnia can be primary or secondary. Primary insomnia occurs when it is not caused by something else and secondary insomnia is referred to as the symptom or side effect of another problem, such as a medical condition, psychological condition, medication, or another sleep disorder (Khurshid, 2018). It is essential patients are properly screened so primary insomnia can be differentiated from secondary insomnia and an appropriate treatment plan can be established. A comprehensive history should include caffeine, alcohol and drug use, level of physical activity, presence of comorbid psychiatric symptoms, psychosocial stressors, medical conditions, medications, and overall sleep hygiene (Khurshid, 2018). Medical conditions that can cause insomnia may

include chronic rhinitis, thyroid dysfunction, congestive heart failure, diabetes, arthritis, fibromyalgia, asthma, gastroesophageal reflux disease and chronic pain (Khurshid, 2018). Insomnia is also commonly seen in psychiatric disorders including depression, anxiety, bipolar disorder, psychosis, post-traumatic stress disorder and attention deficit hyperactivity disorder. It is essential to assess and consider the differential diagnoses at the initial consult is pertinent, so it can be incorporated into the treatment plan.

Insomnia can significantly reduce quality of life as it can impair cognitive, physical, and emotional functioning. Koffel et al. (2018) noted "Insomnia affects nearly 25% of the general population, with economic costs exceeding \$100 billion dollars per year in workplace performance and health care utilization." Insomnia has become more prevalent. There has been a dramatic increase in insomnia diagnoses between 1993 and 2015, from 800,000 to 9.4 million (Dopheide, 2020). These figures indicate that insomnia is a sleep disorder that needs to be diagnosed in a timely manner and treated appropriately to assure optimal health for patients and help keep healthcare costs down.

The American Academy of Sleep Medicine (2022) has identified cognitive behavioral therapy for insomnia (CBTi) as the primary treatment for insomnia. Medications should only be considered as first line treatment for patients who cannot participate in therapy. CBTi focuses on sleep behavior plans including sleep restriction by reducing time spent awake in bed, and stimulus control, which reduces conditioned arousal when attempting to sleep (Dopheide, 2020). Patients are given a "sleep prescription," which tells them what time to go to bed and what time to wake up. It is recommended to avoid wakeful activities in bed and to get out of bed if a person is not able to sleep. Keeping a nightly record of these elements in

the form a sleep diary can help a patient and clinician understand how much sleep the person is getting and how disrupted it may be.

Additionally, CBTi emphasizes the importance of practicing proper sleep hygiene, relaxation training, and cognitive restructuring (Dopheide, 2020). Sleep hygiene includes creating a restful sleep environment and doing behaviors to promote better sleep such keeping a consistent sleep schedule, avoiding daytime napping, and turning all electronics off an hour before bed. Relaxation training works on deep breathing exercises, progressive muscle relaxation, and guided imagery. Cognitive restructuring requires changing negative thoughts around sleep and turning them to more constructive thoughts. Traditional CBTi is 4-8 hour sessions delivered over the course of six to eight weeks (Anderson, 2018). Length of therapy can vary depending upon a person's needs and the severity of their insomnia. A significant amount of research has validated the effectiveness of CBTi on overall sleep quality (Kuhn et al., 2016). CBTi is widely preferred over medication for patient safety as well as the financial impact and overall effectiveness of the treatment (Reynolds & Ebben, 2017).

Problem Description

CBTi is the primary treatment for insomnia, but patients are rarely referred for this treatment. One study found only 10% of patients were offered CBTi and 80% had preferred nonpharmacologic treatment (Koffel et al., 2018). Transparent barriers to CBTi include, but are not limited to system barriers, clinician barriers and patient barriers (Koffel et al., 2018). There are simply not enough providers in the healthcare system that offers this type of therapy. In 2016, the United States only accounted for 659 CBTi specialists and providers were found to be disproportionally located (Thomas et al., 2016). There are a significant

amount of underserved areas, such as rural, low income, elderly, and minority populations, making provider access extremely difficult.

Other CBTi barriers involve clinician barriers. Clinician barriers often include lack of motivation to properly assess patients for insomnia, along with an overall lack of knowledge of CBTi (Koffel et al., 2018). Research has found providers are more likely to prescribe sleep medications instead of taking the time to review non-pharmacological options including CBTi (Moloney, 2017). Medications can be a significant expense to patients and the insurance companies. The total annual cost of prescription medications for insomnia is estimated to be \$1.6 million dollars annually and \$1.8 million dollars annually for over the counter products (Daley et al., 2009). Besides the financial burden, sleep medications also have the potential to cause serious side effects and risks to patients. Many sleep medications are controlled substances, so there is risk of developing abuse and dependence. Ambien is a hypnotic sleep medication very commonly prescribed for insomnia. In 2019 the U.S. Food and Drug Administration (FDA) added a black box warning to Ambien stating it can cause sleep behaviors such as sleepwalking, sleep driving, sleep eating, and the potential to engage in other activities while sleeping (Osbourne, 2022). Furthermore, Ambien can cause depressive symptoms such as suicidal ideation, next day impairment, memory loss, overdose, and even death (Osbourne, 2022). Ambien is just one of many sleep medications that pose a potential serious risk to patients. Furthermore, medications are commonly prescribed for insomnia and research suggests this is not an efficacious treatment plan. CBTi and medications have both been beneficial for short-term outcomes for insomnia, but the literature suggests CBTi is far more superior to medications for long-term outcomes (Morin

et al., 2020). Overall, sleep medications may not be adequate if there are other medical, behavioral, or social complications preventing a person from getting a good night of sleep.

Beyond system and clinician barriers to CBTi there are also patient barriers. Patient barriers include hesitancy to initially seek help, knowledge of CBTi and engagement in therapy. Stinson et al. (2006) completed a study that indicated 52% of participants thought medications were the only treatment option for insomnia. The length of time it takes to get in to see a CBTi provider and then complete the traditional CBTi program can lead to lack of engagement. Other patient barriers to treatment may include time constraints, preference of "easy" treatment to accommodate busy schedules, the inconvenience of traveling, complications of making arrangements to attend appointments, putting in the effort to engage in CBTi over the simplicity of taking a medication and having doubt that it is an effective treatment option (Koffel et al., 2018). Furthermore, there is a stigma around mental illness, which is higher in some cultural groups and often is a major barrier when accessing mental health services (Gopalkrishnon, 2018).

Dartmouth Health is a large healthcare system in the state of New Hampshire. Dartmouth Health has a sleep clinic in the southern region of the state and is only one of four major institutions that offer sleep services to five southern counties. In this region there are approximately 1.02 million people, which accounts for about 73% of the state's population (United States Census Bureau, 2022). Wait times to see one of two providers often exceeds three months and by that time acute insomnia turns chronic. Traditionally when patients presented with primary insomnia the sleep providers at Dartmouth Health would refer them to a five week, self-paced online CBTi program that cost \$50. It was recognized through chart reviews and follow-up visits that patients very rarely followed through with this

program. Every patient presenting for a primary insomnia consult was referred to this program, approximately 10-20 referrals per month. One provider established zero patients followed through and the other provider had two patients complete it over the course of six months. The providers did not ask why patients did not follow through with this online program, but assumed lack of engagement was due to cost. The providers collectively found CBTi Coach, a free phone application that employs all the components of CBTi therapy. By eliminating the barrier of cost the providers thought they would see an increase in adherence to therapy.

After completing chart reviews and seeing patients at follow-up visits it was recognized despite having a free CBTi program patients were still not utilizing this treatment modality. Only one patient was identified to download the program over the following six months. Barriers to utilization were identified at follow-up encounters and similar to what was identified in the literature review. Patients reported not having enough time. Patients were not motivated and hesitant that it was not going to be effective. Some were unsure how to download the phone application and navigate through the program. Other patients preferred to be prescribed medication. In this quality improvement project, the providers recognized there was a need to decrease barriers to CBTi utilization. Formerly the providers explained CBTi, provided CBTi resources and the patients were given the option to follow-up as needed. The literature proposed giving patients a rigid behavioral sleep plan with a sleep prescription, asking them to fill out nightly sleep diaries and scheduling frequent follow-up appointments would help increase CBTi utilization. Ultimately, these interventions should help improve sleep quality and quantity.

Available Knowledge

Increasing Access

It is apparent there is a significant amount of ongoing research on methods to increase access to CBTi. National efforts have been made to increase training for CBTi providers to help close the gap between providers and the demand for providers (Koffel et al., 2018). Additionally, there is research working on the development and implementation of various delivery formats for CBTi to help increase access. To start, there are many different self-paced books and online web-based programs. Group CBTi and shortened versions of CBTi have become gradually more available to help increase access. Telephone-delivered CBTi and video telehealth have become increasingly popular and have demonstrated efficacy in increasing access to therapy and improving overall patient sleep outcomes (McCurry et al., 2016; Gehrman et al., 2016). CBTi smart phone applications are another delivery method that is gaining popularity due to advances in technology and their accessibility. Cognitive Behavioral Therapy (CBT) including CBTi delivered via mobile phone applications have been widely studied and proven efficacious (Rathbone et al., 2017). Face to face CBTi is the preferred delivery method, but research has found mobile applications have the potential to produce similar results and are a good alternative method (Rathbone et al., 2017).

CBTi Coach is a free phone application developed by the Veterans Association, Stanford University and the Department of Defense for people who experience symptoms of insomnia (Kuhn et al., 2016). CBTi Coach was developed by a team of experts in insomnia, CBTi, clinical intervention, development, technology, and implementation science, as an approach to address treatment adherence concerns (Kuhn et al., 2016). Components from face-to-face CBTi were integrated into the phone application. CBTi Coach offers psychoeducation on sleep hygiene, relaxation training, and behavioral sleep plans. It also has

tools for tracking sleep through sleep diaries and insomnia symptoms through the insomnia severity index (ISI) (Kuhn et al., 2016). Reilly et al. (2022) conducted a study on participants engaging in CBTi Coach for six weeks and found significant improvements in subjective sleep outcomes and objective sleep efficiency. The study concluded the mobile application was efficacious as a self-management tool for patients with insomnia and had similar results to traditional face-to-face CBTi (Reilly et al., 2022). Koffel et al. (2016) examined the effects of integrating the CBTi Coach phone app with CBTi therapy. CBTi Coach was found to have an impact on homework completion, adherence to therapy and increased accessibility to CBTi therapy materials (Koffel et al., 2016). This research is reassuring CBTi Coach will help increase adherence to therapy. In another qualitative study it was reported patients were not familiar with CBTi Coach. They were more likely to engage in treatment, because it was easily accessible from home (Koffel et al., 2020). However, patients identified the importance of personal contact through follow-up visits as this would help address individual needs and enhance adherence (Koffel et al., 2020). This study validates the importance of setting up follow-up appointments with patients to enhance adherence to CBTi Coach. CBTi Coach is an efficacious treatment method for insomnia, but patient motivation and commitment to engage in therapy will largely affect the outcomes of the treatment (Rathbone et al., 2017).

Increasing Utilization

Motivational interviewing is a patient centered communication method to help patients identify ambivalence and plan for change (Wheeler, 2014). Motivational interviewing is a therapeutic approach designed to help increase patient motivation in engaging in psychotherapy when resistance is present. Motivational interviewing utilizes four

key principles including asking open ended questions, making affirmations on a patient's strengths and efforts, reflecting on the patients feelings, and summarizing what was said to move from one idea to another (Wheeler, 2014). Using these skills will help a patient advance through the phases of the change process. Motivational interviewing proficiency is an essential skill providers should have to help improve patient outcomes.

There have been a number of systematic reviews and meta-analyses evaluating the effectiveness of motivational interviewing. It has been concluded motivational interviewing prior to CBT has found patients who received motivational interviewing attended more CBT sessions and reported improved symptoms (Majd et al., 2020; Randall & McNeil, 2017; Wheeler, 2014). Motivational interviewing enhances patient motivation, which increases adherence to therapy. Patient activation refers to an extent of a patient's understanding, competence, and willingness to engage in their own treatment plan (Heath, 2022). When patients are more involved in their healthcare they are more likely to adopt healthy behaviors. Motivational interviewing has been found to have a significant impact on patient activation and promoting patient engagement in their treatment plan (Innab & Kerari, 2022; McKeirnan et al., 2021).

Evidenced based practice for insomnia

As mentioned above, setting up follow-up appointments can help increase adherence to CBTi. Offering different delivery formats of CBTi including web based and smart phone applications is a good alternative to traditional one on one therapy and helps increase access. However, Koffel et al. (2020) suggests being mindful of the audience these formats are targeted towards and provide additional support to promote engagement. It is recommended that providers should offer a form of personal contact to ensure the patients' needs are being

met and to enhance participation with CBTi (Koffel et al., 2020). This could be in the form of a follow-up office visit, telemedicine conference, or telephone encounter. Providing patient coaching for digital CBTi is greatly supported in the literature. Patients have reported getting more exposure and having more knowledge about CBT, which has led to better outcomes when digital therapy is blended with personal contact (Hermes et al., 2021; Schueller et al., 2017). A personal interaction with the provider can complement remotely delivered services and help the patient comply with therapy (Lattie et al., 2020). To support the patient-provider relationship, Schueller et al. (2017) developed the Efficiency Model of Support, which emphasizes the importance of integrating human support in the context of technology based behavioral interventions such as CBTi. Patients benefit from this model, because having human support can overlap with variables found in psychotherapy. Also, there are likely going to be failure points when a patient utilizes a technology-based therapy (Schueller et al., 2017). Human support will be able to address the failure points and implement strategies to overcome these barriers. This research implies the best practice is to provide support to patients through personal interactions and this will help increase adherence.

The literature also supports the use of a sleep diary to increase adherence to CBTi. A sleep diary is a daily record of a patient's sleep schedule. In a systematic review conducted by Matthews et al. (2013) it was found that patients who had completed sleep diaries were more likely to increase adherence to CBTi and improve overall sleep outcomes. The use of sleep diaries was found to be a better predictor in patient participation over patient self reports, spouse reports, and the use of online homework reports (Matthews et al., 2013). It is recommended that providers encourage their patients to fill out a daily sleep diary to help increase adherence to therapy. In another systematic review conducted by Mellor et al.

(2021) it was discovered that derived components of CBTi including the use of sleep diaries were found to be good predictors of adherence to therapy. The systematic review proposed sleep diaries were one of the most widely used measurements and are recommended to use in practice to help increase adherence to therapy (Mellor et al., 2021).

Rationale

With the increase in patients presenting with insomnia nationwide, the providers at Dartmouth Health must transition to evidence based care to help increase access and utilization of cognitive behavioral therapy for insomnia, the primary treatment for insomnia. CBTi Coach is a free mobile application that was developed to help increase access to therapy and it has proven to be effective (Koffel et al. 2016; Koffel et al., 2020; Reilly et al., 2022). This tool needs to be implemented more into practice, so patients can have better sleep outcomes. Evidence based practice has identified motivational interviewing, human support blended with digital therapy, and the use of sleep diaries as key components to help increase adherence to CBTi (Majd et al., 2020; Mellor et al., 2021; Koffel et al., 2020; Randall & McNeil, 2017; Wheeler, 2014). Practitioners need to enforce these components into practice to help increase adherence to CBTi.

The first intervention in this quality improvement project was motivational interviewing. Motivational interviewing contains elements of the Transtheoretical Model of Change. Prochaska and DiClemente developed the Transtheoretical Model of Change, also called the Stages of Change Model, in the late 1970s (LaMorte, 2022). It operates on the notion that behavior change is accomplished through a cyclical process and not in a single or sudden event. The model theorizes people move through six stage of change: precontemplation, contemplation, preparation, action, maintenance, and termination

(LaMorte, 2022). Precontemplation is a stage when individuals are not seriously considering behavior change and are often unaware their behavior is problematic. Contemplation is the stage in which people recognize their behavior is problematic and are actively considering making a behavior change. Preparation is when a person is committed to make a change and believe the change can promote a healthier lifestyle. Action is the stage when people are actively engaging in their changed behavior and are adopting new behaviors. Maintenance is the stage in which people have sustained their behavioral change for at least six months and intend to keep moving forward with the behavior change. Termination is the stage people have recognized their unhealthy behavior and have no desire to return to that previous behavior. Moving through the stages is not always linear and cycling through the stages is part of the change process (LaMorte, 2022).

In a systemic review conducted by Hashemzadeh et al. (2019), it revealed strong evidence on the efficacy of the Transtheoretical Model for changing health behaviors. Numerous studies have concluded when the Transtheoretical Model is implemented in practice patient behavior is more likely to change compared to when it is not applied. Providers should be able to recognize what stage a patient is in when they present with an undesired behavior. Knowing what stage a patient is in can help the provider assess adherence, facilitate behavior change and help track as patients progress through the stages. Motivational interviewing parallels that of the Transtheoretical Model of Change (Wheeler, 2014). This model was used to explain why motivational interviewing was expected to work for this quality improvement project.

The second intervention this quality improvement project utilized was cognitive behavioral therapy (CBT) and the CBTi Coach phone application. The CBT model theorizes

that dysfunctional thoughts lead to irrational expectations. Changing the thought process can lead to behavioral change and clinical strategies are aimed at helping individuals identify their current way of thinking and help them create positive mental and behavioral changes (Wheeler, 2014). This theory was implemented in the intervention that was provided to patients, which is why it was expected to work. Changing negative thoughts around sleep can lead to positive thought processing and successful behavioral changes that ultimately improve sleep quality and quantity.

Specific Aims

The primary purpose of this project was to increase access and utilization of cognitive behavioral therapy for insomnia. This project aimed to employ motivational interviewing as a technique to increase patient adherence to CBTi Coach. Increased participation in CBTi Coach therapy, filling out nightly sleep diaries, and following a rigid sleep prescription plan with attendance of frequent follow-up appointments were expected to result in better quality and quantity of sleep.

The specific aims of this project were:

1. Measure the impact of motivational interviewing on CBTi utilization.
2. Measure the impact of CBTi Coach, sleep diaries and behavioral sleep prescription plans with frequent follow-up appointments on overall quality and quantity of sleep.

Methods

Context

Dartmouth Health is New Hampshire's only academic health system and the state's largest private employer (Dartmouth Health, 2022). Dartmouth Health's mission states, "We advance health through research, education, clinical practice and community partnerships,

providing each person the best care, in the right place, at the right time, every time" (Dartmouth Health, 2022). Dartmouth Health serves a population of 1.9 million patients across northern New England and provides access to more than 1,800 providers in every area of medicine (Dartmouth Health, 2022). This health system also includes 24 Dartmouth Health clinics that provide ambulatory services across New Hampshire and Vermont. Dartmouth Health has two sleep medicine clinics, one in Lebanon, New Hampshire and the other in Manchester, New Hampshire. The Manchester location is where this quality improvement project took place.

The Manchester sleep department is led by the neurology Medical Director and one office practice manager. There are two sleep specialists (one nurse practitioner and one physician assistant), one licensed practical nurse (LPN), and one clinical secretary. Services that are provided include referrals for sleep studies, CPAP management, parasomnia management, and insomnia management. Between the two providers there are a total of 62 hours spent in direct face-to-face patient care each week. New patient visits are 60 minutes and follow-up visits are 30 minutes in length. There are approximately 40 new patients and 44 established follow-up patients per week. New patients are scheduled for a follow-up visit every 2 weeks, 4 weeks, 2 months or 3 months depending on their needs. A stabilized patient will follow-up every 6 or 12 months depending on their stability and concern for relapse. When a sleep disorder is resolved a care coordination note is sent to the primary care provider for monitoring and a patient may choose to follow-up as needed.

Cost/Benefit Analysis

Insomnia is associated with significantly higher rates of overall healthcare utilization. A diagnosis of a sleep disorder including insomnia has been associated with approximately

eight additional office visits, 18 additional prescription medications and \$7,000 in healthcare expenditure per individual per year (Huyett & Bhattacharyya, 2021). Initial consults can range between \$150-\$300 and follow-up visits between \$85-\$225, depending on the length and complexity of the visit (TheraThink, 2022). Additional costs come from emergency department visits, hospitalizations, prescription medications and the development of comorbidities. Insomnia has been associated with an increase in cortisol secretion (Fernandez-Mendoza & Vgontzas, 2013). Hypercortisolemia is associated with significant morbidity including hypertension, diabetes, osteoporosis, and acute myocardial infarction (Fernandez-Mendoza & Vgontzas, 2013). Insomnia has now been firmly linked to these comorbidities (Fernandez-Mendoza & Vgontzas, 2013). Insomnia needs to be properly treated to prevent other comorbidities from occurring. Adopting CBTi into practice would help reduce these high costs, keep health care expenditure down and provide the best healthcare outcomes for patients.

The project intervention used a free phone application. This specific CBTi delivery format was chosen to eliminate the utilization barrier of cost. Therefore, there were no copyright or usage fees associated, as well as no costs associated with implementation of the intervention. No additional visits were needed for the providers to explain the intervention, so the impact on the workforce was neutral. Finally, there was no cost to the patient or direct monetary gain to the institution outside of regularly billed specialty visits for which they were referred.

Interventions

A project team was organized consisting of the institution's medical director, physician assistant sleep specialist, University of New Hampshire (UNH) faculty mentor and

the Doctor of Nursing Practice student/Advanced Practice Registered Nurse sleep specialist to develop a quality improvement project to increase access and adherence to cognitive behavioral therapy for insomnia. After the project proposal was composed it was submitted to UNH Nursing Quality Review Committee for approval.

The interventions for this project included 1. motivational interviewing with patients to identify and address precipitating factors of insomnia and decrease barriers for CBTi, 2. utilization of CBTi Coach, an evidence-based phone application that implements the components of CBTi therapy, 3. providing a behavioral sleep prescription plan, 4. encouraging the use of sleep diaries, and 5. scheduling frequent follow-up appointments.

Patients were screened at the initial consult to see if they met inclusion and exclusion criteria. Inclusion criteria were patients 18 years old or older and reported primary insomnia. Patients were excluded from the sample if another sleep disorder was suspected at the initial consult and a sleep study was ordered, they had another unstable sleep disorder diagnosis, and they were under the age of 18 years old. Patients who presented with primary insomnia at the initial consult and were already taking sleep medications were not excluded from the intervention. At the consult the clinician identified other medical, psychological and behavioral factors that may have been contributing to insomnia and if another secondary diagnosis was precipitating the insomnia, those patients were excluded.

Motivational Interviewing

If a patient met the inclusion and exclusion criteria the clinician utilized motivational interviewing. Motivational interviewing helped the patient identify ambivalence and the clinician facilitated effective interventions that met the needs of the individual patient. The clinician used the four key principles of motivation interviewing including asking open-

ended questions, affirming by commenting on the patient's strengths, reflective listening and summarizing. The clinician had the patient set two short-term goals and one long-term goal. The clinician assessed patient engagement by asking the patient about their thoughts on engaging with CBTi. The clinician helped the patient identify personal barriers to engaging with CBTi Coach. The clinician explained CBTi and how to utilize the CBTi Coach phone application. Patients were encouraged to fill out a daily sleep diary and a weekly insomnia severity index (ISI) questionnaire. These were embedded in the phone application. Patients were also encouraged to record how much time was spent each day using the phone application. The clinician recommended patients should dedicate 30-60 minutes daily to the application and review the CBTi components. The clinician helped the patient recognize a time of day that would be best for them to engage. One goal was specifically about the patient's commitment to how much time per day they would use the phone application. All questions were answered and a two-week follow-up appointment was scheduled.

At the follow-up appointment the clinician reviewed each of the goals and to what extent they were met. Motivational interviewing continued to be implemented to help the patient identify barriers and continue to work towards their goals. The sleep diary was reviewed to see if there were any improvement in sleep onset latency, number of awakenings, total time of wakefulness after sleep onset, total sleep time and sleep efficiency, from week one to week two. The insomnia severity index tool was reviewed to monitor treatment progress. The patient also had recorded their total time spent using the phone application. This provided some insight into how much the patient was utilizing CBTi Coach and if they were meeting their goal to make time to use it. The clinician implemented a teach back method by asking the patient to repeat the plan and set goals for the next appointment. Any

additional questions were answered and the patient scheduled another follow-up appointment in two weeks.

At the second follow-up appointment the same steps were followed as identified in the first follow-up appointment. The patient was scheduled for one last follow-up appointment for a total of 4 visits, one consult and three follow-ups. This last follow-up appointment ended at week six of the patient utilizing the CBTi phone application. Six weeks is the traditional timeframe for CBTi therapy.

Cognitive Behavioral Therapy for Insomnia

Patients were encouraged to utilize CBTi Coach. CBTi Coach is a free phone application developed by the Veterans Association, Stanford University and the Department of Defense (Kuhn et al., 2016). The phone application enforces the five key components of CBTi including sleep restriction, stimulus control, sleep hygiene, cognitive restructuring, and relaxation techniques. For sleep restriction, CBTi Coach provides an automated time in bed period, in addition, it allows patients to set reminders for their prescribed wake time and bedtime (Kuhn et al., 2016). There is a "Create New Sleep Habits" section that provides stimulus control guidelines and sleep hygiene recommendations (Kuhn et al., 2016). There is a "Changing Your Perspective" section the focuses on cognitive restructuring (Kuhn et al., 2016). For relaxation training, CBTi Coach includes audio-guided relaxation exercises including guided imagery, progressive muscle relaxation training, deep breathing and mindfulness exercises. CBTi Coach has a sleep diary to provide a summary of changes in sleep parameters over time. CBTi Coach includes the insomnia severity index, which is designed to assess daytime and nighttime symptoms associated with insomnia. Users can

setup a daily reminder so they are prompted to fill out the sleep diary and the insomnia severity index.

Study of the Interventions

Motivational Interviewing Impact

The impact of motivational interviewing was measured by the extent to which the patients met their goals. A goal directed approach to motivational interviewing helps strengthen the patient's commitment to change and absence of creating goals can result in maintenance of ambivalence (Lubman et al., 2012). If the patient was meeting their goals, this indicated the motivational interviewing was effective. If the patient was not meeting their goals, the clinician needed to make modifications to their motivational interviewing technique. Changes were being made when a person was meeting or partially meeting their goal, so it could be established the observed outcome was due to motivational interviewing. Additionally, the patient recorded how many hours were spent each day and week using the phone application. If they reported no use or minimal usage the clinician needed to adjust their motivational interviewing approach.

Cognitive Behavioral Therapy for Insomnia Impact

Sleep diaries and insomnia severity index scales were the approach chosen for assessing the impact of CBTi Coach. The CBTi Coach sleep diary assesses sleep behaviors including napping, bedtime, time when first tried to fall asleep, latency to fall asleep, number of awakenings during the night, final wake time, whether the final wake time was earlier than desired, the time got out of bed, sleep quality rating, and a comment section for patients to add any additional feedback (Kuhn et al., 2016). The insomnia severity index scale is a seven item self report questionnaire that assesses severity of sleep onset, sleep maintenance, early

morning awakening difficulties, sleep dissatisfaction, interference with daytime functioning, noticeability of sleep problems by others, and personal distress caused by sleep issues (Morin et al., 2011). The insomnia severity index can be further visualized in Appendix A. If the clinician and patient identified improvements in these sleep parameters over time, it was established this positive patient outcome was due to the effectiveness of the intervention.

Measures

Measures for Motivational Interviewing Impact

The first aim of this project was to measure the impact of motivational interviewing to decrease barriers for CBTi utilization. Effective motivational interviewing was measured by whether or not a patient met their short term and long-term goals at each visit. All goals were reviewed at each of the follow-up visits. If a person met their goals, the motivational interviewing was deemed effective. If a person met their goal to some extent, it showed partial effectiveness. If a person did not meet their goals, motivational interviewing was not effective and the clinician adjusted their motivation interviewing approach. Additionally, patients reported their total time per day and week using CBTi Coach. If there was no to minimal usage, motivational interviewing techniques were altered. Level of patient engagement in their treatment plan measured the impact of motivational interviewing. Percentages of number of patients that met their short-term goals between visits and long term goals tracked patient engagement overtime.

Measures for Cognitive Behavioral Therapy for Insomnia Impact

The second aim of this project was to measure the impact of CBTi Coach, sleep diaries and behavioral sleep prescription plans with frequent follow-up appointments on overall quality and quantity of sleep. This was measured through daily subjective sleep diary

data and weekly insomnia severity index scales. The sleep diary measurements included sleep onset latency (length of time to first initiate sleep), number of awakenings, total time of wakefulness after sleep onset, total sleep time and sleep efficiency (the percentage of time spent asleep while in bed). Sleep diaries are the gold standard of subjective sleep measurement. "Validity refers to how accurately a method measures what it is intended to measure" (Middleton, 2022). Sleep diaries are shown to have little validity, because it is a subjective measurement that likely encompasses bias. Polysomnograms and actigraphy are two objective sleep measurements that comparably yield high validity. Sleep diaries have been found to yield higher estimates of total sleep time and sleep efficiency and lower estimates of sleep onset latency and wakefulness after sleep onset (Lehrer et al., 2022). Polysomnograms and actigraphy were unavailable for this project, therefore sleep diaries were utilized despite having low validity.

"Reliability refers to how consistently a method measures something" (Middleton, 2022). Sleep diaries have proven to be reliable tools. The addition of more nights in the sleep diary increases the reliability values. Sleep diaries should be at least 7 days, which yields a reliability value of 0.70 (Borba et al., 2020). If 14 days are included it yields a value of 0.81 and 0.92 for 28 days (Borba et al., 2020). Sleep diaries are more consistently measured the more days that are included. Patients were encouraged to fill out daily sleep diary logs over the course of 6 weeks for a total of 42 days logged.

The insomnia severity index questionnaire was another measurement of the impact CBTi Coach had on overall sleep quality. The insomnia severity index is a seven-item questionnaire that measures both daytime and nighttime symptoms associated with insomnia. A five point Likert scale is used to rate each item, 0 is no problem and 4 is very severe

problem, which yields a total score ranging from 0 to 28 (Morin et al., 2011). A score of 0-7 indicates absence of insomnia, 8-14 is sub-threshold insomnia, 15-21 is moderate insomnia, and 22-28 is severe insomnia (Morin et al., 2011). The insomnia severity index was measured over the course of six weeks and improvements indicated the impact CBTi Coach had on overall quality of sleep.

The insomnia severity index has been widely researched and proven it is a valid and sensitive measure to detect changes in sleep difficulties (Veqar & Hussain, 2020). The internal consistency of the insomnia severity index is 0.90 indicating it has excellent reliability (Veqar & Hussain, 2020). The insomnia severity index is a widely used clinical tool, which is why it was chosen as a measure for this project.

The rationale for choosing these measures considered the population, setting, availability of equipment and timeframe for completing the project. The sleep diary and insomnia severity index are straightforward questions that could be answered directly through the phone application. Unfortunately due to cost and lack of availability of equipment no objective measures were utilized such as polysomnograms or actigraphy.

The success of the project depended largely upon patient participation. It was essential patients filled out their nightly sleep diary, weekly insomnia severity index, CBTi usage hours and showed up for their follow-up visits, so data could be collected. The CBTi Coach embedded sleep diary and insomnia severity index enhanced efficiency. Clinician implementation of motivation interviewing was essential to aid the patient in identifying realistic and measurable goals and help them recognize what they needed to do to reach those goals. Reviewing the goals at each follow-up visit was an ongoing assessment of success or failure of the motivational interviewing technique.

Steps were taken to assess completeness and accuracy of the data. Sleep diaries and insomnia severity indexes were collected from the CBTi Coach phone application. Patients were also asked to record on a separate handout how long they spent using the phone application on a day-to-day and weekly basis. Patient goals were reviewed at each visit to see if they were met or to what extent they were met. The data collected was entered into a Microsoft Excel program to generate a trend analysis.

Analysis

Qualitative and quantitative methods were used to draw conclusions from the data. Descriptive statistics were used to identify the eligible patients and summarize the results from sleep diary data and the insomnia severity index. A trend analysis was used for each of the sleep diary indicators and insomnia severity index scale to identify patterns. Qualitative data was collected by self-reports to what extent patients met their goals and the progress that was made over time. The team was able to identify common themes and draw inferences to summarize the data. Analysis of the narrative data was used to synopsise the qualitative and quantitative data collectively.

Ethical Considerations

Databases used to collect patient information were password protected and accessed in a secure manner. Organization guidelines, procedures, and policies were followed to adhere to patient privacy and confidentiality. Data collected was coded, so patients could not be identified. Data was stored on a secured, password-protected device. A project proposal was submitted to the University of New Hampshire DNP review board committee and Dartmouth Health Academic Support Hub. The project was deemed quality improvement,

not research based, so it was endorsed exemption from IRB approval. There are no professional, financial, or institutional conflicts of interest to disclose.

Results

Patients were screened from January 4, 2023 to February 20, 2023 to see if they met criterion for the project. During this timeframe there were 82 new consult patients that presented to the sleep clinic. Six patients met the project criterion. Other patients were not included due to suspicion of another medical condition or sleep disorder precipitating their poor sleep (mainly obstructive sleep apnea) or they did not meet the age requirements. Of the six patients that did meet the requirements, two chose not to participate. One patient reported he could not make time in his busy work calendar to schedule three follow-up appointments. One patient reported she had already done behavioral methods for insomnia management and they were not effective. Through the assessment it was learned she did not do sleep restriction, but was convinced it was not going to be effective. The other four patients completed the intervention over the course of six weeks between January 2023 and March 2023. The participants were all over the age of 18 years old and had primary insomnia. The project followed the steps of the intervention. One minor modification was made to specify two short term goals at each visit and one long term goal at the first visit. Each of the four participants agreed to engage in cognitive behavioral therapy. They downloaded the CBTi Coach phone application and recorded a daily sleep diary and a weekly insomnia severity index assessment. Three follow-up appointments were made at two-week intervals. At the follow-up visits the clinician discussed short term goals to see if they were met and helped the patients set two new short term goals for the following session. Any additional guidance

was provided at each visit. At the final visit the patient and clinician determined if the long-term goal was met.

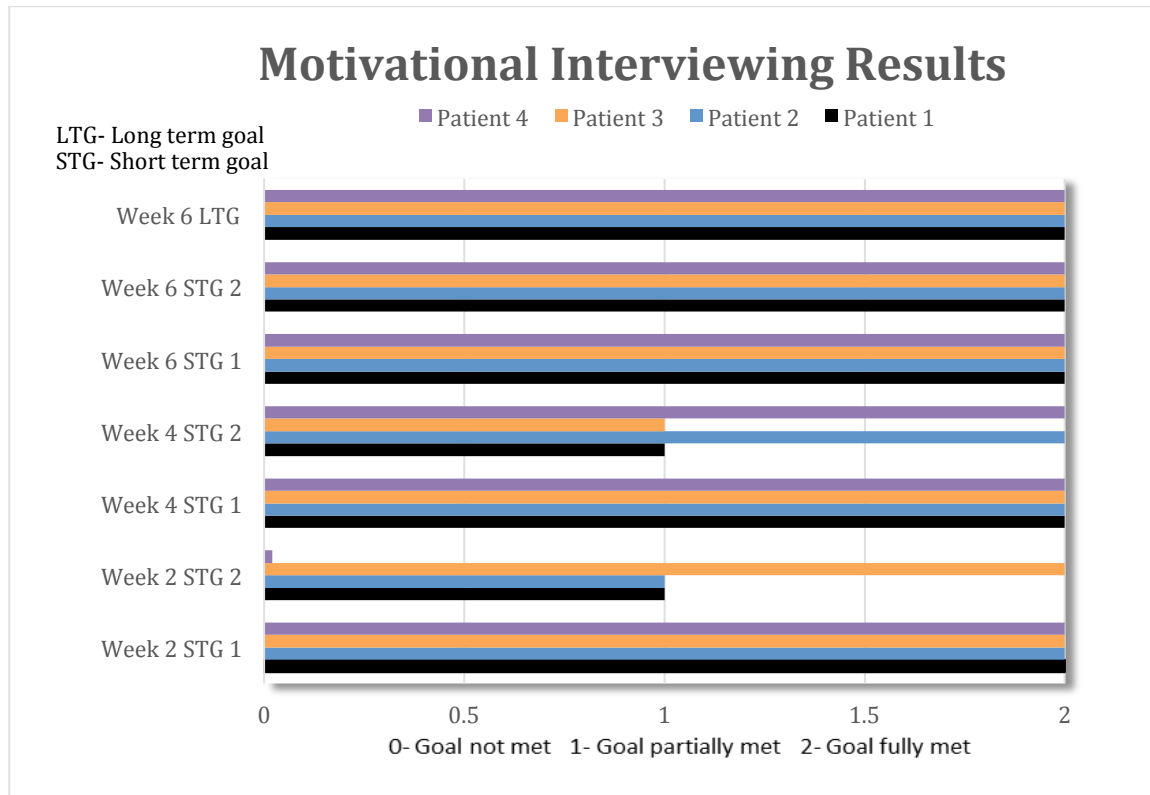
Results of Motivation Interviewing

The impact of motivation interviewing on patient engagement in their treatment plan was measured by whether or not a patient met their short term goals each visit and long-term goal at the final visit. A patient reported whether the goal was fully met, partially met, or not met. Each patient identified two short term goals. The first short term goal focused on sleep hygiene and sleep restriction. The second goal was based on how much time the patient planned to use the CBTi Coach phone application each day and week.

Every patient had fully met their first goal at every office visit. They were able to achieve the sleep hygiene and sleep restriction goals with no issues. The second goal of total CBTi Coach usage was harder to attain at week two (the first follow up visit) and week four (the second follow up visit). Only one patient fully met the time goal at week two, two patients partially met the time goal and one patient did not meet the goal. The clinician made adjustments to motivational interviewing and helped each patient set more realistic goals and by week four two patients fully met their time goal and two patients partially met their goal. The clinician continued to work on motivational interviewing techniques and by week 6 all of the patients fully met their time goal. The long term goal that was set in week one was evaluated in week six and all four patients fully met their goal. Further visualization of the patients and whether or not they met their goals is presented in Figure 1.

Figure 1

Motivational Interviewing Results



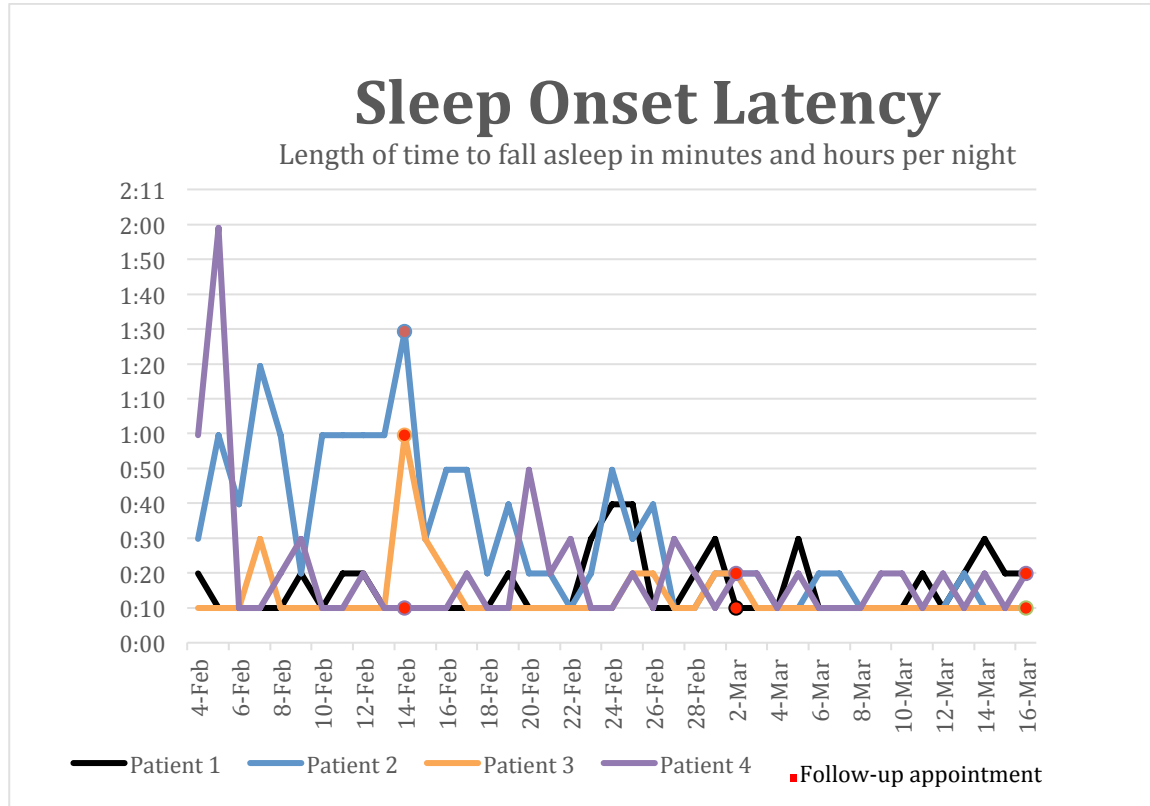
Results of Cognitive Behavioral Therapy for Insomnia

The second aim of this project was to measure the impact of CBTi Coach on overall quality of sleep. This was measured through daily subjective sleep diary data and weekly insomnia severity index scales. The sleep diary measurements included sleep onset latency (length of time to first initiate sleep), number of awakenings, total time of wakefulness after sleep onset, total sleep time and sleep efficiency (the percentage of time spent asleep while in bed).

Two patients struggled more with sleep onset latency. There was a downward trend on length of time it took to initiate sleep over the six weeks. There were significant improvements in sleep onset latency for these patients after the follow-up visits. Further visualization of sleep onset latency is presented in Figure 2.

Figure 2

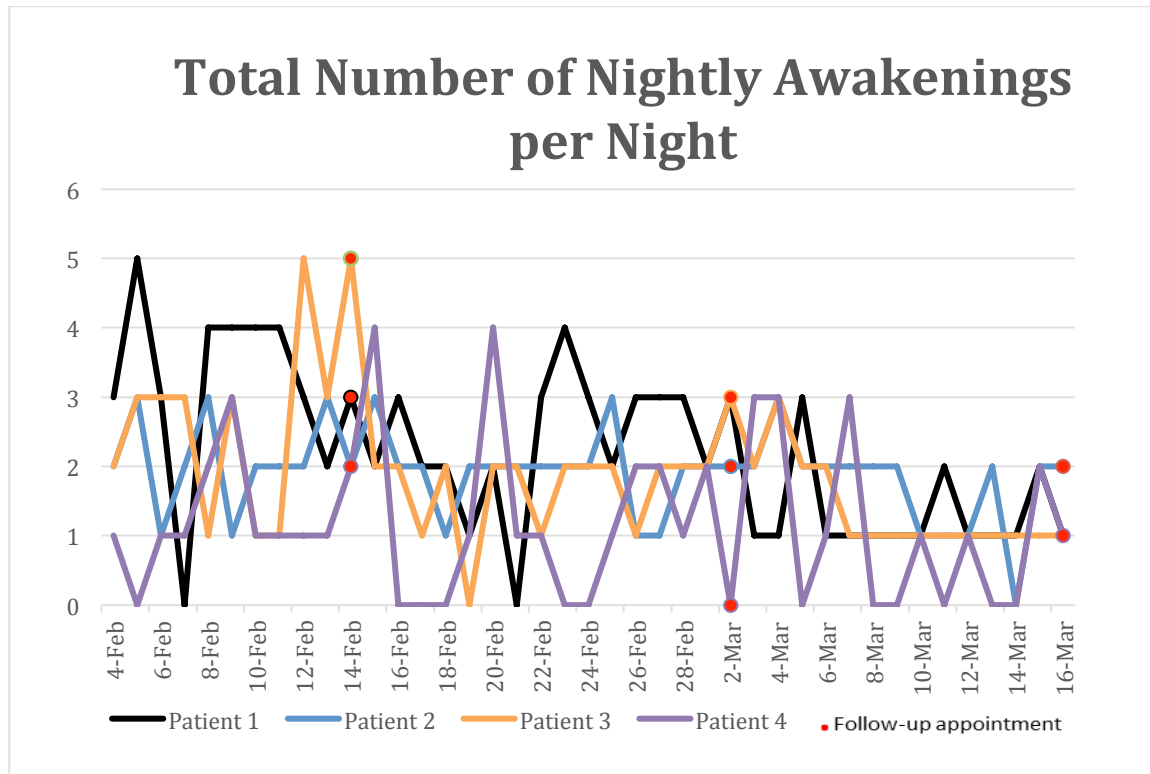
Sleep Onset Latency



Total nightly awakenings were more of a concern for two patients. Overall there was a downward trend in nightly awakenings, which was most prominent after the second follow-up visit. These results are further detailed in Figure 3.

Figure 3

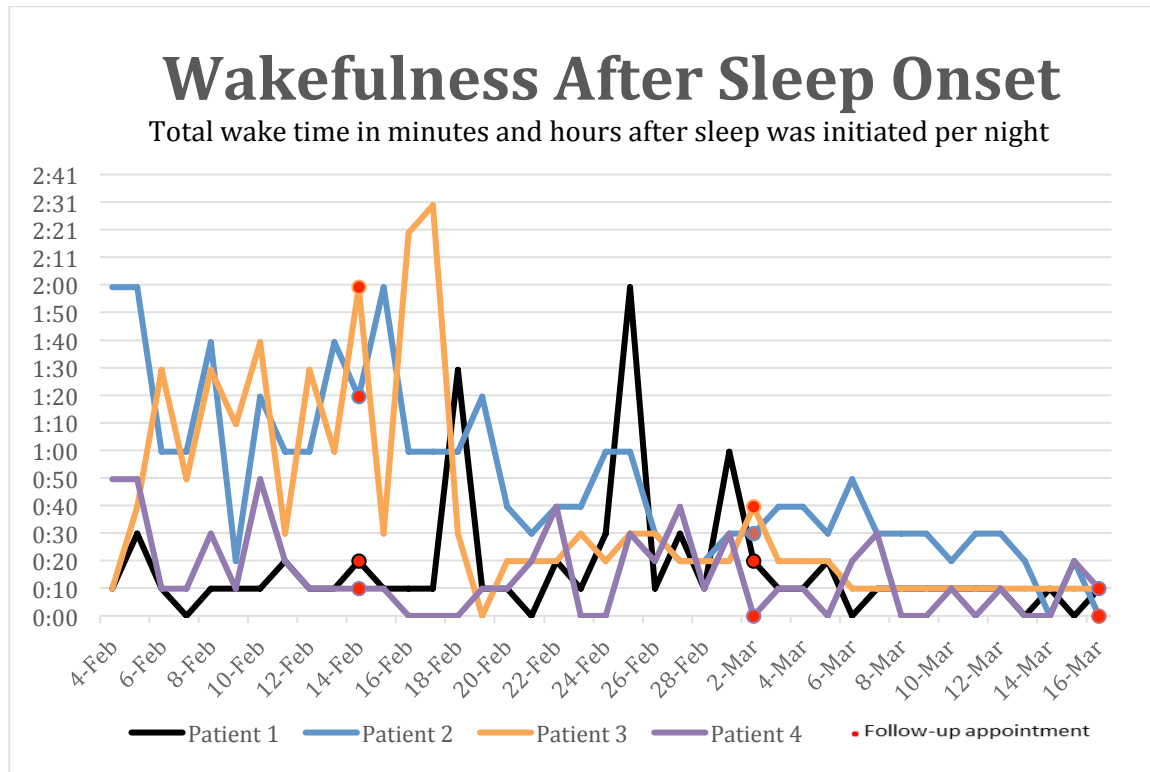
Total Nightly Awakenings



The next measurement was total time awake after sleep onset. Two patients struggled more with sleep maintenance, but all of the patients were not satisfied with how much time they were awake in the middle of the night. Overall there was a significant downward trend with total time spent awake. There were some improvements after the first follow-up visit and even more improvements after the second follow-up visit. These results can be visualized in Figure 4.

Figure 4

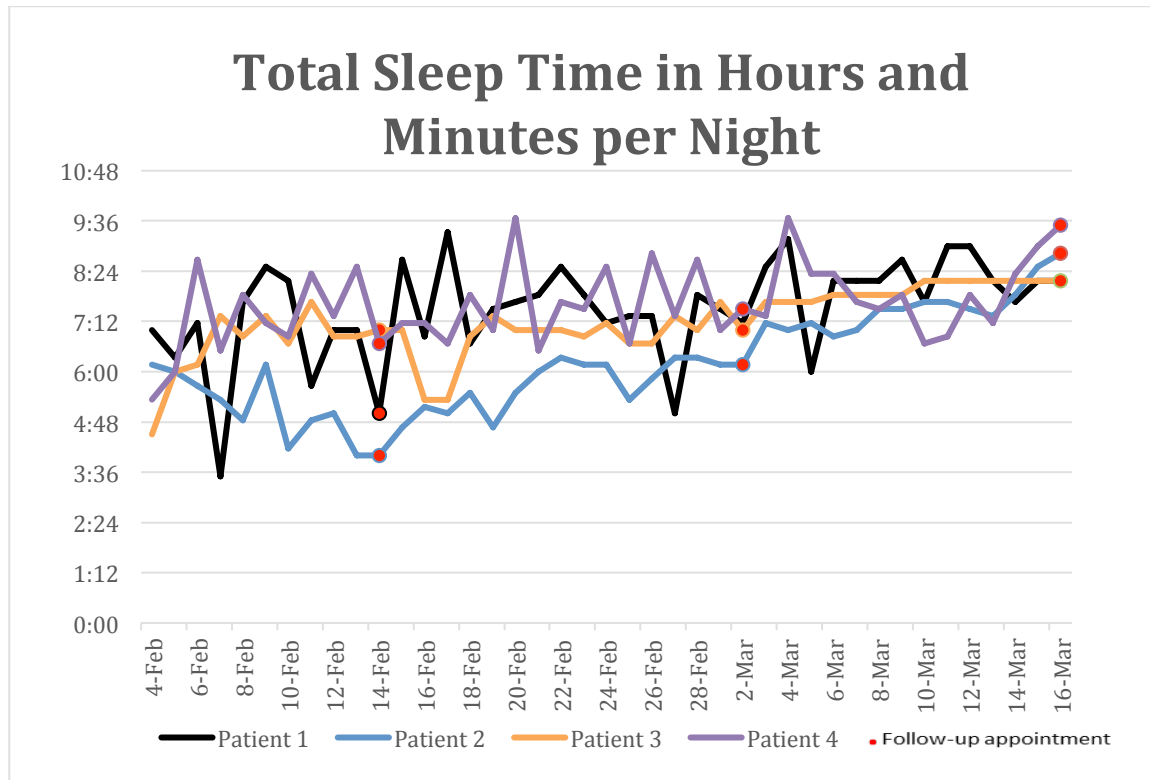
Total Wake Time After Sleep Onset



The next sleep diary measurement was total sleep time. All patients were concerned with the amount of sleep they were getting at the initial consult. Figure 5 shows an upward trend and how total sleep time increased over the six weeks for all of the patients. There were bigger improvements after the first and second follow-up visits.

Figure 5

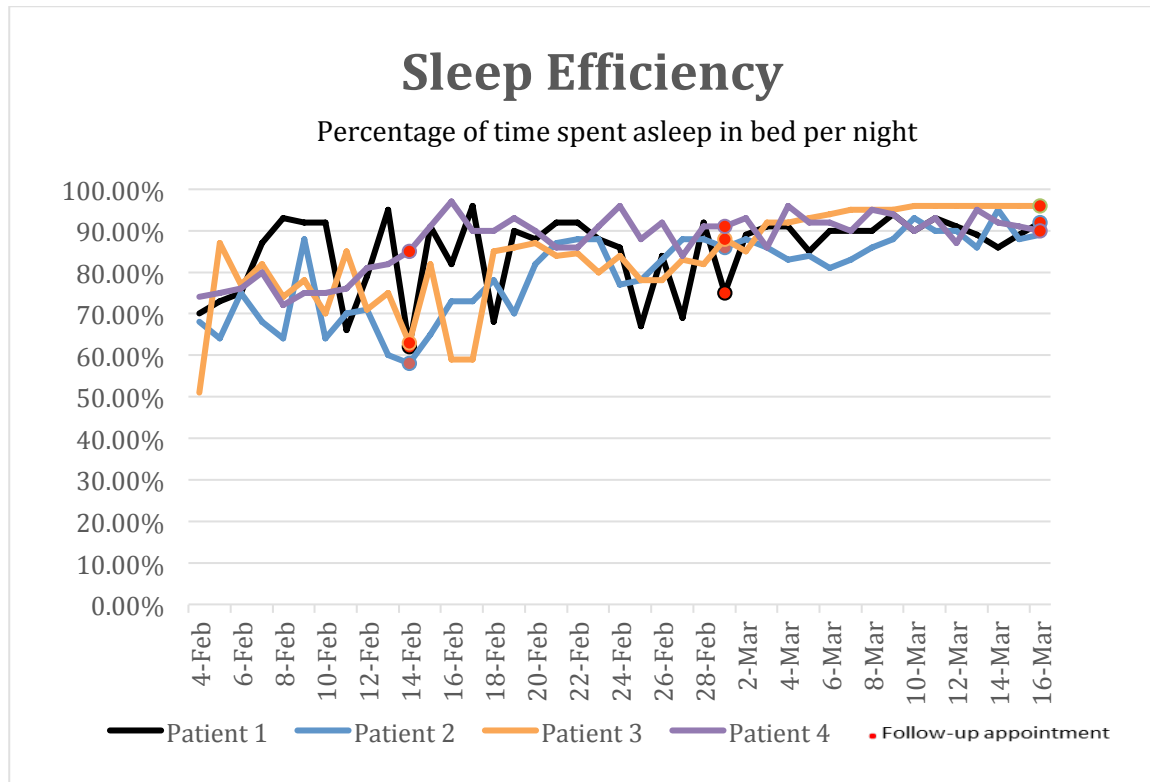
Total Sleep Time



The last sleep diary measurement was sleep efficiency. Sleep efficiency is the percentage of time spent asleep in bed. Sleep efficacy is considered normal at 85% and better. All of the patients had less than adequate sleep efficiencies at the start of the intervention. Figure 6 shows a visualization of an upward trend of sleep efficiencies over six weeks. There were great improvements after the first and second follow-up visit. At the end of the intervention all patients were considered to have normal sleep efficiencies.

Figure 6

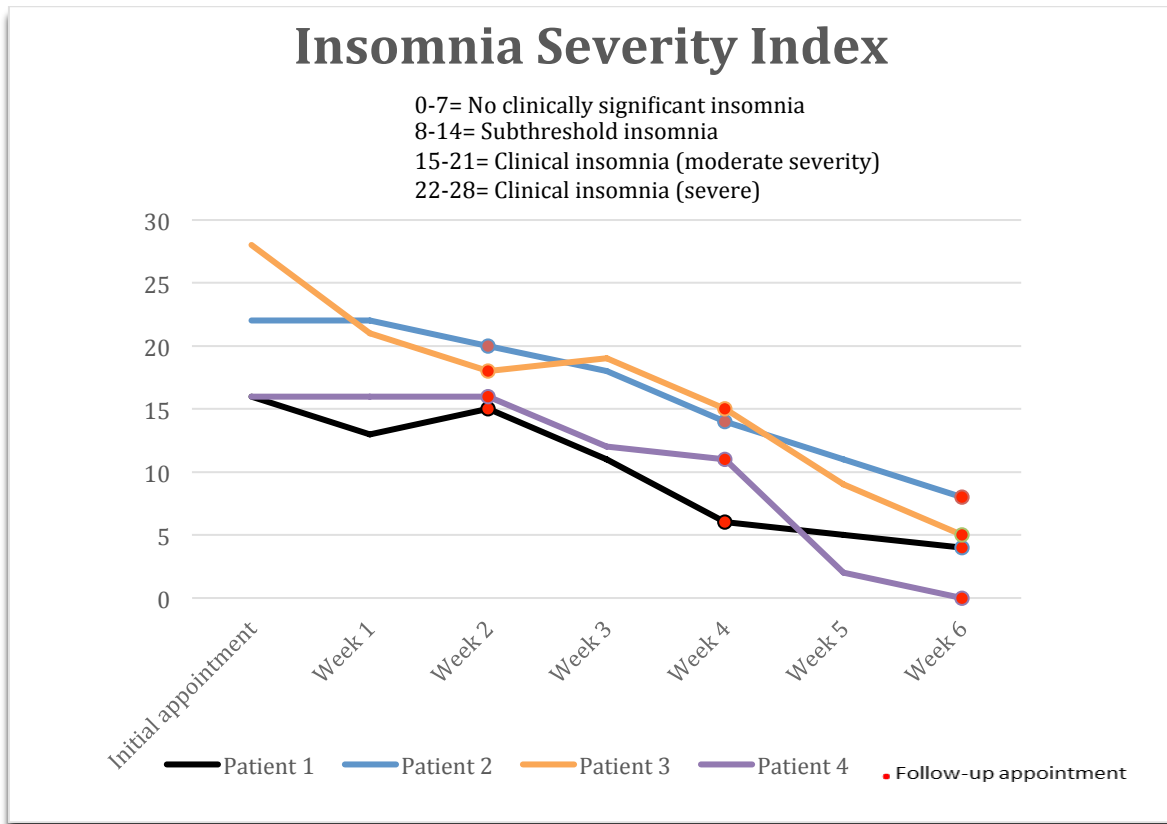
Sleep Efficiency



The final measurement was the insomnia severity index. Patients filled out the insomnia severity index assessments at their initial consult and the following six weeks for a total of seven assessments. A score of 22-28 indicates severe insomnia. Two patients reported severe insomnia at the initial consult. A score of 15-21 indicates moderate insomnia. Two patients reported moderate insomnia at the initial consult. Self-reported insomnia severity trended down over the course of six weeks. There were consistent improvements after the first and second follow-up visits. At the end of the intervention one patient was in the 8-14 range indicating sub-threshold insomnia. Three patients were in the 0-7 range indicating absence of insomnia. These results are further detailed in Figure 7.

Figure 7

Insomnia Severity Index



Discussion

Summary

The first aim of this project was to measure the impact of motivational interviewing on CBTi utilization. This project found motivational interviewing to be very effective on patient engagement. The clinician had the patients set two short terms goals at each follow-up visit. The first goal was to work on sleep hygiene and sleep restriction, which limits wakeful time in bed. At every follow-up visit each of the four patients continued to meet this goal. This indicated the motivational interviewing was effective and the patients were actively engaging in their treatment plans to meet these goals. The second goal was time based and how much time the patient was going to use the CBTi Coach phone application each day and week. At the first follow-up visit only one patient fully met their goal. The clinician had utilized motivational interviewing to help the patients identify why the goals

were not met, barriers to overcome, and set new realistic goals for the following follow up appointment. The motivational interviewing had proved to be more effective by the second follow-up visit, because two patients had fully met their goals. At the final follow-up visit all of the patients had met their time goals. The motivational interviewing showed continuous progress and full effectiveness by the end of the intervention. Goal setting through motivational interviewing helped patients identify realistic goals and ways to reach those goals by eliminating barriers. This helped the patients stay engaged in their treatment plan and ultimately all of the patients reached their long term goal of improved sleep by the end of the intervention.

The second aim of this project was to measure the impact of CBTi Coach, sleep diaries and sleep prescriptions with frequent follow-up appointments on overall quality and quantity of sleep. CBTi is validated as an effective treatment, so it was expected to be successful as long as patients were engaged. Sleep diary indicators and the insomnia severity index were measured over time to follow each patient's progression. The results found improvements in all of the sleep diary indicators. The downward trend of sleep onset latency showed it took patients a shorter amount of time to initiate sleep by the end of the intervention. The downwards trends of total nightly awakenings and time spent awake after sleep onset showed significant improvements with sleep maintenance by the end of the intervention. The improvements with sleep initiation and sleep maintenance were reflected in the upward trends of total sleep time and sleep efficiency. All of the patients were getting more hours of sleep and spending less time awake in bed by the end of the intervention. Lastly, there was a significant downward trend in the insomnia severity index scale. Initially two patients reported severe insomnia and two patients reported moderate insomnia. By the

end of the intervention three patients were considered to have absence of insomnia and one patient had sub-threshold insomnia. All of these findings suggest there were significant improvements in sleep quality and quantity.

Interpretation

The nature of the intervention shows promising positive outcomes. Utilizing motivational interviewing helps patients stay engaged in their treatment plan. Identifying short term goals for each visit gives the patient something to work towards, which ultimately helps make improvements in sleep. The CBTi Coach phone application is a good resource for patients. It provides effective tools making it easy to document and track specific sleep indicators and it gives additional information on the CBTi components. The follow-up visits are essential for the clinician to provide feedback, help the patients set new attainable goals and make sure patients are following their sleep behavioral plan. Each component of the intervention helped improve sleep quality and quantity for all of the participants.

As the literature suggests, motivational interviewing has a significant impact on patient activation and promoting patient engagement (Innab & Kerari, 2022; McKeirnan et al., 2021). The findings from this project are comparable with the literature. The motivational interviewing had all of the patients actively engaged in their treatment plans. The patient involvement motivated patients and helped them adopt new healthy behaviors.

Improvements in sleep quality and quantity were not likely not due to the impact of the CBTi Coach phone application alone. All of the patients admitted if there were no follow-up appointments and they were to only use CBTi Coach for treatment they would not have seen the results they did. It was reported the CBTi Coach phone application was very beneficial for tracking sleep through the sleep diary tool and having a place to record the

insomnia severity index, so progress could be easily tracked over time. It was suggested the phone application provided good education around sleep hygiene, cognitive restructuring and had some good relaxation videos to utilize. The CBTi Coach phone application is a great resource to increase access and provide additional tools for CBTi therapy. Although, the participants' reported it would not be effective as mono-therapy and these opinions are consistent with the literature. CBTi Coach helps patients engage more in treatment, but personal contact through follow-up appointments helps to address individual needs (Koffel et al., 2016; Koffel et al., 2020; Rathbone et al., 2017). In all of the sleep diary indicator graphs it is clearly marked when there were follow-up appointments. Typically right after the follow-up appointment there are improvements with each of these indicators. The clinician was able to help the patient identify individual needs and help them make improvements. The CBTi Coach phone application could not provide this essential component needed, so the patient could make adjustments to their sleep hygiene and sleep scheduling. The CBTi Coach phone application will not necessarily help to motivate a patient to engage in therapy. The clinician follow up visits and use of motivational interviewing enabled the patients to stay committed to their treatment plans. The motivational interviewing was shown to be a particular strength of this project.

Six patients met the project criterion, but two chose not to participate. One patient did not have time for the three bi-weekly follow up appointments. The second patient was convinced she already did behavioral methods and it was not going to be effective. These patient barriers to treatment are consistent with the literature. Time constraints, preference of easier treatment due to busy schedules and doubt that CBTi is effective have all been identified as patient barriers to CBTi therapy (Koffel et al., 2018). Although this project was

a very small sample size, one third of the patients identified as good candidates did not engage in CBTi therapy because of these barriers. The impact of this project has shown significant improvement in sleep, but barriers such as time constraints and beliefs of CBTi effectiveness need to be addressed to help get more patients engaged in treatment. When patients do agree to engage in treatment they are likely to see immense improvements in sleep as evidenced by the impact of this project. It is unclear if these results would be generalizable to patients with secondary insomnia.

Limitations

Several limitations to this project have been identified. The timeline to develop, implement and analyze the project was a short eight months. Due to the length of time and very specific criterion to participate in the intervention, this led to a very small sample size. Data collected was not clinically significant and generalizable to a broader population, because of such a small sample size. Although, a small sample size was essential for this particular project to capture each specific sleep indicator. A trend analysis was utilized to compare each of the data points. This was a pilot project designed to test specific characteristics of sleep for a potential larger investigation. The results of the data was significant to the clinic and the intervention will be employed as a quality improvement process moving forward. When the N value increases, the data can be analyzed as clinically significant and implemented in other systems and settings.

Another limitation to the project was all of the data collected was solely subjective. There were no objective measurements due to cost and lack of availability of equipment. Future studies may use actigraphy or polysomnograms to evaluate sleep indicators. Patients were encouraged to fill out the sleep diary as soon as they woke up, so the data would be as

accurate as possible. The sleep improvements validate the self-reports. CBTi is demonstrated to be effective as long as patients are engaged in treatment.

Conclusion

Insomnia is a sleep disorder that is becoming more prevalent and has significant impact on healthcare expenditure. Cognitive behavioral therapy for insomnia (CBTi) is the primary treatment but patients are rarely referred for this treatment due to system barriers, clinician barriers and patient barriers (Koffel et al., 2018). CBTi Coach is a free phone application designed by the Veterans Association to help increase access to therapy. Although, patients were found to rarely utilize the phone application after it was discussed with the clinician. It was later discovered motivational interviewing was beneficial in helping patients engage in treatment and increase adherence to therapy. The use of the CBTi Coach phone application, a strict behavioral sleep plan and three bi-weekly follow-up visits helped improve sleep quality and quantity.

The promising results of the project suggest good sustainability of this quality improvement project. If results are sustained there is potential the findings can be disseminated and implemented throughout the entire healthcare system and spread to other healthcare systems in the state. When patients present with primary insomnia, motivational interviewing should be utilized to help patients engage in CBTi. Frequent follow-up visits will be essential to motivate patient adherence and help patients identify realistic goals. Further studies may include actigraphy or polysomnograms for objective data. Further studies may also include a longer timeline, more patients and patients with secondary insomnia to make the data generalizable to a broader population.

Disseminating the findings to the sleep clinic is the next step for this project. All of the sleep providers can start implementing this intervention into their practice. If the intervention continues to be sustainable, the findings can be disseminated to other local sleep clinics and primary care settings. If primary care providers can implement this intervention into practice patients can be treated earlier and avoid going to a sleep clinic altogether.

Funding

There were no sources of funding supporting this project. The time spent to complete the project was part of the requirements for an academic program.

References

- American Academy of Sleep Medicine. (2022). *New guideline supports behavioral, psychological treatments for insomnia*. AASM. <https://aasm.org/new-guideline-supports-behavioral-psychological-treatments-for-insomnia/>
- Anderson K. N. (2018). Insomnia and cognitive behavioural therapy-how to assess your patient and why it should be a standard part of care. *Journal of Thoracic Disease, 10*(1), 94–102. <https://doi.org/10.21037/jtd.2018.01.3>
- Borba, D. A., Reis, R. S., Lima, P. H., Facundo, L. A., Narciso, F. V. & Silva, A. (2020). How many days are needed for a reliable assessment by the sleep diary?. *Sleep Science, 13*(1), 49-53. DOI: 10.5935/1984-0063.20190131
- Buckwalter, Cullen, L., Hanrahan, K., Kleiber, C., McCarthy, A. M., Rakel, B., Steelman, V., Tripp-Reimer, T., & Tucker, S. (2017). Iowa Model of Evidence-Based Practice: Revisions and Validation. *Worldviews on Evidence-Based Nursing, 14*(3), 175–182. <https://doi.org/10.1111/wvn.12223>
- Daley, M., Morin, C. M., LeBlanc, M., Grégoire, J. P., & Savard, J. (2009). The economic burden of insomnia: Direct and indirect costs for individuals with insomnia syndrome, insomnia symptoms, and good sleepers. *Sleep, 32*(1), 55–64. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2625324/>
- Dartmouth Health. (2022). About Dartmouth Hitchcock medical center and Dartmouth Hitchcock clinics. *Dartmouth Health*. Retrieved from <https://www.dartmouth-hitchcock.org/about>

- Dopheide J. A. (2020). Insomnia overview: Epidemiology, pathophysiology, diagnosis and monitoring, and nonpharmacologic therapy. *The American Journal of Managed care*, 26(4), 76–84. <https://doi.org/10.37765/ajmc.2020.42769>
- Fernandez-Mendoza, J., & Vgontzas, A. N. (2013). Insomnia and its impact on physical and mental health. *Current Psychiatry Reports*, 15(12), 418. <https://doi.org/10.1007/s11920-013-0418-8>
- Gopalkrishnan N. (2018). Cultural diversity and mental health: Considerations for policy and practice. *Frontiers in Public Health*, 6, 179. <https://doi.org/10.3389/fpubh.2018.00179>
- Gehrman, P., Shah, M. T., Miles, A., Kuna, S. & Godleski, L. (2016). Feasibility of group cognitive-behavioral treatment of insomnia delivered by clinical video telehealth. *Telemedicine Journal and E-Health: The Official Journal of the American Telemedicine Association*, 22(12), 1041–1046. <https://doi.org/10.1089/tmj.2016.0032>
- Hashemzadeh, M., Rahimi, A., Zare-Farashbandi, F., Alavi-Naeini, A. M., & Daei, A. (2019). Transtheoretical model of health behavioral change: A systematic review. *Iranian Journal of Nursing and Midwifery Research*, 24(2), 83–90. https://doi.org/10.4103/ijnmr.IJNMR_94_17
- Heath, S. (2019). *Patient engagement strategies for improving patient activation*. Patient Engagement HIT. <https://patientengagementhit.com/features/patient-engagement-strategies-for-improving-patient-activation>
- Hermes, E. D., Rosenheck, R. A., Burrone, L., Dante, G., Lukens, C. & Martino, S. (2021). The implementation and effectiveness of digital cognitive behavioral therapy for

insomnia in primary care: A pilot study. *Sage Journals*.

<https://doi.org/10.1177/26334895211053659>

Huyett, P. & Bhattacharyya, N. (2021). Incremental health care utilization and expenditures for sleep disorders in the United States. *Journal of Clinical Sleep Medicine*, 17(10).

<https://doi.org/10.5664/jcsm.9393>

Innab, A. & Kerari, A. (2022). Impact of behavioral interventions on patient activation in adults with hypertension: A systematic review and meta-analysis. *The Journal of Health Care Organization, Provision, and Financing*.

<https://doi.org/10.1177/00469580221090>

Khurshid K. A. (2018). Comorbid Insomnia and Psychiatric Disorders: An Update. *Innovations in clinical neuroscience*, 15(3-4), 28–32.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5906087/>

Koffel, E., Kuhn, E., Petsoulis, N., Erbes, C. R., Anders, S., Hoffman, J. E., Ruzek, J. I. & Polusny, M. A. (2016). A randomized controlled pilot study of CBT-I Coach: Feasibility, acceptability, and potential impact of a mobile phone application for patients in cognitive behavioral therapy for insomnia. *Health Informatics Journal*, 24(1), 3-13. doi:10.1177/1460458216656472

Koffel, E., Bramoweth, A.D. & Ulmer, C.S. (2018). Increasing access to and utilization of cognitive behavioral therapy for insomnia (CBT-I): A narrative review. *Journal of General Internal Medicine*, 33, 955–962 (2018). <https://doi.org/10.1007/s11606-018-4390-1>

Koffel, E., Amundson, E., Polusny, G. & Wisdom, J. P. (2020). "You're missing out on something great": Patient and provider perspectives on increasing the use of cognitive

behavioral therapy for insomnia. *Behavioral Sleep Medicine*, 18(3), 358-371.

<https://doi.org/10.1080/15402002.2019.1591958>

Kuhn, E., Weiss, B. J., Taylor, K. L., Hoffman, J. E., Ramsey, K. M., Manber, R., Gehrman, P., Crowley, J. J., Ruzek, J. I. & Trockel, M. (2016). CBT-I coach: A description and clinician perceptions of a mobile app for cognitive behavioral therapy for insomnia. *Journal of Clinical Sleep Medicine*, 12(4), 597–606.

<https://doi.org/10.5664/jcsm.5700>

LaMorte, W. W. (2022). *The transtheoretical model (stages of change)*. Boston University School of Public Health. <https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/BehavioralChangeTheories6.html>

Lattie, E. G., Nicholas, J., Knapp, A. A., Skerl, J. J., Kaiser, S. M., & Mohr, D. C. (2020). Opportunities for and tensions surrounding the use of technology-enabled mental health services in community mental health care. *Administration and policy in mental health*, 47(1), 138–149. <https://doi.org/10.1007/s10488-019-00979-2>

Lehrer, H. M., Yao, Z., Krafty, R. T., Evans, M. A., Buysse, D. J., Kravitz, H. M., Matthews, K. A., Gold, E. B., Harlow, S. D., Samuelsson, L. B. & Hall, M. H. (2022). Comparing polysomnography, actigraphy, and sleep diary in the home environment: The study of women's health across the nation (SWAN) sleep study. *Sleep Advances*, 3(1). <https://doi.org/10.1093/sleepadvances/zpac001>.

Lubman, D. I., Hall, K. & Gibbie, T. (2012). Motivational interviewing techniques facilitating behaviour change in the general practice setting. *Australian Family Physician*, 41(9). <https://www.racgp.org.au/afp/2012/september/motivational-interviewing-techniques>

Majd, N. R., Broström, A., Ulander, M., Lin, C.-Y., Griffiths, M. D., Imani, V., Ahorsu, D. K., Ohayon, M. M., & Pakpour, A. H. (2020). Efficacy of a theory-based cognitive behavioral technique app-based intervention for patients with insomnia: Randomized controlled trial. *Journal of Medical Internet Research*, 22(4).

<https://psycnet.apa.org/record/2020-26064-001>

Matthews, E. E., Arnedt, J. T., McCarthy, M. S., Cuddihy, L. J. & Aloia, M. S. (2013).

Adherence to cognitive behavioral therapy for insomnia: A systematic review. *Sleep Med Rev*, 17(6), 453-64. doi: 10.1016/j.smrv.2013.01.001.

McCurry, S. M., Guthrie, K. A., & Morin, C. M. (2016). Telephone-based cognitive behavioral therapy for insomnia in perimenopausal and postmenopausal women with vasomotor symptoms. *JAMA Internal Medicine*, 176(7), 913-920.

doi:10.1001/jmamininternmed.2016.1795

McKeirnan, K. C., Frazier, K., Kherghehpoush, S. & Sedaghat, E. (2021). Using the patient activation measure during a pharmacist-led rural patient home visit pilot project.

Journal of the American Pharmacists Association, 61(4), 279-283.

[https://www.japha.org/article/S1544-3191\(21\)00006-6/fulltext](https://www.japha.org/article/S1544-3191(21)00006-6/fulltext)

Mellor, A., Kavaliotis, E. & Drummond, S. (2021). A systematic review of adherence to

cognitive behavioural therapy for insomnia (CBT-I)-key findings. *SLEEP Advances*, 2(1), 51. <https://doi.org/10.1093/sleepadvances/zpab014.137>

Middleton, F. (2022). *Reliability vs. validity in research: Difference, types, and examples*.

Scribbr. Retrieved from <https://www.scribbr.com/methodology/reliability-vs-validity/#:~:text=What%20is%20validity%3F,the%20physical%20or%20social%20world.>

- Moloney M. E. (2017). 'Sometimes, it's easier to write the prescription': Physician and patient accounts of the reluctant medicalisation of sleeplessness. *Sociology of Health & Illness*, 39(3), 333–348. <https://doi.org/10.1111/1467-9566.12485>
- Morin, C. M., Belleville, G., Bélanger, L., & Ivers, H. (2011). The Insomnia severity index: Psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep*, 34(5), 601–608. <https://doi.org/10.1093/sleep/34.5.601>
- Morin, C. M., Edinger, J. D., Beaulieu-Bonneau, S., Ivers, H., Krystal, A. D., Guay, B., Bélanger, L., Cartwright, A., Simmons, B., Lamy, M., & Busby, M. (2020). Effectiveness of sequential psychological and medication therapies for insomnia disorder: A randomized clinical trial. *JAMA Psychiatry*, 77(11), 1107–1115. <https://doi.org/10.1001/jamapsychiatry.2020.1767>
- Osbourne, N. (2022). *Ambien side effects: Memory, depression, and more*. American Addiction Centers. <https://americanaddictioncenters.org/ambien-treatment/side-effects>
- Randall, C. L., & McNeil, D. W. (2017). Motivational interviewing as an adjunct to cognitive behavior therapy for anxiety disorders: A critical review of the literature. *Cognitive and Behavioral Practice*, 24(3), 296–311. <https://doi.org/10.1016/j.cbpra.2016.05.003>
- Reilly, E. D., Robinson, S. A., Petrakis, B. A., Gardner, M. M., Wiener, R. S., Castaneda-Sceppa, C., & Quigley, K. S. (2021). Mobile intervention to improve sleep and functional health of veterans with insomnia: Randomized controlled trial. *JMIR Formative Research*, 5(12), e29573. <https://doi.org/10.2196/29573>

- Reynolds, S. A. & Ebben, M. R. (2017). The cost of insomnia and benefit of increased access to evidence-based treatment cognitive behavioral therapy for insomnia. *Sleep Clinic*, 12, 39-46. <http://dx.doi.org/10.1016/j.jsmc.2016.10.011>
- Schueller, S. M., Tomasino, K. N., & Mohr, D. C. (2017). Integrating human support into behavioral intervention technologies: The efficiency model of support. *Clinical Psychology: Science and Practice*, 24(1), 27–45. <https://doi.org/10.1037/h0101740>
- Schutte-Rodin, S., Broch, L., Buysse, D., Dorsey, C. & Sateia, M. (2008). Clinical guideline for the evaluation and management of chronic insomnia in adults. *Journal of Clinical Sleep Medicine*, 4(5). <https://doi.org/10.5664/jcsm.27286>
- Stinson, K., Tang, N. K., & Harvey, A. G. (2006). Barriers to treatment seeking in primary insomnia in the United Kingdom: A cross-sectional perspective. *Sleep*, 29(12), 1643–1646. <https://doi.org/10.1093/sleep/29.12.1643>
- TheraThink. (2022). CPT code 99212- E/m billing guide [+reimbursements]. *TheraThink*. Retrieved from <https://therathink.com/cpt-code-99212/>
- Thomas, A., Grandner, M., Nowakowski, S., Nesom, G., Corbitt, C., & Perlis, M. L. (2016). Where are the behavioral sleep medicine providers and where are they needed? A geographic assessment. *Behavioral Sleep Medicine*, 14(6), 687–698. <https://doi.org/10.1080/15402002.2016.1173551>
- United States Census Bureau. (2022). *Quick facts*. United States Census Bureau. United States Census Bureau. <https://www.census.gov/quickfacts/fact/table/sullivancountynewhampshire,cheshirecountynewhampshire,rockinghamcountynewhampshire,merrimackcountynewhampshire,hillsboroughcountynewhampshire,NH/PST045221>

- Veqar, Z. & Hussain, M. (2020). Validity and reliability of insomnia severity index and its correlation with pittsburgh sleep quality index in poor sleepers among Indian university students. *International Journal of Adolescent Medicine and Health*, 32(1).
<https://doi-org.unh.idm.oclc.org/10.1515/ijamh-2016-0090>
- Wheeler, K. (2014). *Psychotherapy for the advanced practice psychiatric nurse: A how to guide for evidence-based practice* (2nd ed.). New York, NY: Springer Publishing Company.

Appendix A

Insomnia Severity Index (ISI)

Name: _____ Date: _____

1. Please rate the current (i.e., last 2 weeks) **SEVERITY** of your insomnia problem(s).

	None	Mild	Moderate	Severe	Very
Difficulty falling asleep:	0	1	2	3	4
Difficulty staying asleep:	0	1	2	3	4
Problem waking up too early:	0	1	2	3	4

2. How **SATISFIED**/dissatisfied are you with your current sleep pattern?

Very Satisfied				Very Dissatisfied
0	1	2	3	4

3. To what extent do you consider your sleep problem to **INTERFERE** with your daily functioning (e.g. daytime fatigue, ability to function at work/daily chores, concentration, memory, mood, etc.).

Not at all Interfering	A Little	Somewhat	Much	Very Much Interfering
0	1	2	3	4

4. How **NOTICEABLE** to others do you think your sleeping problem is in terms of impairing the quality of your life?

Not at all Noticeable	Barely	Somewhat	Much	Very Much Noticeable
0	1	2	3	4

5. How **WORRIED**/distressed are you about your current sleep problem?

Not at all	A Little	Somewhat	Much	Very Much
0	1	2	3	4

Guidelines for Scoring/Interpretation:

Add scores for all seven items (1a+1b+1c+ 2+3+4+5) = _____

Total score ranges from 0-28

0-7 = No clinically significant insomnia

8-14 = Subthreshold insomnia

15-21 = Clinical insomnia (moderate severity)

22-28 = Clinical insomnia (severe)