Poor Sleep Quality and Other Risk Factors for Unemployment Among Patients on Opioid Agonist Treatment

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ABSTRACT

PURPOSE: Patients with opioid use disorder (OUD) face high rates of unemployment, putting them at higher risk of treatment nonadherence and poor outcomes, including overdose death. The objective of this study was to investigate sleep quality and its association with other biopsychosocial risk factors for unemployment in patients receiving opioid agonist treatment (OAT) for OUD.

METHODS: Using a cross-sectional survey design, participants from 3 OAT programs for OUD completed questionnaires to measure sleep quality (Pittsburgh Sleep Quality Index [PSQI]); pain disability; catastrophic thinking; injustice experience; quality of life; and self-assessed disability. Spearman's rank correlation was used to test for associations between sleep quality and other study variables.

RESULTS: Thirty-eight participants completed the study, with mean age 45.6 ± 10.9 years, 27 (71.1%) males, and 16 (42.1%) reporting a high school diploma/equivalent certification as the highest level of academic attainment. Poor sleep quality (defined as PSQI > 5) was identified in 29 participants (76.3%) and was positively correlated with pain disability ($r = 0.657$, $P < .01$), self-assessed disability ($r = 0.640$, $P < .001$), symptom catastrophizing ($r = 0.499$, $P < .001$), and injustice experience ($r = 0.642$, $P < .001$), and negatively correlated with quality of life ($r = -0.623$, $P < .001$).

CONCLUSIONS: There was a high prevalence of poor sleep quality in patients with OUD on OAT and this was associated with multiple known risk factors for unemployment. These findings warrant the consideration of regular screening for sleep problems and the inclusion of sleep-related interventions to improve sleep quality, decrease the unemployment rate, and enhance the recovery process for individuals with OUD undergoing OAT.

KEYWORDS: Opioid-related disorders, intrinsic sleep disorders, disabled persons, opiate substitution treatment, unemployment, methadone

Introduction

The opioid epidemic is a public health crisis in the United States, with 46 800 opioid overdose deaths occurring in 2018 and over 2 million Americans currently living with opioid use disorder (OUD).[1] The Centers for Disease Control and Prevention estimates for 2019 and 2020 indicate continuing increases in rates of opioid overdose deaths.[2]

Opioid agonist treatment (OAT) with methadone or buprenorphine reduces illicit opioid use and the risk of overdose death.[1] However, patients on OAT for OUD have higher rates of unemployment than the general population, a disparity that poses a considerable risk to these patients and may impair their recovery process.[3-5] In these patients, unemployment is associated with decreased treatment adherence to OAT and a corresponding increase in the risk of overdose, morbidity, and mortality.[6] Most of the relatively few published models integrating employment support with OUD recovery programs use a labor-intensive service approach with highly trained staff and require close collaboration between treatment and employment services. These baseline requirements present a significant obstacle to widespread implementation.[5,7]

Although methadone's benefits for patients with OUD are clear, a majority of patients on methadone OAT experience poor sleep quality, as evaluated by both subjective and objective measures.[8] This disordered sleep continues throughout treatment rather than normalizing with time, raising the possibility that the medication itself causes the problem or exacerbates a prior condition.[9] Methadone treatment has been associated with both central and obstructive sleep apnea in patients with subjective sleep complaints.[10] Though there is some evidence that patients on buprenorphine may experience less daytime drowsiness than those on methadone, buprenorphine has also been linked with impaired sleep quality and continuity.[11-13]

Unfortunately, engaging in methadone OAT does not normalize sleep, and the worse patients on methadone sleep, the less they can work. Multiple studies have demonstrated that sleep disturbance in OAT participants is correlated with unemployment (16.2% with sleep disturbance unemployed vs 5.5% without sleep disturbance unemployed in one multisite study).[14-16] Thus, OUD and poor sleep quality have both been linked independently to vocational problems, and opioid use is itself associated with sleep problems. For patients with OUD, this represents a strong threat to access the financial, emotional, and health benefits of employment.

Although sleep quality, opioid use, and vocational problems are clearly connected, they do not exist in isolation. Chronic pain, perceptions of injustice, maladaptive cognitive patterns, life stressors, and other medical and psychosocial risk factors can all exacerbate addiction, sleep quality, and unemployment. Therefore, the purpose of this study was to investigate the prevalence of poor sleep quality in a population of adults with OUD receiving OAT and its association with known biopsychosocial risk factors for unemployment, such as perceived disability, symptom catastrophizing, and injustice experience. Perceived disability refers to an individual's self-assessed level of functional impairment in various domains of daily life due to physical or mental health concerns. Symptom catastrophizing is defined as "an exaggerated negative mental set brought to bear during actual or anticipated painful experience" related to the individual's physical or mental health conditions.[17] In those with higher pain or symptom catastrophizing and pain disability, an individual's pain behaviors may make both employers and physicians more likely to consider that individual unable to meet vocational responsibilities.[18] Injustice experience can be described as an individual's cognitive appraisal of the severity and irreparability of loss due to his condition, blame of his personal suffering on others, and a sense of unfairness of his situation.[19] Symptom catastrophizing or pain behaviors may be unintentional methods of convincing others of the magnitude of an individual's suffering and disability. Perceived injustice (or the injustice experience) has been associated with unemployment related to pain and painful injuries. We hypothesized that poor sleep quality would be prevalent in this population and associated with known risk factors for unemployment including perceived disability, symptom catastrophizing, and injustice experience.

This study was part of a larger project aimed at identifying the barriers to work participation in our treatment population, so that appropriate interventions could be developed and tested. Catastrophizing has been associated with insomnia, and research has demonstrated that intrusive thoughts about not sleeping can contribute to insomnia.[20] Recognizing that there is increasing literature support for emotional responses to stressors, for example, the experience of discrimination, as a cause of disordered sleep, one of our research goals was to develop a systematic approach to the evaluation of disordered sleep that may point to interventions that directly address sleep disorders, versus interventions that address emotional conditions that may underlie the sleep complaints.[21] In particular, we were interested in learning whether our OUD population would potentially benefit from a specific standardized behavioral intervention, the Progressive Goal Attainment Program (PGAP), which addresses work disability risk related to pain, perceived injustice, and catastrophic thinking.[18] This intervention has been researched in patients with a variety of pain conditions and PTSD but has not been researched in the population of patients receiving treatment for OUD.[22,23] With this future research plan in mind, we included the work disability risk factor screening tools used to determine eligibility for the PGAP intervention.

Methods

Population and sample

This study used a one-group cross-sectional survey design. The Institutional Review Board of the University of Maryland approved this study under protocol HP-00085801. Adults with OUD receiving OAT were recruited from 3 urban locations providing opioid agonist therapy for OUD. For recruitment, advertising flyers were used at all locations and the staff at each clinic informed potential participants of the study. Clinic counselors were made aware of the ongoing study and directed clients to call the number on the research flyers if interested in learning more about the study. In addition, at one of the sites a research team member recruited participants. There was no preselection process for potential participants.

Eligible participants had to meet the following criteria for inclusion: (1) aged 18 to 60 years; (2) respond negatively to the question, "Are you getting Social Security Disability benefits?"; (3) respond positively to the question, "Are you interested in finding a job or a better job?"; (4) receiving OAT in the treatment program for at least 6 weeks; (5) currently not working, or working less than 20 hours per week; and (6) able to read and understand English. Screening for eligibility and informed consent took place in a private room at the treatment clinic or by telephone.

Procedure

A research team member reviewed and discussed the details of the study with the participants, obtained informed consent, and scheduled the interview, which was conducted in a private room at the treatment location. Interviews were administered using electronic tablets and responses were entered online using REDCap electronic data capture tools hosted through a password-protected server.[24] Each structured interview lasted approximately 75 minutes and utilized standardized instruments and a vocational readiness scale. Participants each received two $30 gift cards for their participation in this study.

Measures and instruments

Demographic information. Demographic information included gender, race, ethnicity, and age, as well as several questions about housing and legal history derived from the Maryland Department of Health/Behavioral Health Administration Outcomes Measurement System Form, which is used to authorize OAT among recipients of Medicaid. Collected demographic information also included several questions derived from the Statewide Maryland Automated Record Tracking system, a web-based tool for treatment programs,[25] and 2 questions about financial status, derived from the Financial Industry Regulatory Authority National Financial Capability Study.[26]

The Pittsburgh Sleep Quality Index. The Pittsburgh Sleep Quality Index (PSQI) is used to measure the quality and patterns of sleep, ultimately differentiating "poor" sleep, from "good" sleep.[27] This tool includes 7 self-reported domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the last month. Scoring of the answers is based on a 0 to 3 scale, whereby 3 reflects the negative extreme on the Likert-like Scale. A global sum of greater than 5 indicates "poor" sleep while 5 or less indicates "good" sleep. A prior study has demonstrated good agreement between self-reported disordered sleep using the PSQI and polysomnography in patients on methadone OAT.[28]

Pain Disability Index. The Pain Disability Index (PDI) was designed to measure the extent to which chronic pain interferes with a person's ability to engage in various life activities.[29,30] Individuals rate their level of disability for each of seven categories (Family/Home Responsibility, Recreation, Social Activity, Occupation, Sexual Behavior, Self-care, and Life Support Activity) using a graphic rating scale ranging from 0 (no disability) to 10 (total disability). An overall disability score is determined by the sum of the numerical ratings for the 7 categories (range = 0-70). A score greater than 35 indicates significant pain-related disability.[31]

Symptom Catastrophizing Scale. The Symptom Catastrophizing Scale (SCS) items were derived from the validated Pain Catastrophizing Scale, but modified to refer to "symptoms of your condition" rather than referring specifically to pain-related symptoms to make the measure more appropriate for evaluating mental health conditions that are not necessarily associated with pain. The scale has seven items and responses include (0) never, (1) sometimes, and (2) often. Total scores are summed with a range of 0 to 14. A score greater than 7 is considered elevated.[17,31] The SCS has been shown to be a reliable and valid measure of symptom-related catastrophic thinking associated with debilitating mental health conditions, which is known to be a risk factor for work disability.[32]

Injustice Experience Questionnaire. The Injustice Experience Questionnaire (IEQ) is a validated 12-item instrument that measures the experience of injustice in relation to trauma questionnaire.[33,34] Responses include: (0) never, (1) rarely, (2) sometimes, (3) often, and (4) all the time. Total scores range from 0 to 48. A total score of 30 or greater indicates clinically relevant level of perceived injustice.[19] Injustice experience is associated with increased risk of work disability.[35]

The Quality of Life Enjoyment and Satisfaction Questionnaire— Short form. The Quality of Life Enjoyment and Satisfaction Questionnaire Short-Form (Q-LES-Q-SF) is a validated 14-item instrument that assesses self-rated satisfaction in physical and emotional health, work, household activities, social and family relations, leisure time activities, daily function, and sense of well-being in the past week, with responses ranging from 1 (very poor) to 7 (very good).[36] Total scores range from 14 to 70. There is no threshold for what is considered a normal range; however, the raw score may be converted into percent maximum contentment and satisfaction using the equation (raw score—14)/56 × 100.

World Health Organization Disability Assessment Schedule 2.0. The WHODAS 2.0 is a validated 12-item questionnaire assessing functional impairments due to general health conditions such as those resulting from injury or illness, mental health issues, or substance misuse.[37,38] Responses have been positively correlated with other measures associated with increased work disability risk.[39] Respondents evaluate how these health concerns have impacted 6 domains of life, including cognition, mobility, self-care, getting along, life activities, and participation during the prior 30 days. Responses include: (0) none, (1) mild, (2) moderate, (3) severe, and (4) extreme/cannot do. We used simple scoring, which is as reliable as the more complex item-response-theory mechanism of scoring.[40] Total scores range from 0 to 48. There is not a specific threshold for significant disability, but the score is to be interpreted as a continuum of no disability to full disability.

Data analysis plan

Univariate analyses (frequencies, percentages, means, and standard deviations) were reported to describe the sample demographics and standardized measures. Normality of distribution was determined using Kolmogorov-Smirnov one-sample test. Normally distributed data was presented as mean ± standard deviation and non-normally distributed data was presented as median (interquartile range). Spearman's rank correlation was used to test for associations between key study variables: sleep quality (PSQI), age in years, pain disability (PDI), symptom catastrophizing (SCS), injustice experience (IEQ), quality of life enjoyment and satisfaction (Q-LES-Q-SF), and functional impairment (WHODAS 2.0). Sleep quality was the key variable of interest. Using the same variables, 2 Spearman's rank correlations were also conducted in both subgroups of participants receiving methadone only and participants receiving buprenorphine only. All analyses were conducted using SPSS Version 27.0, IBM Corp, Armonk, New York, USA.

Results

Baseline characteristics

There were 38 participants who completed the study. Participants were a mean age of 45.6 ± 10.9 years, 27 (71.1%) male, and 16 (42.1%) reported having a high school diploma/General Education Development certification as the highest level of academic attainment. Thirty-one (81.6%) participants were receiving methadone, Table 1.

Sleep quality

Most participants reported poor sleep quality, with 29 (76.3%) having a PSQI of greater than 5, with an average PSQI of 8.92 ± 4.38. Patients slept a median of 7.5 hours and had increased median latency to sleep at 30 minutes. They also tended to go to bed slightly early at 21:00. The most common sleep disturbance was waking up in the middle of the night or early morning and waking up to use the bathroom. Table 2 reports the answers to specific questions on the PSQI.

Other measures

Results for all the scale measures are presented in Table 3. There was a wide range in responses to the measure of pain disability (PDI), indicating that pain was not a problem for some respondents, but a significant problem for others. Elevated scores for the PDI were highly correlated with elevated scores for other measures of work disability. The median score for PDI was not elevated, but 7 respondents (18.4%) scored above 35, indicating high levels of pain-related disability for those individuals. The mean score for symptom catastrophizing (SCS) was not elevated, but a subset of participants, 18 (47.4%), scored in the elevated range, above 7. The median

Table 1. Participant baseline characteristics (n = 38).

	N (%)
Age in years, mean ± SD	45.6 ± 10.9
Gender	
Male	27 (71.1%)
Female	11 (28.9%)
Race	
Black	20 (52.6%)
White	15 (39.5%)
Other	3 (7.9%)
Highest Educational Level	
Grades 1st-11th	9 (23.7%)
High School Diploma/GED	16 (42.1%)
College Coursework	10 (26.3%)
College Degree (AA/BA/BS)	3 (7.9%)
Opioid Agonist Treatment	
Methadone	31 (81.6%)
Buprenorphine	6 (15.8%)
Unknown	1 (2.6%)
Sleep Quality (PSQI)	
Poor Sleep Quality	29 (76.3%)
Good Sleep Quality	9 (23.7%)
Pain Disability (PDI)	
Elevated Pain Disability	7 (18.4%)
Symptom Catastrophizing (SCS)	
Elevated Symptom Catastrophizing	18 (47.4%)
Injustice Experience (IEQ)	
Elevated Injustice Experience	14 (36.8%)

Abbreviations: AA, associate in arts; BA, bachelor of arts; BS, bachelor of science; GED, general educational development.

score for injustice experience (IEQ) was not elevated, but a large number, 14 (36.8%), scored in the high or very high range of 30 or greater. The average raw score for quality of life (Q-LES-Q-SF) converted into a percent maximum contentment and satisfaction of 56.9% demonstrated that this sample was not experiencing maximal levels of quality of life.

Associations of sleep quality and other measures

Table 4 indicates the significant association of sleep quality (PSQI) with each variable. Worse sleep quality was positively associated with more pain disability (PDI) ($r = 0.657$, $P < .01$),

Table 2. Questions on the Pittsburg sleep quality index (n = 38).

SLEEP TIME	MEDIAN (IQR)
Bedtime (clock time)	21:00 (11:45-22:08)
Risetime (clock time)	6:00 (5:26-7:18)
Latency to sleep (min)	30 (15-60)
Estimated sleep time (h)	7.5 (5-8)
ITEMS	**N (%) ≥ 3X/WEEK**
Latency to sleep >30 min	7 (18.4%)
Waken in the middle of night or early morning	15 (39.5%)
Get up to use bathroom at night	21 (55.3%)
Cannot breathe comfortably at night	8 (21.1%)
Cough or snore loudly at night	6 (15.8%)
Feel too cold at night	6 (15.8%)
Feel too hot at night	7 (18.4%)
Have bad dreams at night	6 (15.8%)
Feel pain at night	10 (26.3%)
Other problems at night	7 (18.4%)
Took sleep medication to help sleep	6 (15.8%)
Difficulty staying awake during daytime	1 (2.6%)
	N (%) "A VERY BIG PROBLEM"
Problem maintaining enthusiasm to get things done	4 (10.5%)

more symptom catastrophizing (SCS) ($r = 0.499$, $P < .01$), more injustice experience (IEQ) ($r = 0.642$, $P < .01$), and more self-assessed disability (WHODAS 2.0) ($r = 0.640$, $P < .01$). Worse sleep quality was negatively associated with quality of life (Q-LES-Q-SF) ($r = -0.623$, $P < .01$) (ie, worse sleep quality was associated with poorer quality of life). Results from the two Spearman's sub-analyses for participants receiving buprenorphine only and participants receiving methadone only showed very similar results to the group as a whole: Supplemental Table 1 (methadone participants n = 31) and Supplemental Table 2 (buprenorphine participants n = 6).

Discussion

In this pilot study of work disability risks in patients receiving OAT for OUD, we found that poor sleep quality was present in most participants and was associated with increased self-assessed disability, pain-related disability, symptom catastrophizing, and perceived injustice, and with poorer overall quality of life. These results have significant implications based on the magnitude of the opioid epidemic and the detrimental effects OUD has on the physical health, mental health, and livelihood of individuals.

For patients with OUD who receive OAT, outcomes often improve; however, treatment retention is generally only 30% to 50%.[41] When patients on OAT are employed, rates of treatment retention improve. There are clearly gaps in the treatment pathway, requiring a careful look from a biopsychosocial perspective at factors that may be prohibiting patients on OAT from succeeding in the recovery process and improving their overall quality of life as a result.

Sleep quality

Most of the participants in our study had poor sleep quality, with over three quarters of the sample reporting a PSQI more than 5, with an average PSQI of 8.62 ± 4.38, findings which are consistent with prior literature on OAT and sleep in patients with OUD. Peles et al[42] reported 75.2% of their sample population to be classified as poor sleepers, with average PSQI of 9.0 ± 4.8, and Zahari et al[43] reported 58.8% of their population to be poor sleepers, with average PSQI of 5.46 ± 0.45. In the general population, poor sleep quality is seen in 32% to 39.4% of individuals.[44]

Other measures

The overall level of pain-related disability (PDI) in our sample is lower than that of populations diagnosed with pain-related disorders such as acute back pain, chronic low back pain, and widespread pain.[45] However, as discussed previously, 18.4% of our sample of patients on OAT for OUD had a level of pain-related disability in the risk-range. Although elevated pain disability (PDI) scores were not highly prevalent in our sample, pain-related disability was a significantly limiting factor for some patients recovering from OUD and must be kept in mind by providers during the recovery process. The symptom catastrophizing scale (SCS) has not previously been studied in patients with substance use disorders. Although the average SCS score for our sample was lower than that of populations with major depressive disorder or musculoskeletal disorders, approximately half of the participants in our study had elevated levels of catastrophizing thoughts.[32] Injustice experience (IEQ) also has not been studied in a population with substance use disorders; the median IEQ score in our population is greater than those found in populations with musculoskeletal injuries and in populations with chronic pain.[33,35] The raw score of 45.84 ± 11.68 for quality of life (Q-LES-Q-SF) converted into a percentage maximum score (1-100) of 56.9 ± 20.9 is very similar with the percentage maximum score of 56.9 ± 20.0 found in the Bourion-Bédès et al[36] study of a population of individuals with substance use disorders (OUD and/or alcohol use disorder).

Associations of sleep quality and other measures

In addition to the high prevalence of poor sleep quality in this sample, poor sleep quality was found to be significantly

Table 3. Scale measures (n = 38).

	MEAN ± SD	MEDIAN (IQR)	ULN
Sleep quality (PSQI)	8.92 ± 4.38		5
Pain disability (PDI)	-	9.50 (0.00-31.75)	35
Symptom Catastrophizing (SCS)	6.16 ± 4.50	-	7
Injustice Experience (IEQ)	-	22.00 (6.75-32.25)	30
QOL Enjoyment and Satisfaction (Q-LES-Q-SF)	45.84 ± 11.68	-	-
Disability (WHODAS 2.0)	10.55 ± 8.39	-	-

Abbreviations: QOL, quality of life; ULN, upper limit of normal.
Means ± standard deviations of key variable scores are presented for normally distributed data. Medians (interquartile ranges) are presented for nonnormally distributed data.

Table 4. Spearman's correlation among key study variables (n = 38).

MEASURE	1	2	3	4	5	6	7
1. Sleep Quality (PSQI)	1						
2. Age (y)	−.124	1					
3. Pain Disability (PDI)	.657**	−.055	1				
4. Symptom Catastrophizing (SCS)	.499**	−.117	.763**	1			
5. Injustice Experience (IEQ)	.642**	−.139	.814**	.763**	1		
6. QOL Enjoyment and Satisfaction (Q-LES-Q-SF)	−.623**	0.317	−.578**	−.522**	−.721**	1	
7. Self-assessed disability (WHODAS 2.0)	.640**	−.135	.740**	.631**	.813**	−.702**	1

Abbreviation: QOL, quality of life.
Higher PSQI scores indicate worse sleep quality.
**$P < .01$.

associated with self-reported disability, pain-related disability, catastrophic thinking, perceived injustice, and poor quality of life. Some of the associations between psychosocial variables demonstrated in this study—namely the associations of poor sleep with pain disability and with injustice experience—have not been previously reported in individuals on OAT for OUD. However, related studies in other patient populations on sleep and catastrophizing, quality of life, pain disability, and general disability have demonstrated similar relationships to those found in our study. Sleep disturbance has been associated with physical and psychosocial disability in patients with chronic pain and with functional disability in patients with rheumatoid arthritis.[46,47] Pain-related disability in particular is also consistently associated with poor sleep in patients with musculoskeletal disorders and/or chronic pain. Finan et al[48] investigated the directionality of the relationship between sleep and pain, and concluded that sleep impairments more reliably predict pain than the reverse. Based on this finding, sleep-related interventions may result in improvement in sleep quality, pain,

and pain-related disability. Such improvement can have a positive impact on work readiness and work performance.

Another psychosocial factor in this study thought to relate to work outcomes among patients receiving OAT was catastrophic thinking, which can involve overemphasis of the negative aspects of an experience and feelings of helplessness about the experience. It is a risk factor for work disability, and has been linked using the Pain Catastrophizing Scale (PCS) with sleep disturbances.[18,49,50] Perceived injustice, a related factor, has also been identified as a psychological risk factor for delayed recovery following injury.[35] Situations in which individuals consider themselves to have suffered undeserved losses or hardship may lead to perceptions of injustice. To our knowledge, this study is the first to investigate the relationship between sleep quality and perceived injustice. Although the directionality is not clear, this finding raises the possibility that interventions directed at addressing the injustice experience could improve sleep and employment outcomes. There is limited evidence on effective interventions to reduce the

experience of injustice, but there is some evidence that Acceptance and Commitment Therapy (ACT) is effective in helping patients improve function without necessarily improving reported subjective symptoms.[51]

Our results on quality of life are consistent with previous evidence that sleep disorders and poor sleep quality are significantly associated with poor health-related quality of life in patients with substance use disorders.[52] Quality of life scores give insight into the general health and wellbeing of individuals, so the results in this study's sample of patients receiving OAT highlight the need for interventions that will allow these patients to better participate in and enjoy their everyday lives, including meaningful work that contributes not only to higher quality of life, but also treatment adherence.[6]

Implications

The idea of OUD as a chronic and treatable disease has become more widely accepted in recent years.[41] However, patients may encounter challenges at every stage of the care cascade during recovery from OUD, ranging from adverse effects of medications to psychosocial issues. Individuals with substance use disorders are known to have lower rates of employment that the general population; those with OUD have the poorest employment outcomes of all substance use disorder patients.[4] Furthermore, higher levels of unemployment are also seen in patients on OAT for OUD who have poor sleep quality compared to those with good sleep quality.[16] In addition to an overall decreased quality of life, sleep problems are associated with impairment of cognitive and interpersonal work skills, presenteeism (ie, not functioning optimally while at work), and absenteeism.[53-56] People with short sleep times were more likely to report avoiding social interaction at work and struggled with concentration and organization, as well as noting increased impatience with coworkers. Increasing employment is an important goal of OUD treatment, as it is associated with decreased relapse rates, criminal activity, and parole violation and with higher treatment retention.[4,7] The multifactorial nature of the challenges associated with recovery from OUD call for a multifaceted treatment response, including interventions directed at sleep, employment readiness, other aspects of patients' subjective experiences, and societal forces that perpetuate barriers to meaningful recovery.

It is difficult to determine the root cause in regards to the associations between poor sleep quality, opioid use, and vocational problems. For example, poor sleep has been causally related to work injuries, which cause pain and often the injustice experience related to workers' compensation system hassles, which may cause poor sleep.[57] Conversely, poor sleep quality has been causally connected to the experience of pain, which is often treated with opioids, which can exacerbate disordered sleep.[48] However, it may not be necessary to definitively identify the ultimate root cause of a problem to be able to intervene in moderating factors and decrease the risk of poor outcomes. Though we are not able to make conclusions in this study about causal relationships, this pilot study was intended to initiate a conversation about potential ways to approach the complex interplay between barriers to recovery for patients with OUD. Interventions to address poor sleep quality need to be tailored to the individual and may require further diagnostic testing and evaluation to determine the causes of poor sleep quality. Sleep disorders are common among patients taking opioids, including obstructive sleep apnea (OSA), central sleep apnea (CSA), insomnia, inappropriate sleep duration, and poor sleep quality.[58-60] The flow chart in Figure 1 provides an outline of the process clinicians could consider in the sleep evaluation of patients with OUD. After an initial screening, patients may need objective testing with a sleep study including polysomnography. For sleep disordered breathing diagnosed on a sleep study (CSA, OSA, sleep-related hypoventilation and hypoxia), treatment options should include consideration of medication or dose adjustment, nocturnal positive airway pressure therapy or other therapies.

For patients with persistent sleep disorders despite treatment, or other sleep problems such as insomnia disorder, a potential treatment modality in this population is cognitive behavioral therapy for insomnia (CBT-I), which is helpful not only for insomnia, but also for other comorbidities such as depression and anxiety.[61,62] Given that CBT-I is manualized and can be delivered via a website, smartphone app and/or telephone, it can conveniently be integrated into the OUD patient's treatment regimen. A brief behavioral treatment for insomnia (BBTI) is another manualized option.[63]

Given this study's demonstrated associations between poor sleep quality and other biopsychosocial risk factors for unemployment, the possibility that sleep-related interventions may be an effective way to target factors beyond poor sleep quality and improve the overall process of recovery from OUD needs further study. Alternatively, it is possible that effectively addressing the psychosocial risk factors for work disability (injustice experience, symptom catastrophizing, pain disability, etc.) would positively impact sleep. Potential interventions that have not been studied in this population in the past, and which address these interrelated work disability risk factors, include PGAP and ACT.[18,51]

Although a complex issue in this population, pharmacologic interventions for sleep may also represent a potentially fruitful avenue for investigation. Existing results have been mixed, but agents directed toward the orexin-hypocretin system have recently attracted interest given that these pathways seem to be implicated in both sleep and addiction.[64]

Limitations

Limitations of the present study include reliance on a small sample and data collected using a one-group, cross-sectional design. We did not follow participants longitudinally over time
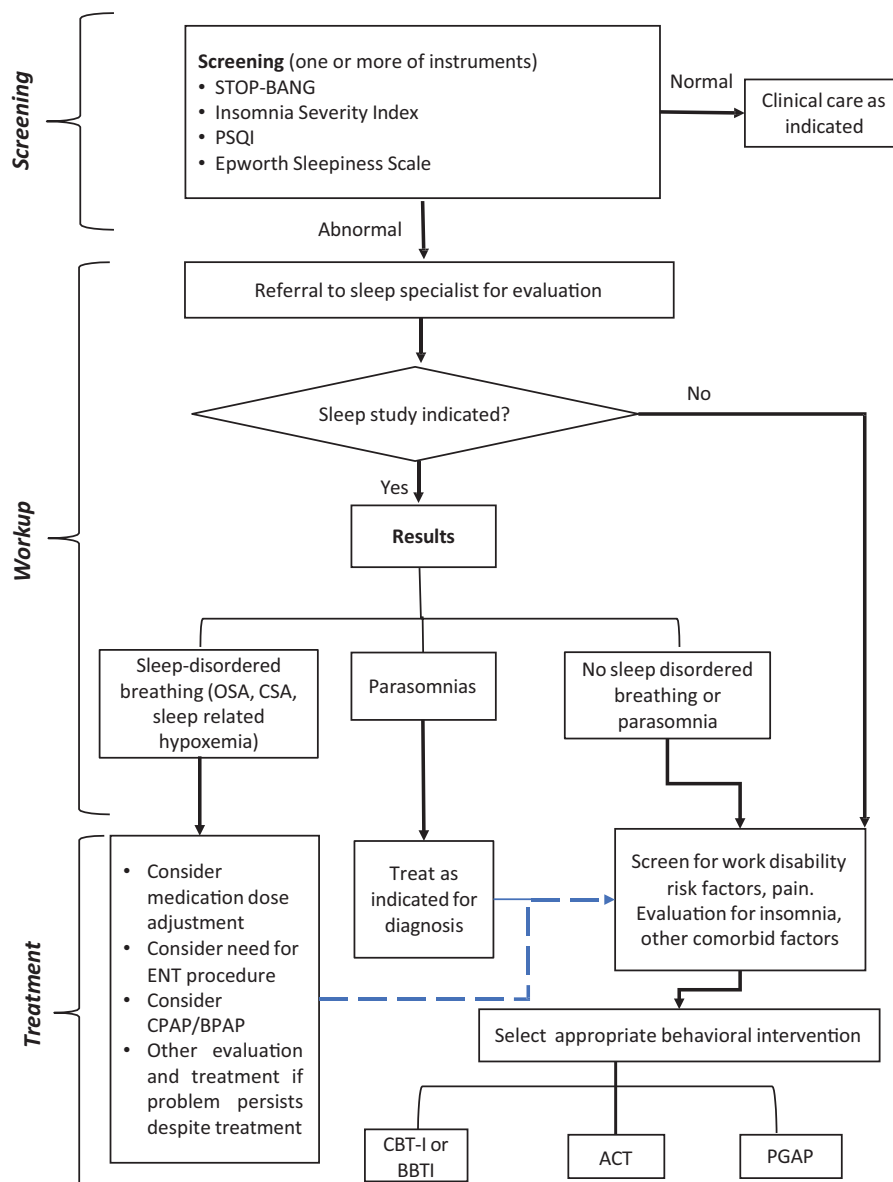
Figure 1. Proposed process for clinical evaluation and management of sleep quality in patients with OUD.

or collect data about the dosage of OAT medications; as previous studies have demonstrated a correlation of methadone dosage with PSQI score, this could represent an unmeasured confounder.[62] Another limitation is that polysomnographic information was not collected for these participants, so we were unable to diagnose specific conditions associated with reported poor sleep. OSA, for example, is a common disorder that may have been present among our sample. Comorbidities such as obesity increase the risk of OSA, but were not assessed in this study. Conversely, in addition to the neurocognitive problems such as decreased concentration, discussed above, that can result from poor sleep, sleep conditions like OSA can result in physical comorbidities including cardiovascular disease.[53] Though these comorbidities were not investigated in this study, they could have an impact on an individual's overall ability to perform in a vocational setting. We also did not perform subanalyses of the correlation between sleep quality and other

psychosocial factors for various demographic groups within the sample. For example, the correlation between sleep quality and injustice experience was not analyzed for separate racial groups and genders. This may present a confounding factor as different racial groups and genders may be expected to experience different levels of injustice. In addition, there were very few participants being treated with buprenorphine compared to methadone, so results should be interpreted cautiously. In regards to generalizability, this study was not specifically advertised to potential participants as a sleep-focused study, so it is unlikely that those with poor sleep quality were more interested in participating in others. However, as an exploratory study, we were not aiming for generalizability, and the inclusion criteria of looking for work or better work, not being in receipt of social security disability benefits, and being working age may make our study sample different from the overall population of those receiving opioid agonist medication.

Conclusions

In conclusion, patients receiving OAT for OUD reported significant sleep disturbance that was associated with psychosocial factors and variables with the potential to negatively impact work ability and overall quality of life. Given that poor sleep quality is common in patients with OUD, we are proposing that clinicians consider regular screening of their patients on OAT for sleep problems and implement sleep-focused interventions and treatments as needed for patients with OUD. Future studies should evaluate the impact of specific psychologically focused interventions such as CBT-I, BBTI, PGAP or ACT on functional status, employment and symptoms that impact these outcomes, including poor sleep.

Availability of Data and Material

The data sets generated and analyzed during the current study are not publicly available due to patient privacy, but deidentified data may be available from authors on reasonable request.

Ethics and Consent

This study was reviewed for ethics and approved by the Institutional Review Board of the University of Maryland. Informed consent was obtained from all individual participants included in the study.

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Supplemental Material

Supplemental material for this article is available online.

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