Sleep in the Substance-using Population

The effect of any psychoactive substance on an individual's sleep will depend on whether that substance is a stimulant, depressant, or has other effects on the brain. A schema is portrayed in Figure 1 (see page 842). The effect of withdrawal from the substance generally will be opposite to the intoxication effects. Psychoactive substances are classified as sedative hypnotics, stimulants, opioids, hallucinogens, and arylcyclohexylamines.

EFFECTS OF SUBSTANCES ON SLEEP

Alcohol

Alcohol is perhaps the best-studied substance in connection with sleep disturbances. Studies show that 13% of the general population used alcohol in the past year to go to sleep, and

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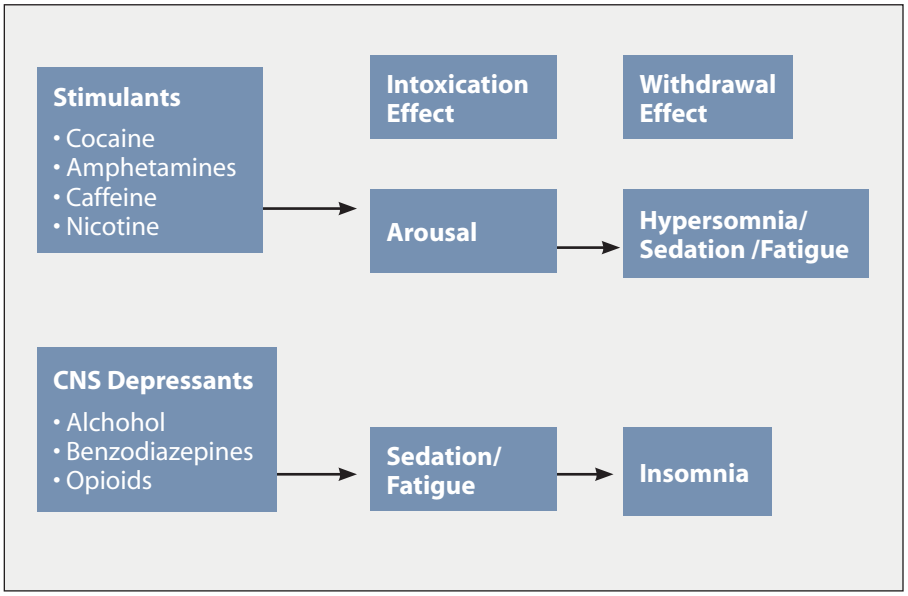

Figure 1. Effects of alcohol, drugs, and medications on sleep.

15% of those people used it regularly for those purposes.[1] In the occasional/social drinker, alcohol's sedating effects can promote sleep onset but tend to disrupt the second half of the night's sleep.[2] Typically the individual will awaken a few hours after falling asleep and find it difficult to get back to sleep. Unfortunately, in the individual who is alcohol dependent, alcohol's sleep-inducing effects are partially lost due to tolerance. In addition, sleep latency is prolonged, and the disruption in the second half of the night is intensified. Patients who drink heavily generally report insomnia and sleep fragmentation (with early awakening), leading to daytime fatigue and sleepiness. Abrupt discontinuation of alcohol among alcohol-dependent patients results in pronounced insomnia, sleep fragmentation, decreased slow-wave sleep (SWS) and increased REM sleep. It has been suggested that individuals with alcohol dependence who abstain may never normalize their sleep pattern, even after 1 to 2 years.[3] Sleep tends to remain fragmented and nonrestorative, with daytime fatigue. However, a return to drinking, at least early on, may result in increased deep sleep and decreased wakefulness. The pattern for chronic heavy drinking will resume quickly. Some studies have demonstrated a connection between a patient's inability to normalize his sleep and relapse to alcohol use.[4] More specifically, higher amounts of REM sleep, as compared to SWS, predicts those at risk for relapse. The individual who drinks regularly has more upper airway resistance with snoring and increased apnea, while those with alcohol dependence, even when abstinent, have an increased prevalence of obstructive sleep apnea and periodic limb movements. For those predisposed to sleep-related breathing disorders, drinking alcohol increases the duration and frequency of apnea episodes.

Caffeine

Caffeine and other methylxanthines are stimulants found in coffee, tea, cola, chocolate, and over-the-counter preparations for headaches, cold remedies, and staying awake. Although a normal cup of coffee has 100 to 150 mg of caffeine, instant coffee has slightly less. Colas have 35 to 75 mg per 12-ounce drinks, while tea has 60 to 75 mg per cup. Cocoa has about 50 mg, and cold preparations can have 15 to 60 mg per tablet. Over-the-counter stimulants have 100 to 200 mg per tablet. Some get overstimulated (restless, nervous, excited, insomnia, flushed face, and/or gastrointestional disturbance) by 250 mg of caffeine, while others need 1,000 mg to produce the same effect. Because tolerance can develop, others may have little effect from caffeine on sleep. Although the half-life is 3 to 7 hours, the drug effects can be longer — 8 to 14 hours — suggesting that coffee should not be consumed after the morning if there is insomnia. The effects are longer in children and pregnant women. The capacity to disrupt sleep is synergistic with alcohol,

CME EDUCATIONAL OBJECTIVES

1. Describe the effects common drugs of abuse may have on sleep.
2. Discuss the degree of sleep impairment due to substance dependence.
3. Identify the effects methadone may have on sleep.

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because both disrupt sleep architecture in different ways. For people who drink 3 or more cups of coffee per day (400 to 500 mg), abrupt discontinuation may cause caffeine withdrawal and its symptoms. A gradual taper will avoid this.

Nicotine

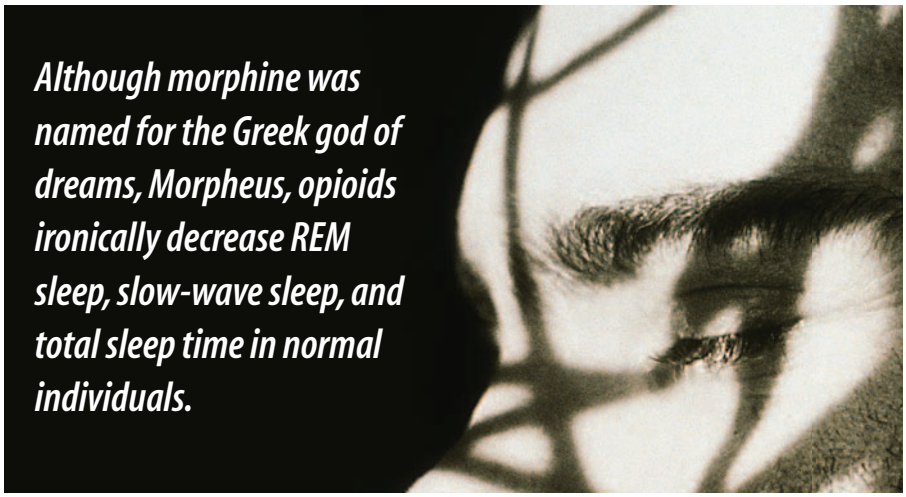
Nicotine is consumed by about 25% of the U.S. population in the form of tobacco, usually smoked but some smokeless. Research using polysomnograms (PSGs) show that smokers have prolonged sleep latency, increased arousals, and more difficulty staying asleep compared to nonsmokers. Poor sleep is a common complaint by those trying to quit smoking. Nicotine patches can reverse the disruption of nicotine withdrawal on sleep architecture, but they do not improve sleep. Some patients report insomnia that is improved when the patch is discontinued before going to bed.

Cocaine and Amphetamines

Other stimulants such as cocaine and amphetamines reduce sleep, improve daytime sleepiness, and improve performance and endurance. For this reason, amphetamines and other medications are helpful with narcolepsy and attention deficit disorder; however, they also have a high abuse potential. When used without narcolepsy, they can reduce sleep time and increase daytime sleepiness, leading to more usage. Addiction produces a withdrawal syndrome for some, characterized by hypersomnolence, hyperphagia, dysphoria, and drug craving. PSGs show disrupted sleep architecture during the first few days and even after a few weeks of withdrawal.

Opioids

Although morphine was named for the Greek god of dreams, Morpheus, opioids ironically decrease REM sleep, SWS, and total sleep time in normal individuals. When patients have pain that disrupts sleep, opioids may help to increase total sleep time. Opioid-dependent patients may report insomnia when taking their drugs and in withdrawal. The half-life of the drugs varies and with it, the onset of withdrawal-induced insomnia. Even after a few weeks of abstinence from opioids, insomnia may persist. The co-occurrence of benzodiazepine abuse and dependence among opioid-dependent patients complicates the management of detoxification and maintenance.



There is not much research on the impact of marijuana and the cannabinoids on sleep. However, what is available suggests that it acutely, and probably chronically, suppresses REM sleep and deep sleep.[5] Acutely, it also increases stage 2 sleep, producing more sleep that is light. Although marijuana may make someone sleepy, it is not recommended as a hypnotic to help people sleep.

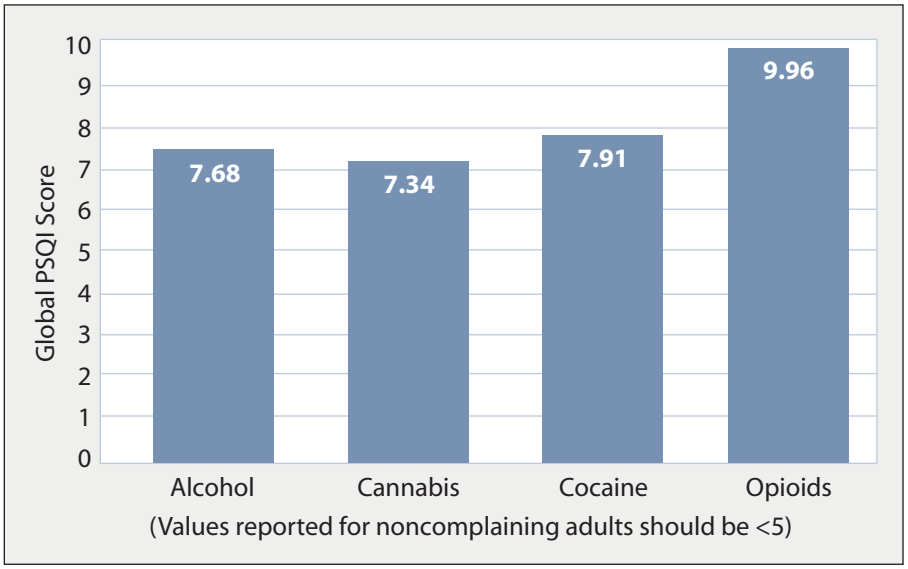


Figure 2. Global sleep quality scores by choice of substance (n=954 patients, mean length of abstinence 54.97 days). There was no significant difference in days of reported abstinence between the four substance classes studied. (Values reported for noncomplaining adults should be <5).

TABLE 1.

The Pittsburgh Sleep Quality Index, Standardized Values

	Global Score (SD)	Range of Values for each Component
Noncomplaining Healthy Adults	<5	0.04 to 1.0
Current Major Depressive Disorder	11 (4.3)	0.76 to 1.88
DIMS*	10	1.42 to 1.96
DOES**	6.5	0.29 to 2.24
Current Alcohol Dependence	10	0.48 to 1.67

** Disorders of Initiating and Maintaining Sleep (DIMS)*
*** Disorders of Excess Somnolence (DOES)*

RESEARCH IN SLEEP IN THE SUBSTANCE-DEPENDENT POPULATION

As part of our efforts to understand the effects of substance use on sleep, we surveyed patients' sleep experiences using the Pittsburgh Sleep Quality Index (PSQI).[6,7] Specifically, we surveyed substance-dependent individuals' sleep patterns during abstinence using this standardized self-assessment instrument. The instrument measures sleep quality using quantitative measures, such as duration of sleep, sleep latency, number of arousals, and also subjective measures of sleep, such as perceived depth and restfulness of sleep. The PSQI provides a reliable, easy-to-use, valid, and standardized measure of sleep quality to distinguish between "good" and "bad" sleepers. Standardized values for various psychiatric, sleep and alcohol-use disorders have been reported (see Table 1), providing available reference points for the population being surveyed.

In total, 954 patients in inpatient or outpatient treatment for substance dependence were surveyed for their sleep components using the Pittsburgh Sleep Quality Index. Patients were surveyed to examine various demographic characteristics, including age, choice of substance, length of abstinence and presence (or absence) of a psychiatric diagnosis and concurrent medication treatment. Other parameters were also examined, including smoking pattern and caffeine intake, to see if they affected sleep. The mean age of the population was relatively young (36.5 years), and most (756) were men. The mean length of abstinence at the time of the survey was 54.97 days. In comparison to referenced controls, individuals with substance dependence who were in treatment, which included monitored abstinence and sometimes medications, were relatively poor sleepers (see Figure 2, page 843).

Patients' sleep was problematic regardless of the reported major substance of abuse, including alcohol, cannabis, cocaine, or opioids. There was no significant difference between the alcohol, cannabis, and cocaine group. There was a significant difference in the sleep quality in the opioid-dependent group compared to the other three ($P<.0001$). Specifically, the opioid-dependent group were poorer sleepers even during reported abstinence than those who identified alcohol, cannabis, and cocaine as their problem substances. Did sleep improve with continuing abstinence? Patient's sleep was assessed with abstinence up to two years (see Figure 3).

There is a statistically significant improvement in individuals' sleep quality with abstinence; but even in patients with up to 2 years abstinence, their sleep quality score does not return to that of a normal population. Specifically, patients who had abstained from substances use for up to one year still scored impaired on their global PSQI sleep scores, indicating poor sleep quality. Some of these patients were receiving treatment for sleep and psychiatric illness as well. The question that continues to be unanswered is whether these individuals' sleep is ever restored to the normal range. Of course, it must be determined if they were ever in the normal range. A study of alcohol-dependent patients who had been abstinent for 1 to 2 years demonstrated altered slow

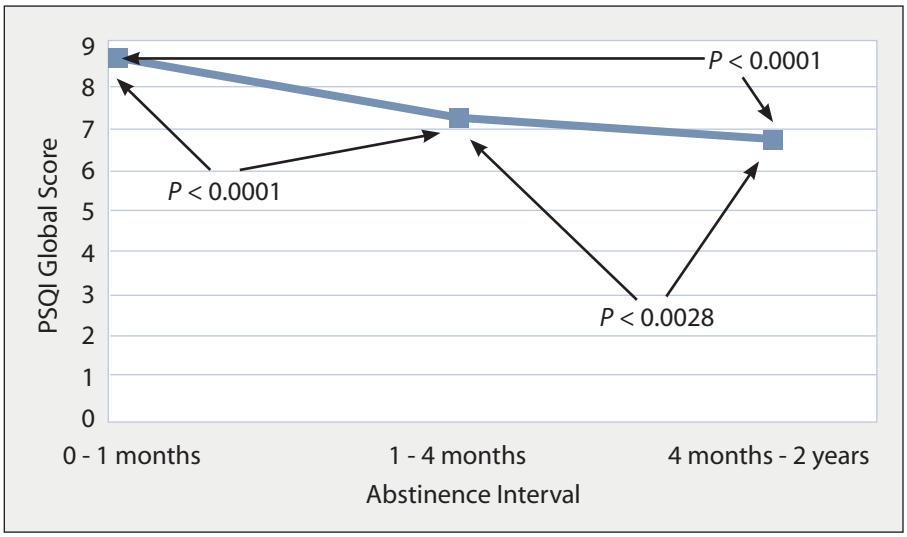


Figure 3. Changes in patients' sleep quality at various abstinence intervals.

wave sleep on PSG, suggesting there may be long-term changes.

METHADONE AND SLEEP

Methadone, a long acting opioid, has been used in treatment for opioid dependence for 40 years. This is a substitution-type therapy. Its long half-life allows for maintenance of consistent blood levels of opioids causing more stability in patients' lives and facilitating their ability to function within society. A pilot study conducted on a stable methadone maintained-population[8] demonstrated that stable methadone patients have more sleep architecture abnormalities than controls and a higher prevalence of sleep apnea. We surveyed a stable methadone maintenance population using the PSQI in order to examine the sleep quality in this population. Our study demonstrated a high global sleep quality score (poor sleep). These scores were similar to recently detoxified opioid-dependent patients. Furthermore, these scores were higher than those demonstrated for individuals detoxified from alcohol, cannabis, and cocaine (see Figure 4).

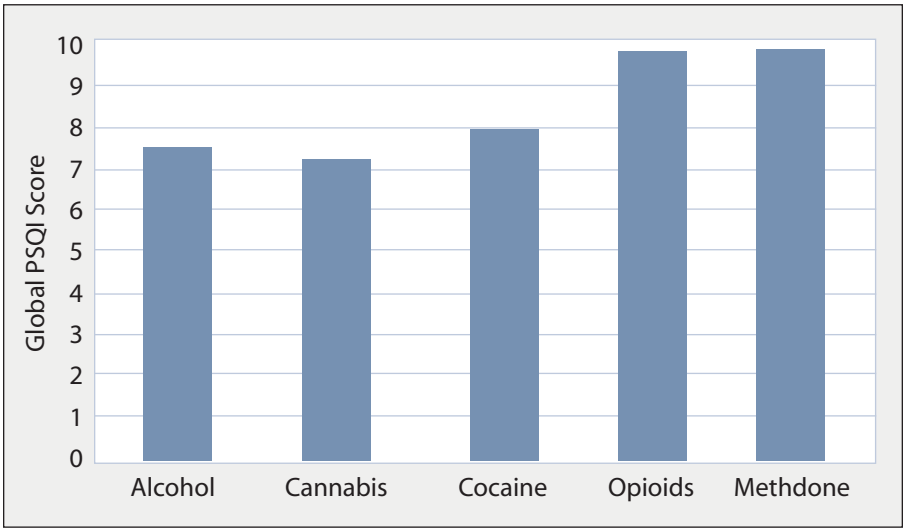


Figure 4. Global sleep quality scores in methadone maintenance patients compared with recently detoxified alcohol, cannabis, cocaine, and opioid-dependent patients.

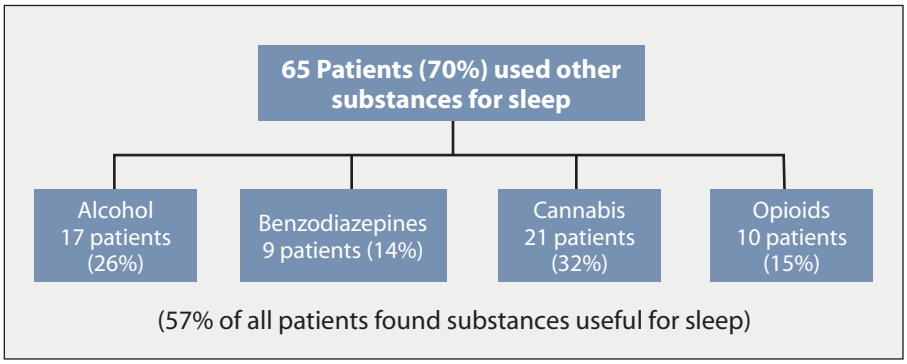


Figure 5. Use of other substances for sleep by methadone-maintenance patients.

Recently detoxified opioid-dependent patients seem to represent the worst of what is already a population of poor sleepers. Methadone maintenance also has no benefit in restoring sleep parameters towards normal. The methadone-maintained patients described problems in all areas of their sleep, including problems with sleep latency, awakenings, sleeping too long, and unrefreshing sleep. No single area of sleep was subjectively reported to be worse than any other. Within the methadone population, most of the patients (70%) used other substances to assist with their sleep, the most common being alcohol (see Figure 5).

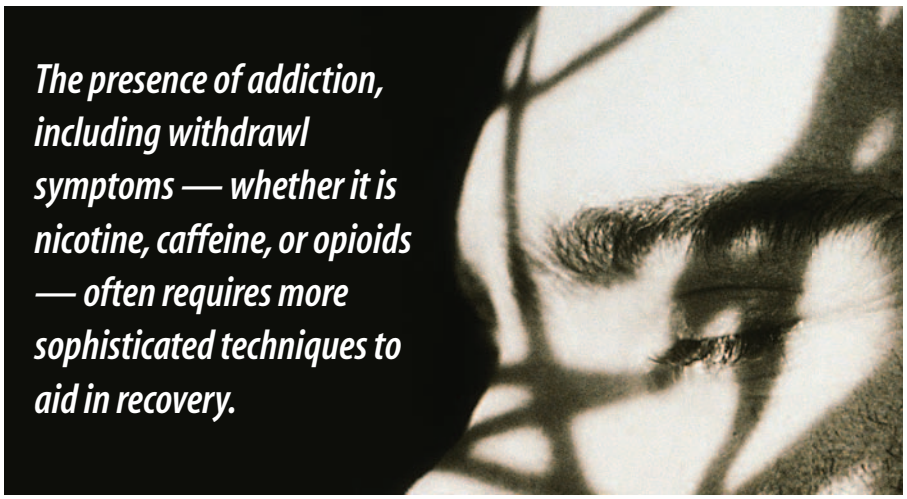
Interestingly, patients who subjectively noted an effect of methadone on their sleep were split between those who felt methadone assisted with their sleep versus those who felt it worsened their sleep. It is not clear if methadone helps some and worsens others.

SUMMARY

It is clear that information about sleeping problems in the substance-using population is murky and ambiguous. With such lack of clarity, assessment is really a process. Denial is a part of addiction and this works against the clinician, but engagement allows the denial to unravel in its own due time. When substance use is minimal and is not associated with the forces of addiction, sleep hygiene education is often all that is needed to remove the negative impact of nicotine, alcohol, caffeine, or marijuana. When the use is more integrated into life and the brain has adapted to the substance, then sleep hygiene education may not be enough. More specific interventions may need to be added to the treatment plan. Behavioral approaches may still be enough to manage sleep problems where there is mild to moderate substance dependence.

The presence of addiction, including withdrawal symptoms — whether it is nicotine, caffeine, or opioids — often requires more sophisticated techniques to aid in recovery. Our sleep quality information suggests detoxification and abstinence may not return the person to the naïve state. Substance-dependent patients in re-

covery with abstinence still have poor sleep quality. Dual diagnosis patients on treatment medications, including psychotropics for insomnia, have severely impaired sleep quality. There may be ongoing sleep pathology that was not there originally, or perhaps it was there originally. Are the sleep disorders biologically based disorders that can be kindled in the brain? Can the brain, through repeated subthreshhold stimulation, change its sleep circuitry? Further research is needed to answer these questions. We assume that some of these people have a primary sleep disorder that preceded the addiction. Because of the slow onset of addiction in many, it may be hard to make this diagnosis. Some addictions are best handled with ongoing medications such as methadone and buprenorphine. These medications seem to have their own impact on sleep architecture that must be managed with other medications. Greater knowledge of a medication's impact on sleep architecture is needed to prescribe for these situations.



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