

flight) and 90 minutes per day after a phase-delay shift (westbound flight), symptoms can last for several days after the flight. There appears to be no difference in the amount of jet lag experienced in homeward versus outward directions per se. Daytime symptoms are thought to be caused by (1) waking behaviors suddenly occurring in the “sleepy” phases of the unadjusted sleep-wake cycle; (2) sleep disruption due to the person’s attempt to sleep during the unadjusted “awake” phases of the cycle; and (3) malaise that results from the loss of harmony (dissociation) among the various rhythms governed by the circadian system, some of which phase adjust more rapidly than others.

**Complications:** Subjective distress about not sleeping well and social embarrassment because of falling asleep at inappropriate times may occur. Self-treatment, especially involving the use of large amounts of alcohol, may complicate the clinical picture. Menstrual irregularities in female air crew have been attributed to repeated jet lag, but clear and convincing data on this subject are lacking. Patients with bipolar (manic-depressive) disorder may experience an exacerbation, with a higher likelihood of mania following eastward flights and depression after westbound travel.

**Polysomnographic Features:** In general, polysomnographic studies have shown a greater number of arousals and a greater percentage of stage 1 sleep during the first two to three sleep periods after arrival compared to home-based sleep. Sleep efficiency is consequently mildly reduced, usually no more than 10% from baseline. Prolongation of sleep latency and reduction of slow-wave sleep occur quite variably, the latter possibly more dependent on age than on the time zone change itself. Most often, the second half of the sleep period is the more severely disrupted, whether the flight was eastbound or westbound.

**Other Laboratory Test Features:** Actigraphy may demonstrate a disrupted sleep-wake pattern consistent with time zone (jet lag) syndrome. There may be loss of the normal pattern of circadian rhythmicity, as demonstrated by 24-hour temperature or biochemical patterns.

**Differential Diagnosis:** In most cases, the syndrome is self-limited and does not come to clinical attention. Persistence of symptoms beyond 2 weeks after the flight suggests the probability of some other disorder producing insomnia or excessive sleepiness, such as psychophysiological insomnia or the obstructive sleep apnea syndrome.

#### **Diagnostic Criteria: Time Zone Change (Jet Lag) Syndrome (307.45-0)**

- A. The patient has a primary complaint of insomnia or excessive sleepiness.
- B. There is a disruption of the normal circadian sleep-wake cycle.
- C. The symptoms began within 1 or 2 days after air travel across at least two time zones.
- D. At least two of the following symptoms are present:
  1. Decreased daytime performance

2. Altered appetite or gastrointestinal function
3. An increase in the frequency of nocturnal awakenings to urinate
4. General malaise
- E. Polysomnography and the multiple sleep latency test demonstrate loss of a normal sleep-wake pattern evidence (i.e., a disturbed chronobiologic rhythmicity).
- F. No medical or mental disorder accounts for the symptoms.
- G. The symptoms do not meet criteria for any other sleep disorder producing insomnia or excessive sleepiness (e.g., shift-work sleep disorder).

**Minimal Criteria:** A plus C.

#### **Severity Criteria:**

- Mild:* Mild insomnia or mild excessive sleepiness, as defined on page 23.  
*Moderate:* Moderate insomnia or moderate excessive sleepiness, as defined on page 23.  
*Severe:* Severe insomnia or severe excessive sleepiness, as defined on page 23.

#### **Duration Criteria:**

- Acute:* 7 days or less.  
*Subacute:* More than 7 days but less than 3 months; symptoms are associated with more than one episode of time-zone change.  
*Chronic:* 3 months or longer; symptoms are associated with multiple episodes of time-zone change.

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### **Shift Work Sleep Disorder (307.45-1)**

**Synonyms and Key Words:** Night shift, irregular work hours, transient insomnia, transient excessive sleepiness, “work-shift” change in conventional sleep-wake schedule, acute-phase shift of sleep, frequently changing sleep-wake schedule.

**Essential Features:**

*Shift work sleep disorder consists of symptoms of insomnia or excessive sleepiness that occur as transient phenomena in relation to work schedules.*

The work is usually scheduled during the habitual hours of sleep (i.e., shift work—rotating or permanent shifts), roster work, or irregular work hours. The sleep complaint typically consists of an inability to maintain a normal sleep duration when the major sleep episode is begun in the morning (6 a.m. to 8 a.m.) after a night shift. The reduction in sleep length usually amounts to one to four hours (mainly affecting REM and stage 2 sleep). Subjectively, the sleep period is perceived as unsatisfactory and unrefreshing. The insomnia appears despite the patient's attempts to optimize environmental conditions for sleep. The condition usually persists for the duration of the work-shift period. Early morning work shifts (starting between 4 a.m. and 7 a.m.) may also be associated with complaints of difficulty in sleep initiation as well as difficulty in awakening. Work on permanent evening shifts can be associated with difficulties initiating the major sleep episode. Excessive sleepiness usually occurs during shifts (mainly night) and is associated with the need to nap and impaired mental ability because of the reduced alertness.

**Associated Features:** Reduced alertness, which occurs not only during the work shift, may be associated with reduced performance capacity, with consequences for safety. Also, major portions of the individual's free time may have to be used for recovery of sleep, which in many cases will have negative social consequences such as marital disharmony and impaired social relationships. There have also been reports of increased irritability, presumably related to the lack of sleep or to the conflict between demands for sleep and demands for social activities.

**Course:** The course is closely associated with the shift schedule. There can be improvement in symptoms after the first week of a new shift, but the symptoms usually persist to some degree until a conventional daytime shift is established. After rotation to another shift from the night shift, sleep-onset disorders rather than maintenance difficulties can occur for several days. Adaptation rarely occurs despite many years of night-shift work, in part because of resumption of full daytime activities and nighttime sleep during weekends and vacations.

**Predisposing Factors:** It is known that a normal, full sleep episode during the daytime becomes more difficult with increasing age. Also, individuals described as morning types appear to obtain shorter daytime sleep after a night shift. Presumably, individuals with a strong need for stable hours of sleep may be at particular risk.

**Prevalence:** The prevalence depends on the prevalence of shift work in the population. It appears that most individuals experience sleep difficulties after a night shift. Depending on which country is considered, between 5% and 8% of the population is exposed to night work on a regular or irregular basis. Thus, a prevalence

of shift work sleep disturbance of 2% to 5% may be a reasonable estimate. These figures, however, do not involve individuals with early morning work, which may comprise another group at risk.

**Age of Onset:** Variable, depending upon the age at which shift work is commenced.

**Sex Ratio:** None known.

**Familial Pattern:** None known.

**Pathology:** No known anatomic or biochemical pathology has been described. The condition is directly related to the circadian interference with sleep during the morning and evening, which conflicts with the shift worker's need to sleep at these times. The excessive sleepiness during night work appears to be partly related to the lack of sleep and partly related to the conflict between the requirement of working at night and the circadian sleepiness propensity during the night hours.

**Complications:** It is hypothesized that the condition may lead to chronic sleep disturbances, although very little empirical evidence is available. Gastrointestinal disorders may be exacerbated or produced by the effects of shift work. There are also indications that cardiovascular disease may result. Disruptions of social and family life are frequent. Drug and alcohol dependency may result from attempts to improve the sleep and decrease the wakefulness disturbances produced by shift work.

**Polysomnographic Features:** The disorder is usually able to be diagnosed by history. Polysomnographic recordings may be useful if the sleep disorder is severe or the etiology of the sleep disturbance is in question. Ideally, the sleep recording is performed during the habitual "shifted" sleep period and in the work environment of the individual. A 24-hour recording over the first and last of the series of rotating shifts should be performed. Monitoring of an episode of usual daytime wakefulness and night sleep during a daytime shift is ideal for comparative purposes. If excessive sleepiness is part of the complaint, a multiple sleep latency test should be carried out in the standard manner at least three times: at the beginning, middle, and end of the work shift.

If field (at home and at work) polysomnography is not feasible, an alternative evaluation involves polysomnography in the sleep laboratory during simulated shift work sleep and wake patterns. One night of recording is performed during the habitual sleep period, followed by an MSLT performed over a period that conforms to the work shift. Polysomnography may demonstrate impaired quality of the habitual sleep period, with either a prolonged sleep latency or shortened total sleep time, depending on the timing of the sleep period in relation to the underlying phase of the circadian timing system. The sleep period may be fragmented, with frequent arousals and awakenings. The MSLT may demonstrate excessive sleepiness during the time of the work shift.

**Other Laboratory Test Features:** Actigraphy may be helpful to demonstrate a disrupted sleep-wake pattern consistent with shift work sleep disorder. There may be a loss of the normal pattern of circadian rhythmicity, as demonstrated by 24-hour temperature or biochemical patterns.

**Differential Diagnosis:** Sleep disturbances before early morning work may be mistaken for another disorder of initiating sleep, whereas the disturbance after the night shift might be mistaken for another disorder of sleep maintenance. The excessive sleepiness should be differentiated from that due to narcolepsy or sleep apnea syndrome. Sometimes, patients with sleep disorders such as narcolepsy tend to adopt shift work as an attempt to rationalize symptoms of excessive sleepiness. Conversely, patients suffering from insomnia may adopt nighttime work patterns. Furthermore, both the insomnia and the excessive sleepiness might be mistakenly attributed to a persistent circadian rhythm sleep disorder. However, historic information on the relation between the occurrence of disturbed sleep and work-hour distribution should provide sufficient information to indicate the correct diagnosis. Drug- and alcohol-dependency sleep disorders can occur concomitantly.

#### **Diagnostic Criteria: Shift Work Sleep Disorder (307.45-1)**

- A. The patient has a primary complaint of insomnia or excessive sleepiness.
- B. The primary complaint is temporally associated with a work period (usually night work) that occurs during the habitual sleep phase.
- C. Polysomnography and the MSLT demonstrate loss of a normal sleep-wake pattern (i.e., disturbed chronobiologic rhythmicity).
- D. No medical or mental disorder accounts for the symptoms.
- E. The symptoms do not meet criteria for any other sleep disorder producing insomnia or excessive sleepiness (e.g., time-zone change [jet lag] syndrome).

**Minimal Criteria:** A plus B.

#### **Severity Criteria:**

- Mild:* Mild insomnia or mild excessive sleepiness, as defined on page 23; the sleep deficit is often one to two hours.
- Moderate:* Moderate insomnia or moderate excessive sleepiness, as defined on page 23; the sleep deficit is often two to three hours.
- Severe:* Severe insomnia or severe excessive sleepiness, as defined on page 23; the sleep deficit is greater than three hours.

#### **Duration Criteria:**

- Acute:* 7 days or less.
- Subacute:* More than 7 days but less than 3 months.
- Chronic:* 3 months or longer.

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### **Irregular Sleep-Wake Pattern (307.45-3)**

**Synonyms and Key Words:** No circadian rhythm, disregard of zeitgebers, grossly disturbed sleep-wake rhythm, low-amplitude circadian rhythms.

#### **Essential Features:**

*Irregular sleep-wake pattern consists of temporally disorganized and variable episodes of sleeping and waking behavior.*

Although patients with irregular sleep-wake patterns may have a total 24-hour average sleep time that is within normal limits for age, no single sleep period is of normal length, and the likelihood of being asleep at any particular time of day is unpredictable. Depending on the source of the sleep complaint, the clinical manifestation may be inability to initiate and maintain sleep at night, frequent daytime napping, or both. Ambulatory patients living in the community may emphasize the nocturnal insomnia and view the daytime napping as a necessary result of their difficulty at night. The nighttime caretakers of institutionalized patients with this disorder may resort to physical or chemical restraints to control concomitant symptoms of nocturnal wandering and agitation, while the family of the same patient complains that the patient is seldom awake when they come to visit.

Unlike in patients with the advanced sleep-phase, delayed sleep-phase, and non-24-hour syndromes, a well-kept sleep-wake log by patients with this disorder shows no recognizable ultradian or circadian patterns of sleep onset or wake time. Instead, sleep is broken up into three or more short blocks in each 24 hours, with marked day-to-day variability in the timing of sleep and wakefulness. The pattern is reminiscent of that of newborn infants, except that sleep occupies a much smaller fraction of the 24-hour day in patients with this disorder than in infants.

**Associated Features:** Subjective cognitive impairment and sleepiness characterize the awake intervals between the sleep episodes, particularly in ambulatory outpatients. The syndrome is probably most common in patients with severe congenital, developmental, or degenerative brain dysfunction, but rare cases have