Circadian Rhythm Sleep Disorders

(s. Chronobiological Disorders)

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**Chronobiological Disorders** - disruption of inherent circadian pattern of wakefulness and sleep → shift in phase relation between internal biological clock and desired sleep-wake schedule (i.e. disorders of sleep TIMING rather than sleep GENERATION):

1. sleep at wrong time of day
2. cannot sleep at right time of night (N.B. this is not true insomnia!)
   * diagnosed by proper **clinical history** (sleep logs).
   * management – aim is to ***entrain biological clock to appropriate phase***:
     1. appropriate sleep scheduling
     2. exposure to bright light.

Time Zone Change (Jet Lag) Syndrome

* arises from ***transmeridian flights*** of long duration (usually at least three time zones).
* reflects **adaptation** necessary to reset internal rhythm **to day-night cycle of destination**.
* symptoms are proportional to number of time lines crossed; do not occur even with long flights north to south!
* enhanced by *sleep deprivation* (before prolonged trip, altered conditions during flight) + *alcohol* use during flight.
* internal clock adaptation speed:

1 hour / per day after ***phase advance*** (eastbound flight);

1.5 hours / per day after ***phase delay*** (westbound flight).

N.B. recovery may take as long as 7-10 days (esp. for ***eastward travel***).

* treatment & prophylaxis:
  1. **pretravel sleep schedule** should be shifted 1-2 hours closer to destination schedule.
  2. **hypnotic** use (e.g. zolpidem) during trip (to minimize in-flight sleep loss) and in new time zone.
  3. correctly timed **bright light exposure** and **immediate adoption** of new time zone schedule.
  4. early evening ingestion of 0.5-5.0 mg melatonin (as health food supplement).

Shift Work Sleep Disorder

* sleep problems are similar to jet lag (8-hour shift = flight across eight time zones).
* main differences from jet lag:
  1. no reinforcement of external light-dark cycles
  2. absence of social patterns that conform to new sleep schedule.
* after single change in shift, 2 weeks may be needed for readjustment; shift workers often are required to change their schedules every 2-4 weeks + nighttime sleep on weekends → chronic desynchronization with their circadian clock.
* remission during vacations!
* treatment: modafinil (Provigil®), armodafinil (Nuvigil™) - both FDA approved!
* prophylaxis:
* ***bright light*** at night and ***dark bedrooms*** in daytime.
* best is to sleep during day, but most persons are unwilling to spend days off asleep (H: 2-3 hour nap in afternoon and 4-6 hours of sleep in morning after work).
* ***forward rotations*** - shift rotations days→ evenings→ nights are better tolerated than rotations in opposite direction.
* ***less frequent rotations*** - shift rotations no more than once every 2-3 weeks.

Delayed Sleep Phase Syndrome (DSPS)

- difficulty falling asleep at night and difficulty waking up on time in morning; normal sleep length and internal sleep organization.

* phase shift occurs during weekends if bedtimes and rise times are delayed; such phase delays (induced by sleeping later) are not corrected during week.
* **adolescence** (usual time of DSPS appearance): increased sleep needs + social factors and greater independence prevent earlier bedtimes → many adolescents sleep later on weekends → DSPS → patients tend to "choose" late-night activities because they are unable to sleep at that time (circulus vitiosus).
* DSPS may affects ≈ 7% urban adolescents.

N.B. DSPS may be initial manifestation of depression in adolescents.

* + treatment (condition is usually very refractory to treatment) - *schedule is most critical element*:
    - advance times of going to bed and arising from bed by 15 min each day or two beginning with usual weekend sleep times.

N.B. it is easier to achieve *phase delay* than *phase advance*!

* + - alternative quicker approaches (with more rapid phase shifts) are more socially disruptive and require strong motivation.
    - once desired schedule is achieved, it must be rigorously maintained 7 days per week.
    - *bright-light phototherapy* during morning hours is also helpful.

Advanced Sleep Phase Syndrome

- evening sleepiness and early morning awakening (sleep onset at 6-9 PM and awakening 1-3 AM are typical).

* + more likely to occur in **elderly** persons.
  + treatment - *schedule is most critical element* (reverse to DSPS); *bright-light phototherapy* during evening hours.

Non-24-Hour Sleep-Wake Disorder

- caused by **destruction of retinohypothalamic tract** - major cause of sleep-wake complaints in ***blind persons***!

N.B. chiasmal lesions that interrupt retinohypothalamic tract may cause syndrome even when visual loss is incomplete.

* without retinal input, internal clock moves in and out of phase with environmental clock (i.e. completely out of touch with 24-hour cycle) - **cyclical** fluctuation is typical (cycles may be of several weeks duration) - individuals maintain 25- to 27-hour biologic day despite all attempts to entrain themselves to 24-hour cycle.
* when phase difference is large, ***sleep times become highly irregular*** (prolonged wakefulness lasting up to 40-50 hours may be followed by sleep periods of 12-20 hours and then resumption for few days of relatively normal schedule).
* treatment (for patients who retain some retinal input to suprachiasmatic nucleus) - appropriately timed exposure to **high-intensity bright light**.

tasimelteon (Hetlioz®) – FDA approved melatonin receptor agonist, to treat non-24- hour sleep-wake disorder (“non-24”) in totally blind individuals.

Irregular Sleep-Wake Pattern

- sleep episodes of varying length at **irregular** intervals (vs. Non-24-Hour Sleep-Wake Disorder – has cyclical fluctuation).

* caused by **destruction of suprachiasmatic nucleus** (or its effector pathways).
* occurs mainly in institutionalized persons with severe static or progressive ***encephalopathies***.
* picture is often complicated by ***nocturnal agitation*** and use of sedatives or antipsychotic medications to control agitation.
* treatment - morning exposure to bright light, increased daytime activity, prohibition of morning and evening naps.

Bibliography see [p. S40 >>](http://www.neurosurgeryresident.net/S.%20Symptoms,%20Signs,%20Syndromes\S40-48.%20Sleep%20disorders\S40.%20GENERAL%20-%20Sleep%20Disorders.pdf)

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