Prevention of Jet Lag

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- level 1 studies, which meet all of the evidence criteria for that study type;
- level 2 studies, which meet at least one of the evidence criteria for that study type; or
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1. Key Points

1.1 Understand that jet travel across time zones causes the circadian clock (located in the suprachiasmatic nuclei within the hypothalamus) to become misaligned with destination time, which causes the symptoms of jet lag: poor sleep, fatigue, decreased mood, and gastrointestinal problems. 

1.2 Recognize that the minimization of jet lag consists of jet travelers seeking and avoiding light at certain times according to an individualized predetermined jet lag plan such that the circadian clock is realigned with destination time as quickly as possible.

1.3 Be aware that exogenous melatonin, when taken at the correct time, may also help to minimize jet lag but is best used in conjunction with the regulation of light exposure.
2. Population at Risk

2.1 Recognize that anyone who jet travels across multiple time zones is likely to experience some jet lag, especially older people.

Evidence

- In a survey of 507 international travelers, 78% reported at least one symptom of jet lag (1).
- In simulated jet lag laboratory studies, middle-aged (37 to 52 years) and elderly (64 to 74 years) people lost more sleep and complained of lower daytime alertness than young people (18 to 30 years) (2; 3).
- In a survey of 100 jet travelers, experience with long-haul flights (number of flights per year longer than 6 hours in length) was not significantly related to ratings of jet lag severity (4).
3. Direct Effectiveness of Intervention/Counseling on Clinical Outcomes

3.1 Regulate light exposure, whether flying east or west, as outlined in a jet lag plan to phase shift the circadian clock so it realigns to destination time as quickly as possible, thereby minimizing jet lag.

Recommendations
- See table How To Develop A Jet Lag Plan.
- See figure Time Grid for Jet Lag Plan.
- See figure Jet Lag Plan for 6 Time Zones East.
- See figure Jet Lag Plan for 7 Time Zones East.
- See figure Jet Lag Plan for 9 Time Zones East.

Evidence
- An early cohort study of two jet travelers found that correctly scheduled exposure to outdoor light on arrival led to a more rapid circadian adjustment to destination time than incorrectly timed outdoor light (5).
- In a randomized, controlled trial, appropriately timed bright light from a light visor on arrival reduced the circadian misalignment in 10 jet travelers by 1 hour and modestly improved sleep efficiency, as measured with wrist actigraphy, on the second night after arrival by 5% compared to 10 jet travelers who only received dim light (6).
- An observational study of 20 jet travelers who voluntarily sought advice on when to seek and avoid light at their destination found that the more closely the travelers followed light exposure schedules, the less jet lag symptoms they reported (7).
- Randomized, controlled trials have shown that in humans, light exposure before the core body temperature minimum phase delays the circadian clock, and light exposure after the core body temperature minimum phase advances the circadian clock. Light exposure within 4 hours of the core body temperature minimum produces the greatest phase shifts (8; 9).
- An observational study found that two of six travelers who did not regulate their light exposure shifted in the wrong direction following an 8-hour eastward flight (10).

Comments
- Patients may consider purchasing or renting a bright light box if bright outdoor light is not available at the times they need to seek light.
- Bright light boxes are considered more effective at shifting the circadian clock than light visors or LED glasses.
- There is no evidence that bright blue light is more effective at shifting the circadian clock than bright white light.
- There is no consistent evidence to suggest that light behind the knees effectively shifts the circadian clock (11).
- The circadian clock is more likely to shift in the wrong direction after eastward flight.
- There has been no placebo-controlled study of the “anti-jet lag” diet.

3.2 Recommend that jet travelers take exogenous melatonin at the correct time to reduce jet lag after eastward flight.

Evidence
- In a randomized, controlled study of six jet travelers who flew eastward across eight time zones, melatonin, 3 mg, taken at the correct time increased the number of travelers who shifted their circadian clock in the correct direction from four of six to all six (12).
- In eight of ten randomized, controlled studies of jet travelers, melatonin significantly improved subjective jet lag symptoms, although there was no evidence it was taken at the correct time (13).
• Randomized, controlled laboratory studies showed that three consecutive daily doses of melatonin, 0.5 mg, phase shift the circadian clock (14; 15).
• A randomized, controlled laboratory study showed that phase advances to bright light can be increased by taking melatonin, 0.5 mg, at the correct time (16).

Comments
• If taken at the correct time, an immediate-release formulation of melatonin, 0.5 mg, will significantly phase shift the circadian clock but to a lesser degree than bright light.
• Melatonin is available OTC, and synthetic melatonin is the purest formulation.

3.3 Note that bright light boxes may induce migraines, worsen eye damage in patients with eye diseases or who are taking photosensitizing agents, and may induce mania in patients with mood disorders.  

Evidence
• In an observational study, 28% of migraine sufferers who were interviewed by a neurologist reported that bright light can trigger their migraines (17).
• Expert opinion recommends that close ophthalmologic monitoring should occur if bright light is to be used by patients with preexisting eye disease or who are taking photosensitizing agents (18).
• In an observational study of 70 patients with seasonal affective disorder who used a bright light box for 5 days, one patient reported hypomania on the fifth day (19).

Comments
• Commercially available bright light boxes typically filter out ultraviolet light.

3.4 Avoid recommending melatonin to anyone who plans to drive or operate heavy machinery up to 8 hours after ingestion or to anyone with asthma.  

Evidence
• A Cochrane review of the use of melatonin for the prevention and treatment of jet lag points out that melatonin can cause sleepiness (13).
• In a randomized, controlled trial, exogenous melatonin administered at 4:00 a.m. and 4:00 p.m. was proinflammatory in both healthy humans and asthmatics (20).

Comments
• The half-life of melatonin is about 0.5 hours.
• Do not recommend melatonin in treating pregnant or lactating women or patients on prescription medications.
4. Frequency

4.1 Recommend that patients follow a jet lag plan a few days before departure and complete it before or after arrival. 

Recommendations

- See table How To Develop A Jet Lag Plan.
- See figure Time Grid for Jet Lag Plan.
- See figure Jet Lag Plan for 6 Time Zones East.
- See figure Jet Lag Plan for 7 Time Zones East.
- See figure Jet Lag Plan for 9 Time Zones East.

Evidence

- Expert opinion states that the more the circadian clock is shifted in the correct direction before travel, the less circadian realignment is necessary after flight, and the less the risk that inappropriate light exposure on arrival will shift the circadian clock in the wrong direction, thereby prolonging jet lag (21; 22).

Comments

- If optimal performance is required on arrival, the circadian clock is best shifted before departure.
- Jet lag plans can be stopped once patients are satisfied with the quality of their nighttime sleep and daytime alertness.
5. Patient Education

5.1 Recognize that although handheld electronic calculators, slide rulers, and websites have been produced to educate travelers about ways to avoid jet lag, none has been formally evaluated for its educational value.

Evidence
- Consensus.
6. Referral/Consultation

6.1 Refer patients to a sleep specialist if they have insomnia for more than 2 weeks after jet travel.

Recommendations
- See module Insomnia.

Evidence
- Consensus.

Comments
- When a predisposed individual is exposed to a precipitant of poor sleep, such as jet lag, chronic insomnia can result.

6.2 Refer patients interested in using a bright light box or visor to an ophthalmologist if they have a preexisting eye disease or to a psychiatrist if they have a mood disorder.

Evidence
- Consensus.
Prevention of Jet Lag

References


Glossary

LED
light-emitting diode

OTC
over the counter

Terms

Circadian
A word derived from the Latin "circa," meaning "about," and "dies," meaning "day." The term "circadian clock" refers to the pacemaker in the hypothalamus (suprachiasmatic nuclei) that drives all peripheral circadian rhythms. These peripheral circadian rhythms occur in all physiologic systems, including core body temperature and various hormones.

Phase advance
When the circadian clock shifts earlier in time

Phase delay
When the circadian clock shifts later in time
**Tables**

**How To Develop A Jet Lag Plan**

Please note that a jet lag plan should be followed closely for maximum effectiveness.

- Print out a time grid (see figure Time Grid for Jet Lag Plan). Fill in home and destination cities. Fill in corresponding destination time line.

- On Day 0 draw a rectangle around your usual nighttime sleeping hours using home time. If you regularly sleep ≤7 hours per night, draw a triangle 2 hours before your wake time. If you regularly sleep >7 hours per night, draw a triangle 3 hours before your wake time. The time of the triangle is an estimate of the timing of your body clock (temperature minimum). The goal is to move your temperature minimum into the time for sleep in the new time zone.

- Under the line on the bottom of the time grid, draw a rectangle around your desired sleeping hours at your destination. Draw a triangle 2-3 hours before your wake time (as you did for Day 0)—this is the time your triangle needs to move to.

- Determine the direction your triangle needs to move. Typically, it will need to move earlier in time for eastward flight and will need to shift later in time for westward flight. Note: large moves earlier in time of 8 or more hours are too difficult; if the final triangle at destination is 8 or more hours earlier than the triangle at home, plan on moving your triangle later.

- If you need to move your triangle earlier, draw a triangle on Day 1 at the same time as on Day 0. If you need to move your triangle later, draw a triangle on Day 1, 2 hours later than on Day 0.

- Draw a triangle on each subsequent day. For moving later you can assume 2 hours per day; for moving earlier 1.5 hours per day. Continue to do this for subsequent days until you reach within 1 hour of your final triangle.

- If you are moving your triangle earlier, you will need at least 3 hours of dark immediately before and 3 hours of light immediately after each triangle. Draw "L"s for light and "D"s for dark, from Day 1 onwards.

- If you are moving your triangle later, you will need at least 3 hours of light immediately before and 3 hours of dark immediately after each triangle. Draw "L"s for light and "D"s for dark, from Day 1 onwards.

- At times when you need dark, sleep or stay indoors away from windows (if you are near windows wear sunglasses and if you must go outside wear very dark sunglasses). At times when you need light, stay awake, go outside for outdoor light or use a bright light box (commercially available). If you do not get much light or dark at the correct times, your triangle may shift more slowly (e.g., it may move earlier only 1/2 hour per day and may move later only 1 hour per day).

- Exogenous melatonin, 0.5 mg, may help you move your triangle earlier (but may not help you move it later), but you need to take it 10 hours before each triangle and be aware that it may make you sleepy. You can also draw in your flight departure to arrival times. You can choose when to start shifting your triangle before flight or on arrival.

- Once you are happy with the quality of your nighttime sleep and daytime functioning at your destination, you can stop the plan.
Figures

Time Grid for Jet Lag Plan
A time grid to be filled in when constructing a jet lag plan.

Home (____)  

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Destination (____)  

Day 0  
Day 1  
Day 2  
Day 3  
Day 4  
Day 5  
Day 6
Jet Lag Plan for 6 Time Zones East

A time grid completed for jet travel from Chicago to London (6 hours eastward flight). Notice that this plan begins 3 days before departure. A light box would help provide the early morning light required at home before travel. Sleep is shifted 1 hour per day so that sleep is minimally disturbed but the body clock can begin to shift in the correct direction. In this case as the light is further in time from the triangle, the triangle will move earlier in time only approximately 1/2 hour per day. However, taking exogenous melatonin (0.5 mg) will help move the triangle earlier in time up to 1 hour per day. D = when to seek dark, L = when to seek light. M = time to take exogenous melatonin, 0.5 mg, if desired. Jet lag symptoms should subside within 1 day after arrival.

Time of Day (24 h)

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D = when to seek dark, L = when to seek light. M = time to take exogenous melatonin, 0.5 mg, if desired.
Jet Lag Plan for 7 Time Zones East

A time grid completed for jet travel from Chicago to Paris (7 hours eastward flight). D = when to seek dark, L = when to seek light. M = time to take exogenous melatonin, 0.5 mg, if desired. If started on arrival, jet lag symptoms should subside in 3 to 4 days.

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<td>Home (Chicago)</td>
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<td>Destination (Paris)</td>
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**Day 0 - Home**
- M

**Day 1**
- M 
  - Typical flight time
- D D D L L L

**Day 2**
- M
- D D D L L L

**Day 3**
- M
- D D D L L L

**Day 4**
- D D D L L L

**Day 5**
- D D D L L L
Jet Lag Plan for 9 Time Zones East

A time grid completed for jet travel from Los Angeles to Rome (9 hours eastward flight). As the triangle needs to move earlier in time by more than 8 hours, it is best to move the triangle later in time. D = when to seek dark, L = when to seek light. If started on arrival, jet lag symptoms should subside in 4 to 5 days.

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Day 0 - Home

Typical flight time

- Day 1: L L L\(^\uparrow\)D D D
- Day 2: L L L\(^\uparrow\)D D D
- Day 3: L L L\(^\uparrow\)D D D
- Day 4: L L L\(^\uparrow\)D D
- Day 5: D
- Day 6: D D D
- Day 7: L L\(^\uparrow\)D D D
- Day 8: L L L\(^\uparrow\)D D D

\(^\uparrow\) Indicates the start of the new time zone.