Guidelines

For

Air Travel Medicine

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Setting Clinical and Professional Excellence

Persons crossing international boundaries away from their medical support systems are put at risk for illness and injury. Travel medicine is a new medical discipline that quantifies these health risks and develops strategies for reducing them.
Pre-travel medical evaluation, vaccines against endemic infectious diseases, and medications for self-treatment of common illnesses such as GI dyspepsia, heartburn, diarrhea, headache, common cold, insomnia and skin burn scratches are fundamental to travel medicine disciplines; besides; travel medicine involves preventing deep vein thrombosis, minimizing jet lag during long haul air travel and reducing the occurrence of accidents and water- and altitude-related illnesses.
The new field of travel medicine is emerging for:
1. Importance of international travel of millions of persons leaving their country to high-risk regions of the tropical, semi-tropical and countries of crisis jeopardizing their health.
2. Frequency of illness and injury while being away from support and medical care.

Several environmental and physiologic stresses may be encountered in modern aircraft. These include but are not limited to preflight activities, sustained periods of noise and vibration exposure, turbulence, variable air circulation, environmental temperature changes, disruption of circadian rhythms, sustained periods of postural immobility and varying exposure to low-level radiation, low cabin humidity and lowered barometric pressure and partial pressure of oxygen as commercial jet aircraft maintain a relative cabin pressure altitude between 5,000 - 8,000 feet during routine flight even at the highest operating altitude. At this relative altitude, the barometric pressure decreases from a normal sea level value of 760 mm Hg to around 560 mm Hg, causing the normal baseline arterial partial pressure of oxygen (PaO_2) of 98 mm Hg at sea level to decrease to around 60 -70 mm Hg in normal individuals. This corresponds to approximately 90 % oxygen saturation (SaO_2) on the oxyhemoglobin dissociation curve, a point below which there is a steep gradient of the pressure/saturation relationship. Using 50-55 mm Hg as a minimum acceptable PaO_2 level for a healthy person, passengers with cardiovascular, circulatory or pulmonary compromise associated with a reduced PaO_2 before flight could easily experience symptoms related to hypoxemia at normal cabin altitudes. It has been recommended that a minimum preflight sea level PaO_2 measurement of 68 -70 mm Hg be used to ensure adequate oxygenation without supplementation
Preflight evaluation for these patients may include pulmonary function testing, high-altitude simulation testing (measuring PaO_2 while breathing mixed gases of varying oxygen content, thus simulating an aircraft environment at altitude) or simply observing patients' ability to walk and climb stairs(6 min walk). In addition to lowered oxygen content, the air extracted from the outside environment at the high altitudes of commercial aviation is extremely dry, causing the inside cabin humidity to remain low, ranging anywhere from 10-20%. This low humidity affects certain medical conditions, most notably those involving the respiratory passages and skin and contact lens wearers

and people with dry eyes should instill artificial tears frequently to avoid corneal irritation resulting from low cabin humidity.

Jet Lag

Multi-hour flights going west or east across many time zones will invariably lead to circadian dyschronisms (jet lag), resulting in fatigue, inappropriate sleepiness and wakefulness cycles, headache, irritability and decreased concentration. This is more pronounced with aging and with the number of time zones crossed. It does not occur for travel north and south where the times change very little. Bright sunlight resets the internal clock & exposure to bright late-afternoon or evening light delays the onset of normal sleep time, and exposure to early-morning light advances the biologic clock, so that sleep time is earlier than usual. Thus, managing exposure to light can help adaptation, particularly on the days after arrival in a new time zone. For example, people traveling westward could maximize exposure to bright afternoon light to help delay sleep time. People traveling eastward could maximize exposure to bright light in the early morning to help awakening and promote earlier sleep. In the absence of exposure to light, the body's hypothalamic biologic clock for most persons exceeds 24 hours helping to explain why it is easier for most persons to travel across many time zones going west, where days are lengthened, compared with traveling east, where days are shortened in length. The principles to follow for trips across time zones:

1) If the entire trip is less than 4 days, it may be best to not worry about acclimatization to the new setting, minimizing jet lag going and coming;
2) Persons should be aware that performance is depressed during the short time after relocation across time zones
3) Get on local schedule and become exposed to daytime light as quickly as possible;
4) Drink non-alcoholic, non-caffeinated drinks at all chances;
5) Plan on one day for each hour time-zone crossed for acclimatization to occur;
6) Hypnotics can be useful for a few days after reaching final destination; while the use of melatonin 0.5- 5 mg makes physiologic sense, the traveler should take it on the first day of travel at the time he wants to go to sleep at his destination and may be continued at bedtime for a few days once he is at his destination. It is most effective when crossing five or more time zones or traveling east.

Travelers' diarrhea

Immunity to travelers' diarrhea occurs as persons remain in the high-risk area with reduced illness rates among persons having visited the tropics in the previous 6 months. This natural immunity from exposure to the prevalent pathogens is rapidly lost after leaving the endemic area.

Risk factors for TD include: origin in an industrialized region with travel to a developing region ; age, with highest risk seen in toddlers and adolescents ; living close to locals and

adventure travelers; regularly taking proton pump inhibitors ; heavy consumption of alcohol and host genetics
Bismuth subsalicylate (BSS) given in liquid (two ounces or four tablespoons) or the tablet formulation of the drug (two tablets chewed well) taken with each of the three daily meals and at bedtime (four doses of each/day) is a helpful preventive measure.
Non-absorbed rifaximin given daily at a dose of 200 mg twice daily with meals or 600 mg once daily with major meals while in a high-risk area shown to be effective in preventing the disease
Milder forms of enteric symptoms can often be managed by symptomatic drugs including BSS or loperamide: 4 mg (2 capsules) initially followed by 2 mg (1 capsule) after each unformed stool (not to exceed 8 mg (4 capsules) per day for ≤ 48 hours
Treatment of watery diarrhea in the absence of fever or passage of bloody stools:
Rifaximin 200 mg three times a day for three days; or
Ciprofloxacin 500 mg bid or 750 mg once a day for three days; or
levofloxacin 500 mg once a day for three days
Treatment of diarrhea with fever or dysentery (passing grossly bloody stools) or treatment of breakthrough diarrhea while taking rifaximin as a diarrhea preventive
Azithromycin 1,000 mg once

High Altitude Destinations
Travellers to areas of the world with altitude ≥7,000 ft may develop acute mountain sickness (AMS), which occurs in persons arriving in high altitudes from lower areas without acclimatization at intermediate elevations.
Patient may develop difficulty sleeping; dizziness or light-headedness; fatigue; headache; loss of appetite; nausea or vomiting; rapid pulse rate; shortness of breath with exertion
In severe cases: cannot walk, cough with/out blood, chest tightness or congestion, shortness of breath at rest, cyanosis; decreased consciousness or withdrawal from social interaction; gray or pale complexion.
Treatment involves returning to a lower altitude, hydrating with water. For most patients who do not have a history of allergy to sulfonamides, daily acetazolamide (Diamox) 125 mg once or twice a day is sufficient for management of early AMS. For more severe forms of altitude sickness: lung inhalers, dexamethasone and nifedipine.

Cardiovascular Disease
These groups of people can fly without any special treatment:
• Patient with mild angina (chest pain) that only happens during moderate exercise, whose condition and medicine has not changed recently
• Patient with mild heart failure, which causes breathlessness on mild to moderate exercise, whose condition and medicine has not changed within six weeks
• Patient with occasional heart palpitations or irregular heartbeat, whose condition doesn't cause fainting and who are being treated.

• Patient with heart attack who had his blocked artery successfully opened and his heart is pumping normally; can be able to fly after three days if he is under 65.
Older patient who is not breathless and don't have chest pain should wait 10 days.
• Patient with a pacemaker or defibrillator fitted can fly after three days, providing there are no complications from his operation.
Patient should not fly if:
- has heart attack (myocardial infarction) within the past two weeks
- has coronary artery bypass surgery within the past three weeks (longer if they have had pulmonary complications)
- Has his heart is not pumping properly, who are still breathless, or who need further tests or treatment

*Should there is strong demand for travel of the above patients; inflight O_2 with medical care giver and physician letter should be ensured.
*To help determine a passenger's potential for risk, a treadmill exercise stress test is useful to document absence of ischemic symptoms and to enable the prognosis and functional capacity to be estimated
*Most implanted cardiac devices, including pacemakers and cardioverter defibrillators, are effectively shielded from interference from security devices

Deep Venous Thrombosis "economy class syndrome."
While called "economy class syndrome", the risk is seen in all classes of travel.
Immobility and edema of the lower extremity, orthostatic stress and compression of the popliteal vein at the edge of the seat, hemoconcentration associated with diminished fluid intake and insensitive water loss in the dry cabin atmosphere, flights ≥8 hrs or multiple shorter flights over a short period are contributing factors apart from the other general risk factors for DVT.
Patients can be advised according to risk:
Low VTE risk: all patients not in categories below:
Preventive measures include requesting bulkhead seating if available, wearing support stockings, taking periodic walks during flight, doing isometric calf exercises, maintaining adequate hydration but avoid excess alcohol and caffeine-containing drinks.
Moderate VTE risk:
Involve family history, past history of VTE with identifiable cause, thrombophilia, immobility , cardiac disease, pulmonary arteriovenous malformations (PAVM), obesity (BMI >30kg/m_2), height >1.9m or <1.6m, significant medical illness in previous six weeks, , pregnancy or oestrogen therapy (hormone replacement therapy or combined oral contraceptive pill) and postnatal (within two weeks of delivery).
In addition to the above advice, wear below-knee compression stockings, avoid sedatives, and avoid sleeping for prolonged periods in abnormal positions (stockings may increase

risk of superficial thrombophlebitis in patients with varicose veins).

High VTE risk:

Involve past history of idiopathic VTE (or patients with PAVM with a history of previous VTE or embolic stroke), those within six weeks of major surgery or trauma & patients with active malignancy.

In addition to the above advice, consider a pre-flight prophylactic dose of low molecular weight heparin or formal anticoagulation (INR 2–3). There is no evidence to support aspirin prophylaxis

Patients who have had a VTE should not fly for four weeks or until the proximal deep vein thrombosis has been treated and symptoms resolved.

Pregnancy

• Pregnant women are generally advised not to travel by air when approaching their expected delivery date (≥36 weeks), those at 32-36 weeks should have clinician letter available & their seat belts should be worn below the abdomen, across the hips; these precautions are necessary to prevent a delivery during flight rather than to guard against harm to the fetus, since the fetal circulation and fetal hemoglobin protect the fetus against desaturation during routine air flight due to the increased affinity for oxygen of the fetal hemoglobin and the shape of the fetal oxygen hemoglobin dissociation curve.

• Pregnant travelers should request an aisle seat, stretch and perform isometric leg exercises and walk about the cabin when possible.

• Pregnant patients with a history of significant anemia, prematurity, cervical incompetence, bleeding or other increased risks should be advised not to fly.

• Pregnant travelers; if possible; should avoid travel to endemic areas where endemic diseases can be more virulent to them.

Diabetes

• Adjustments to mealtimes, glucose self-monitoring and timing of medications & special diabetic meals should be requested well in advance of the travel date.

• Physician's letter specifying the diagnosis, usual medication dosages and the necessity of traveling with syringes, as well as a "Diabetes Alert Card" must be ensured.

• Insulin should be kept refrigerated (but never frozen) until it is to be used. Insulin may be kept unrefrigerated at room temperature if it will be used within a month. Insulin should not be exposed to temperature extremes such as might be encountered in the baggage compartment.

• Eastward travel means a relatively short day, and less insulin may be required, whereas westward travel means longer days and the potential need for more insulin.

Ear Conditions

• Because of the rapid cabin pressure changes normally encountered during flight operations, any medical condition affecting the patency of the eustachian tube or sinus ostia could lead to complications. Failure to equilibrate pressures in the middle ear (barotitis media) or paranasal sinuses (barosinusitis) typically occurs on descent. Barodontalgia (toothache provoked by exposure to changing barometric pressure) is difficult to predict but does occasionally occur in patients with dental pulp disease.

• Negative pressure in the middle ear created by blockage creates a partial vacuum, leading to pain and possibly tinnitus, vertigo, hearing loss or even ruptures of the tympanic membrane.

• Recent surgical procedures involving structures of the inner or middle ear may be affected by pressure changes and are a contraindication to flight. Recent tympanostomy tube insertion, however, usually prevents symptoms of barotitis media.

• Patients should be instructed in the use of topical and systemic decongestants, chewing gum, perform an effective Valsalva maneuver, side-side movement of jaw and frequent swallowing & yawning. Infants should be given a bottle or pacifier to suck on to prevent discomfort, particularly during ascent and descent.

Motion sickness: nausea, vomiting, sweating, and vertigo are often triggered by turbulence and vibration and are made worse by warmth, anxiety, hunger, or overeating. Motion sickness can be minimized before and during travel by moderating intake of food, fluids, and alcohol. Fixing the eyes on a stationary object or on the horizon can help, as can lying down and keeping the eyes closed. Other measures include choosing a seat where motion is felt least (in the center of an airplane), refraining from reading, and using an air vent. Motion sickness can be treated prophylactically in susceptible travelers with either oral diphenhydramine (Benadryl) or transdermal scopolamine (Transderm Scop) taken before travel.

Psychologic stress: (aviophobia , aerophobia)

In the form of fear of flying especially on a first flight; a little apprehension is quite understandable, but sever forms may be troublesome as hyperventilation commonly simulates heart disease and may cause tetany-like symptoms; anxiety, panic, paranoia, and a sense of impending death. Advice the traveler to:

• Adjust his seat in a reclining position - unless advised otherwise by the cabin crew.

• Close his eyes, breathe in, count three and breathe out counting three, for 10-15 minutes.

• Imagine a pleasant environment, concentrate on relaxing every part of the body and feel the tension drain away.

• The best is to look of out the window if possible.

• For sever forms; clinical psychologist consultation is warranted as hypnosis and behavior modification might benefit some people. Fearful passengers may also benefit from melatonin (0.5 to 5 mg po before the desired sleep time) or short-acting anxiolytic

(zolpidem 5 mg orally once daily immediately before bedtime, alprazolam should be initiated with a dose of 0.25-0.5 mg given three times daily the dose may be increased to achieve a maximum therapeutic effect, at intervals of 3 to 4 days, to a maximum daily dose of 4 mg, given in divided doses); these medications can be taken before and, depending on duration, during flight.
Patients with violent or unpredictable tendencies must be accompanied by an attendant and appropriately sedated.

Chronic obstructive pulmonary disease (COPD)
Patients with COPD are potentially at risk from altitude-induced hypoxaemia and from expansion of gases within closed body cavities (bullae and pneumothoraces).
Patients with severe COPD (FEV_1 <30% predicted) should consult their specialist beforehand and should carry their usual medication, spacer, and emergency prednisolone in their hand luggage. Pulse oximetry with/out 6 minutes walk test can be performed in primary care to identify significant hypoxaemia.

Pneumothorax or recent thoracic surgery
Passengers with pneumothorax do not tolerate air travel well because of expansion of trapped gases & should not fly.
After a documented pneumothorax, a pre-flight chest x-ray should be arranged to ensure resolution; a further delay of 7 days (spontaneous pneumothorax) or 14 days (traumatic pneumothorax) is recommended.
Similar recommendations apply to those who have recently undergone thoracic surgery, in whom a recent chest x-ray is required. Recurrent pneumothorax is very unlikely following pleural surgery; non-surgical pleurodesis is less effective.

Obstructive sleep apnoea
Obstructive sleep apnoea is not a contraindication to air travel, but a doctor's letter is required outlining the diagnosis and the necessary equipment which will need to be taken.

Other Medical Conditions
Passengers with recent abdominal, central nervous system, ophthalmologic or thoracic surgery are susceptible to problems associated with expansion of trapped gas at reduced cabin pressures. Intestinal gas may expand by 25% by volume at a cabin altitude of 8,000 feet, which may cause tearing of suture lines, hemorrhaging or bowel perforation in passengers with recent abdominal surgery complicated by ileus or those with small or large bowel obstruction, a waiting period of at least 7- 10 days after any laparoscopic or surgical procedure involving introduction of a gas into the body is reasonable, provided other patient stability factors are met.
Patients with anemia (whether the acute type associated with recent surgery or trauma, or the chronic type associated with an intrinsic medical condition and is particularly for

patients with sickle cell anemia) should be further assessed or be advised to delay travel if possible. Supplemental oxygen is advised for anyone with a hemoglobin level below 8.5 g per dL unless the anemia is known to be well compensated.
Any medical devices equipped with pneumatic components, such as catheters or feeding tubes must be capped off during the ascent and descent phases of flight.
Pneumatic splints are not allowed by many airlines but, if used, some air should be released before departure to permit anticipated gas expansion.

Summary of Contra-Indications to Fly

· Anemia - with haemoglobin less than 7.5g/dL
· Sever uncontrolled cardio-vascular accident
· Recent cerebro-vasular accident
· DVT - acute
· Contagious or communicable diseases especially skin diseases that are contagious or repulsive in appearance.
· Haemorrhage - recent gastro-intestinal- within three weeks of intended date of travel.
· Fractures - unstable/untreated
· Jaw - fractured with fixed wiring
· Operations - Within 10 days of simple abdominal operations & 21 days of chest surgery
· Introduction of air to body cavities for diagnostic or theraputic purposes within 7 days. Longer time needed for air injection to serious organs like eyes.
· Sever otitis media & sinusitis especially with loss of Eustachian tube function.
· Pregnancy beyond the 36^{th} week of gestation and mothers within the first week after delivery. (Medical clearance needed for those in 32^{th}-36^{th} week of gestation).
· Pneumothorax - suspected or confirmed
· Respiratory Disease - with marked breathlessness at rest
· Sickling crisis - recent
· Psychiatric Disorders and those whose behaviour are unpredictable, aggressive or may disrupt the flight or endanger other passengers

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