I. Health Effects of Air Travel

A. Cabin pressure set to 5000-8000ft altitude

PROBLEM 1): Drop in PO2 and oxygen saturation according to the oxyhemoglobin dissociation curve (the lower the resting PO2, the greater the drop in oxygen saturation). The drop increases over time and becomes clinically significant at 3 hours.

EVALUATION: **Hypoxic-challenge testing.** For patients with resting oxygen at 92-95% and history of hypercapnia or FEV1 <1.6 L. Pulmonary lab will give patient 85% nitrogen/15% oxygen for 20 min (simulates 8000ft). If PaO2 drops <50 mm Hg or if POx drops < 85%, patient will need supplemental oxygen.

TREATMENT: **Supplemental Oxygen.** Compressed oxygen is supplied by all USA based air carriers or foreign air carriers that begin or end in the USA. Physician statement of need and Rx is required.
PROBLEM 2) Gas Expansion! The low cabin pressures can cause gas expansion of up to 30%. Recommendations: no air travel for 14 days following bowel surgery or laparoscopic surgery (reports of bowel perforation and wound dehiscence). No air travel for 7-10 days for patients following bowel obstruction or diverticulitis. Divers need to wait 24 hours following diving.

B. Thromboembolic Risk

- Systematic review of case-control studies → pooled odds ratio of 1.59 (95% CI 1.04-2.43), of prospective controlled cohort studies → 2.93 (95% CI 1.50-5.58)
- Immobilization linked to 75% of cases, increased in non-aisle seats
- Risk increases for flights > 4 hours, peaking when > 8 hours
- Other modifiable risk – dehydration 48
- Thrombophilia increases risk 16X, oral contraceptives 14X (MEGA)

Recommendations:
- Good hydration, reducing alcohol and caffeine consumption
- Changing positions with periodic calf-muscle exercises
- Graded compressive stockings with ankle pressure of 17-30 mm Hg
- Aspirin - ? benefit
- Lovenox for moderate risk patients (flight > 8 hours and previous thromboembolism, hypercoagulable state, major surgery in prior 6 weeks, or known malignancy)

C. Jet Lag

Clinical effects:
Daytime fatigue, sleep-wake disturbances, decreased appetite, constipation, and reduced psychomotor and cognitive skills.
The body has a harder time shortening the 24-hour day cycle than lengthening it, so it is easier to readjust to westward travel.

Resynchronization typically takes one day for every time zone crossed going westward, 1.5 days for every time zone going eastward.

**Three Methods to help with Jet Lag:**

1. **Realignment of the circadian clock with the use of appropriately timed exposure to light, the administration of melatonin, or both**
   - Exposure to bright light at the right time of day, e.g. in the evening if you are adding hours to your day, or morning if shortening it.
   - Melatonin is a “darkness signal” to speed re-entrainment. 8/11 RCTs report significant subjective improvement with Melatonin. Usual dose is 5 mg. May have hypnotic effect at higher doses (>1 mg).

2. **Planning the optimal duration and timing of sleep**
   - Introduce sleep 1 to 2 hours earlier for eastward travel, the opposite for westward.

3. **Using medication to counteract the symptoms of insomnia or daytime sleepiness**
   - Zolpidem 10mg at bedtime for 3-4 days for eastward travel 5-9 time zones.
   - Zaleplon during flight for shorter periods of sleep (2-4 hours).
   - Caffeine! Slow release (300mg) after traveling 7 time zones eastward showed improved alertness and reduced other jet lag symptoms in a RCT.

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**D. Infectious Diseases**

One billion international tourist arrivals in 2012!
Some association of viral enteritis or viral upper respiratory illness, among individuals with close personal contact or within 2 rows of an index passenger.
II. In Flight Medical Events

A. Types of incidents

Nearly 3 billion commercial flights annually, with an estimation of one medical incident per 600 flights (no national or international registry of in-flight medical events).

1. Syncope or Pre-syncope

2. Gastrointestinal
   - Diarrhea, nausea, vomiting, diffuse abdominal pain, biliary or renal colic, GI bleeding

3. Cardiovascular
   - Chest pain, palpitations, high blood pressure, dehydration

4. Neurological
   - Stroke, TIA, headache, dizziness, seizure

5. Respiratory
   - Difficulty breathing

6. Trauma
   - Fractures, burns, cuts

7. Other
   - Fever, hyper- or hypo-glycemia, intoxication, anxiety, altered mental state, pregnancy, birth, cardiopulmonary resuscitation, death

B. Resources for the Passenger Provider

1. Crew Training
   a) FAA requires training every year including simulation sessions for CPR, group behavior strategies, and communication among involved persons (the patient,
passenger provider, pilot, medical advisors on the ground).

2. FAA Emergency Medical Kits (required)

a) Contents

Automatic external defibrillator (AED)
Sphygmomanometer
Stethoscope
Orotracheal tubes in three sizes (child, small adult, large adult)
Syringes
Needles
1 intravenous infusion set with tubing, 2 Y-connectors, alcohol wipes, adhesive tape, scissors and tourniquet
500 ml of normal saline
Bag-valve-mask resuscitator with a reservoir and three masks (child, small adult, large adult)
Emergency airway, three sizes (child, small adult, large adult)
1 pair of disposable gloves
List of contents and drug information
Drugs:
4 tablets of anti-histamine
2 ampules of an anti-histamine drug
4 aspirin 325mg tablets
2 ampules of atropine
1 bronchodilator
2 ampules of lidocaine
4 tablets of a non-opioid analgesic
1 ampule of 50% glucose
2 ampules of epinephrine 1:1000
2 ampules of epinephrine 1:10000
10 tablets of nitroglycerin 0.4 mg

3. Medical Advice from the Ground

a) Many airlines contract with aviation and emergency specialists on the ground to assist their crews and passenger providers consultation by satellite phone

(1) They assist with diagnostic assessment and treatment decisions given personnel and equipment available
(2) They help assess emergency services available on the ground if an emergency landing is considered.

(3) They communicate with providers on the ground.

C. What Physicians Should Do

1. Keep in mind…

   a) On-board care is isolated from a supportive team, limited in available equipment, carried out in public and in confined spaces!

   b) The 1998 Aviation Medical Assistance Act includes a Good Samaritan provision, protecting passengers who offer medical assistance from liability, other than for gross negligence or willful misconduct.

2. General Approach

   a) Identify yourself and specify your level of medical training to the flight crew.

   b) Your assessment:

      (1) Assess mental status, and identify the chief problem and high-risk symptoms.

      (2) Obtain vitals (if not able to hear for BP, use radial pulse).

      (3) Determine if there are any neurologic deficits.

      (4) For cardiac arrest, apply the AED. For patients with a pulse but suspected cardiac problems, consider using the AED to trace cardiac rhythm.

      (5) Initiate consultation with the ground-based consultant to discuss treatment and diversion decisions.
(6) Diversion decisions are ultimately the pilot’s responsibility. Provide your best guess about the patient’s condition and urgency of appropriate level of care.

(7) Some conditions for which diversion (to facilitate higher level of care at a considerably important time savings):

(a) Unremitting chest pain concerning for cardiac disease

(b) Respiratory distress

(c) Severe abdominal pain

(d) Stroke

(e) Persistent unresponsiveness

(f) Refractory seizures

(g) Severely agitated behavior

(8) Keep notes to hand over to EMS ground transport.

REFERENCES: