This is Aerospace Medicine

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Disclaimer

The views expressed here are not necessarily the views of the Department of Transportation or the Federal Aviation Administration.

Overview

Introduction
Flight Environment
Clinical Aerospace Medicine
Operational Aerospace Medicine
What’s Changing – PBR II

Definition

• Aerospace medicine – the medical study of physiological and psychological disorders associated with atmospheric or space flight. Also called aviation medicine.

Brief History of Aerospace Medicine

Brief History of Flight Medicine

• 1903 First powered flight
  o Wright brothers
  o Kitty Hawk, NC
Brief History of Flight Medicine

• 1915: Aviation medicine driven by WWI high losses of life due to physically unfit pilots
  o 90% physiologic events/pilot error
  o 8% mechanical
  o 2% air-to-air combat

• 1920s: US military realized need for experts in aviation medicine
  o Flights surgeon class of April 29, 1922
  o School led by Louis Bauer

• 1925 Air Mail Act: Powered flight presented new physiologic demands such as altitude exposure.

• High visibility accidents and increased air traffic led to Federal Regulations:
  o Crash of TWA Flight 589, F-10 Trimotor, on March 31, 1931 killed Notre Dame coach Knute Rockne
  o Part 61 Certification: Pilots, Flight Instruments and Ground Instructors
  o Part 67 Medical Standards and Certification
  o Part 91 General Operating And Flight Rules
  o Part 121 Operating Requirements: Domestic, Flag and Supplemental Operators
  o Part 135 Operations Requirements: Commuter and on-demand and rules governing persons on-board such aircraft

Aerospace Medicine Practitioners

• Address needs of all who work, recreate, and travel in the air, sea, and space
• Trained in medicine, with special knowledge of operating in extreme environments of flight, undersea, and space
• Uniquely equipped to make decisions on selection and retention of aviators, divers, and space mission and space flight participants.
American Osteopathic College of Occupational and Preventive Medicine
OMED 2016 Didactic Sessions.

Aerospace Medicine Practitioners

• Military Flight Surgeons
  • Caring for aviators and their families, manage aerospace medicine and public health programs within the military
  • Special training programs:
    • Residency in Aerospace Medicine (RAM)

Aerospace Medicine Practitioners (Non-Physicians)

• Aerospace Experimental Psychologists
• Aerospace Physiologists
• Bioenvironmental Engineers
• Cognitive Psychologists
• Environmental Health Professionals
• Flight Nurses
• Human Factors Engineers
• Industrial Hygienists
• Radiation Health Professionals
• Systems Engineers

Aerospace Medicine Practitioners

• Aviation Medical Examiners (AMEs)
  • Trained, designated and supervised by the FAA
  • Examine/certify civilian pilots
  • Training provides an understanding of aviation related problems, physiology, standards, and administrative processes
  • One week course with mandatory refresher courses

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Advanced Training in Aerospace Medicine

• Civilian Residencies
  • University of Texas - Medical Branch
  • Wright State University

• Civilian Fellowships
  • Mayo Clinic

• Military Residencies
  • US Navy
  • US Army
  • US Air Force
American Osteopathic College of Occupational and Preventive Medicine
OMED 2016 Didactic Sessions.

Stressors of Flight

- Hypoxia
- Barometric pressure changes
- Dehydration
- Imobility
- Vibration
- Temperature extremes
- Acceleration
- Vertigo

The Flight Environment

Hypoxia

Cabin Altitude

- First pressurized high altitude passenger airliner
  - 1939 Boeing 307 Stratoliner

Cabin Altitude

- Cruise altitude 25,000 – 51,000 feet
- Cabin altitude 6500 – 8000 feet
- Respiratory compromised patients could possibly be at risk for hypoxia

Hypoxia

- The absence of an adequate supply of oxygen to the tissues, most significantly critical organs (brain, eyes, ears, vestibular) to maintain normal physiologic function
- Signs
  - Increased breathing rate, confusion, lethargy, loss of coordination
- Symptoms
  - Breathlessness, dizziness, headache, poor judgment, lightheadedness, delayed reaction time, tingling, fatigue, drowsiness, loss of peripheral vision, euphoria
Types of Hypoxia

- Hypoxic hypoxia
- Stagnant hypoxia
- Hypemic hypoxia
- Histotoxic hypoxia

Hypoxic Hypoxia

- Caused by a decrease in the partial pressure of oxygen due to an increase in altitude
  - Occurs at the level of the lungs

Stagnant Hypoxia

- Caused by mechanical pooling of the blood
  - POSITIVE G FORCE

Hypemic Hypoxia

- Decrease in oxygen carrying capacity of blood
- Caused by
  - Smoke and fumes
  - Smoking
  - Anemia
  - S/P blood donation

Histotoxic Hypoxia

- The inability of cells to take up or utilize oxygen from the bloodstream, despite the normal delivery of oxygen to cells and tissues
  - Caused by drugs (cyanide), alcohol, carbon monoxide

Factors Affecting Hypoxia Tolerance

- Not under physician control
  - Altitude
  - Exposure time
  - Rate of ascent
  - Age
  - Natural adaptation
- May be under physician control
  - Alcohol & drug use
  - Smoking
  - Physical activity
  - Illness & disease
  - Fatigue
Use of Portable Oxygen Concentrators

- Must be one of the 24 FAA approved devices
- Supply of fully charged batteries for no less than 150% for the duration of the flight and ground connection time
- Extra batteries must be protected in carry-on baggage from short circuits and physical damage
- May operate POCs while seated and when moving about the cabin
- Must be properly stowed when not in use

Approved POCs

- AirSep FreeStyle
- AirSep LifeStyle
- AirSep Focus
- AirSep FreeStyle 5
- DeVibass Healthcare iGo
- Inogen One
- Inogen One G2
- Inogen One G3
- Inova Labs LifeChoice
- Inova Labs LifeChoice Activox
- International Biophysics LifeChoice
- Invacare XPO
- Invacare Solo2
- Oxlife Independence
- Oxywell (Model 4000)
- Oxus RS-00400
- Precision Medical EasyPulse
- Respironics EverGo
- Respironics Simply Go
- SeQual Eclipse
- SeQual eQuinox (Model 4000)
- SeQual SAROS
- VBOX Trooper

The Flight Environment

Immobility and Venous Thromboembolism

- Immobility - flights greater than 4 h
- Recent surgery
- Recent trauma
- Abnormalities of blood clotting
- Previous or family history of DVT
- Malignancy
- Pregnancy
- Estrogen: OC or HRT
- Increasing age over 40 years
- Chronic heart disease
- Obesity
- Chronic venous insufficiency

Venous Thromboembolism

- Prophylaxis
  - Increased mobility
  - Antiembolism stockings
  - Anticoagulation with low molecular weight heparin (LMWH) or warfarin

The Flight Environment

Motion Sickness
Airsickness

- Caused by conflicting signals to the brain
  - Visual signal indicate no movement
  - Vestibular signals indicate movement
  - Conflicting signals result in nausea, and sometimes vomiting

Airsickness

- Symptoms
  - Increased salivation and swallowing
  - Nausea and vomiting
  - Headache
  - Dizziness
  - Cold sweat
  - Drowsiness

Airsickness

- Factors affecting airsickness
  - Alcohol
  - Illness
  - Fatigue
  - Stress
  - Fear

Airsickness

- Prevention
  - Diet: Low fat diet, breads, cereals, vegetables, fruits
- Treatment
  - Natural: ginger-ale, foods with natural ginger
  - OTC: antihistamines (diphenhydramine)
  - Prescription: Transdermal scopolamine patch, meclizine, antivert

The Flight Environment

Flying After Diving

SCUBA Diving and Flying

- Compressed air is used during Self Contained Underwater Breathing (SCUBA) diving
SCUBA Diving and Flying

- As pressure increases during a dive nitrogen is dissolved in the blood.
- Decompression illness (DCI) is caused when nitrogen dissolved in the blood comes out of solution forming bubbles inside the body during depressurization (during climb).
  - Decompression sickness (DCS) - bubbles form in tissue and result in local damage (i.e., joint pain).
  - Arterial gas embolism (AGE) - bubbles enter the lung circulation, travel through arteries and cause remote tissue damage by blocking blood flow at a small vessel.

Diving and Flying

- Current recommendations from Professional Association of Diving Instructors (PADI) and Diver's Alert Network (DAN).
  - Single dives - A minimum pre-flight surface interval of 12 hours.
  - Repetitive dives or multiple days diving - A minimum pre-flight surface interval of 18 hours.

Fitness to Fly & Return to Flight Status

- Screen passengers, aviators, astronauts, air traffic control personnel and divers.
  - Pilots for risk of sudden in-flight incapacitation for the duration of their medical certificate.
  - Passengers for acute risk of an in-flight medical event for traveling in the near future.

Clinical Aerospace Medicine

Pilots Fitness to Fly

- 15 Disqualifying Conditions (Without an SI)
  - Angina pectoris
  - Bipolar disease
  - Cardiac valve replacement
  - Coronary heart disease that has been treated or, if untreated, that has been symptomatic or clinically significant
  - Diabetes mellitus requiring hypoglycemic medications
  - Disturbance of consciousness without satisfactory explanation of cause
  - Epilepsy
  - Heart replacement
  - Myocardial infarction
  - Permanent cardiac pacemaker
  - Personality disorder that is severe enough to have repeatedly manifested itself by overt acts
  - Psychosis
  - Substance abuse
  - Substance dependence
  - Transient loss of control of nervous system function(s) without satisfactory explanation of cause.

Operational Aerospace Medicine
Operational Aerospace Medicine

- Civil Operations
- Military Operations
- Medevac Operations
- Search and Rescue Operations
- Diving and Hyperbaric Medical Operations
- Aircraft Accident Investigation

Civil Operational Aerospace Medicine

- Commercial air transport flight operations
  - Deep vein thrombosis prophylaxis in susceptible individuals
  - Potential for spread of infectious diseases
  - Effect of cabin altitude on patients with respiratory complications
  - Effect on electronic devices (pacemakers)
  - Circadian desynchronosis (west is best)

Physician Resources

Medical Considerations for Airline Travel

- Stresses of Flight
- Airline Special Services
- In-Flight Medical Care
- Reported In-Flight Illness and Death
- Medical Considerations Before International Travel
- Jet Lag
- Radiation

Fitness to Fly and Medical Clearances

- Anemia
- Cardiovascular Diseases
- Decompression Illness
- Deep Vein Thrombosis
- Diabetes
- Diarrhea
- Ear, Nose and Throat
- Fractures
- Neurology
- Ophthalmological Conditions
- Pregnancy and Air Travel
- Pulmonary Diseases
- Surgical Conditions
- Travel with Children

Physician Resources

FAA AME Guide
Pilot Bill of Rights II
Signed into law July 15, 2016
H.R. 636 (S. 571)

Prior to PBR II

• All pilots were required to possess:
  o An FAA pilot’s certificate
    — Ability to fly
  o An FAA medical certificate issued by an AME
    — Medical fitness to fly

PBR II

• Private pilots who:
  o Complete an online wellness course
  o Possess a valid state driver’s license
  o Can be cleared medically fit to fly by their private physicians to operate aircraft:
    — Up to 6000 pounds
    — Up to 6 occupants
    — Maximum airspeed 250 knots
    — Maximum altitude 18,000 feet MSL
    — Under IFR conditions

PBR II

• Physician checklist
  o Developed by the FAA

• Physician Attestation: “I certify that I discussed all items on this checklist with the individual during my examination, discussed any medications the individual is taking that could interfere with their ability to safely operate an aircraft or motor vehicle, and performed an examination that included all of the items on this checklist. I certify that I am not aware of any medical condition that, as presently treated, could interfere with the individual’s ability to safely operate an aircraft.”

After to PBR II

• Private pilots, flying covered aircraft, are required to possess:
  o An FAA pilot’s certificate
    — Ability to fly
  o Private physician’s medical clearance, valid driver’s license and on-line wellness course
    — Medical fitness to fly

After to PBR II

Senator Tries to Relax Medical Rules for Private Pilots

By JOHN LORY, ASSOCIATED PRESS
WASHINGTON—May 5, 2016, 1:18 PM ET
After to PBR II

• Sen. James Inhofe is trying to eliminate the physicians attestation requirement by attaching it to a major defense spending bill

After to PBR II

• Sens. Dianne Feinstein and Richard Blumenthal countered saying eliminating even the "moderate safety precaution" of having the doctor sign a statement that the pilot is fit to fly "would leave pilots with the exclusive responsibility for coming to a medical judgment about their own fitness to fly, which we believe would represent an unacceptable risk to the safety of our airspace"

• "Changes to civil aviation policy have no place in a military policy bill, recently negotiated compromises should not be re-litigated mere weeks after passage into law, and the safety of our airspace is too important to put at risk."

Physician Resources

• FAA Checklist
  o 180 days from July 15, 2016 to develop

• FAA AME Guide
  o Available online

PBR II

• This is a very fluid situation
• Stay tuned