Air Crew Fatigue
Risk Management

A Validated Diagnostic Approach

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Take Away

• Incident analysis indicates significance of human factors linked to alertness and fatigue

• Air crews are subject to difficult duty cycles and long periods of sitting that have cumulative negative health effects

• Sleep apnea diagnosis may provide critical information on risk:
  • Falling asleep, inappropriate response to unexpected events, long-term health consequences

• Correct diagnosis is needed, and available

• Starting a study to investigate prevalence of sleep deprivation issues in flight crew population
Fatigue in Aviation

• Pilot duty cycles require variable shifts, cause single-duty fatigue, and prone to irregular sleep patterns
• Impacts alertness, performance, response to unexpected events
• One treatable condition that could contribute to pilot fatigue is obstructive sleep apnea (OSA)
One treatable condition that could contribute to pilot fatigue is obstructive sleep apnea (OSA). Obstructive Sleep Apnea (OSA)

- Apnea – Complete
- Hypopnea - Partial
  - Central (CSA) 5%
  - Obstructive (OSA) 90%
  - Mixed 5%
- Duration – 10 to 120 secs
- Frequency – 5 to 120/h sleep (apnea-hypopnea index – AHI)
The Problem

OSA affects 6 to 8% of the adult population
Largely (~85%) undiagnosed and untreated because of lack of access and high cost of gold standard diagnosis by polysomnography (PSG)

Short Term Effects

• Drop in Blood Oxygen Levels (Hypoxia)
• FrequentAwakenings/Sleep Disruption
• Poor Sleep Quality
• Sympathetic Activation (Surge of Adrenalin)
The Problem

Long Term Effects

• Excessive Daytime Sleepiness
  • 3-4 times risk of auto accidents ($15.9 billion and 1,400 lives in USA)
• Increased risk of cardiovascular diseases:
  • 4 times risk of hypertension
  • 3 times risk of heart failure
  • 3-4 times risk for stroke
• Cancer links presumed; being validated

Sleep labs - Expensive and in short supply

Need - an accessible, affordable, reliable way to reach a broader group
Fatigue Measurement

• FAA attributes some incidents to OSA
• NTSB: in a set of 34 accidents, 32 of which were fatal, OSA was diagnosed; 294 incidents involving some type of sleep disorder
• 4,917 FAA pilots being treated for OSA (special issuance medical certificate).
  • Of these, only 347 have a BMI of 40 or greater
Diagnosis: The Gold Standard - Polysomnography

- $1500 to $3000 in USA
- Limited availability
- Complex
- Manual analysis
- Overnight in a sleep lab
Solution
A Better Way of Diagnosing OSA

Monitors and analyzes breathing sounds during sleep at home or “on the road”:
- Simple
- Inexpensive
- Portable (home use)
- No wait-time
- Battery powered
- Wireless
- Single use
New standard for apnea testing
Breath sounds and airflow with detection of apneas and hypopneas

Inspiration (I), expiration (E) and snoring (S)

Sleep time

Head position

Apnea-Hypopnea Index (AHI)
TREATMENT OF OSA

• Avoidance of alcohol and sedatives
• Avoidance of supine position if apneas are supine-related
• Avoidance of weight gain
• Weight loss in the obese
  - diet and exercise
  - bariatric surgery
• CPAP
Conclusions

• Studies needed to determine how common OSA is in airline pilots and link with fatigue and fatigue-related mishaps

• Such trials should involve inexpensive and portable, but accurate means of diagnosing OSA so that pilots undergo testing with minimal inconvenience

• Solution shown may provide a convenient means of diagnosing OSA at home or “on the road” at minimal inconvenience to pilots and at minimal cost to airline and insurance companies