



NTSB National Transportation Safety Board

Sleep Apnea Screening in the Transportation Industry

Presentation to:

Washington Sleep Leadership
Summit 2015

Name: Christopher A. Hart

Date: February 11, 2015

Outline

- **NTSB Basics**
- **Fatigue**
- **Obstructive Sleep Apnea**
 - **Accidents**
 - **NTSB Recommendations**
 - **Responses**

NTSB 101

- Independent agency, investigate transportation accidents, all modes
- Determine probable cause(s) – but not blame or liability – and make recommendations to prevent recurrences
- ***SINGLE FOCUS IS SAFETY***
- Primary product: Safety recommendations
- Not a regulator, cannot require anything, but recommendation acceptance rate > 80%

Major Fatigue Challenges

- The fundamental disconnect: ***Commercial transportation is 24/7, but humans are not***
- The underlying science not well developed
- Difficult to measure
 - Initially
 - Degradation while underway (adrenaline effects?)
 - Post-accident
- One size may not fit all
 - At work: Depends upon shift, shift changes, duties, environment, rapid crossing of time zones (aviation), other factors
 - Not at work: Can't regulate activities, lifestyle
- How to ensure that employees come to work well rested and ready to perform for the duration?

Fatigue Factors

- Sleep
- Diet
- Exercise
- Alcohol/Tobacco
- Age
- Other?

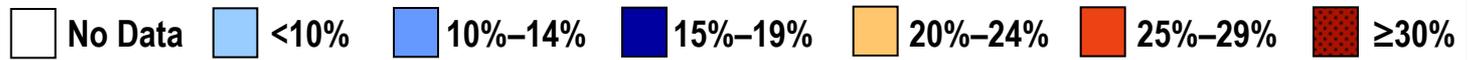
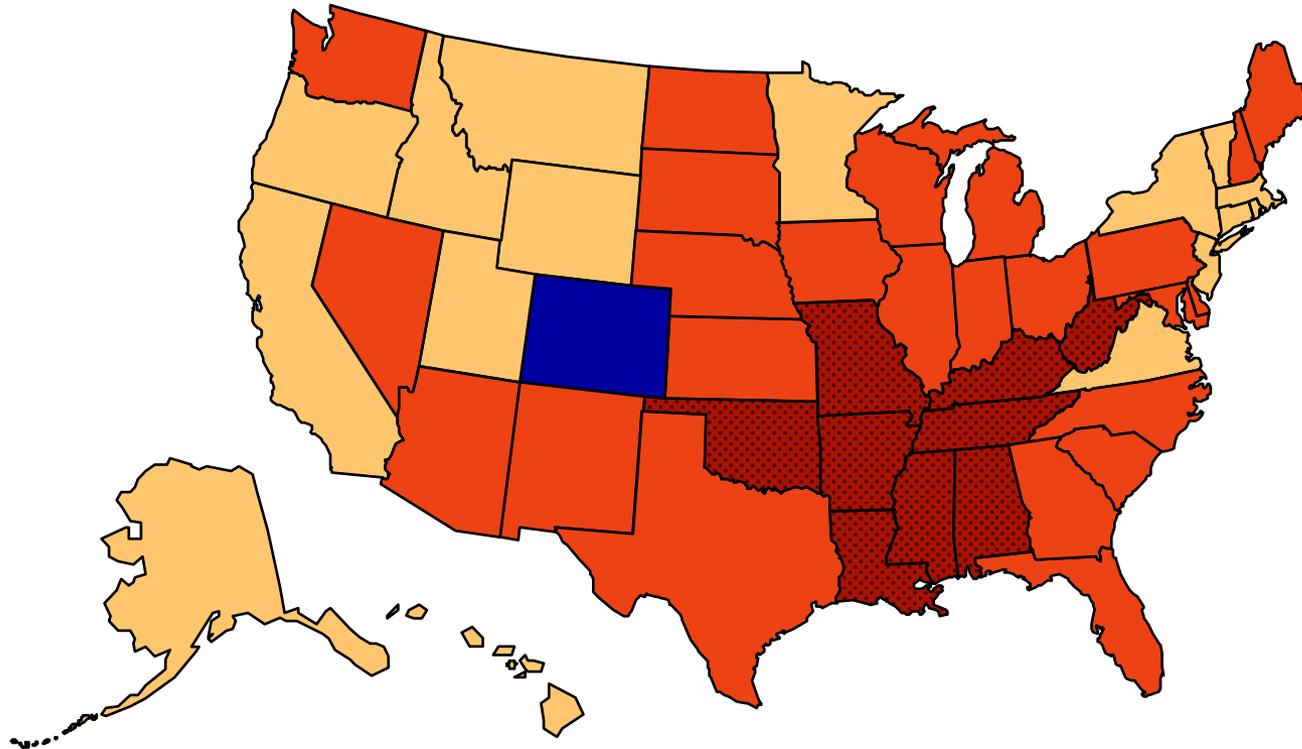
Transportation Risk: OSA

- **OSA causes extreme daytime sleepiness that**
 - **Results in fatigue-related decrements in psychomotor and cognitive function, particularly vigilance tasks**
 - **May result in micro-sleep or worse in quiet and/or monotonous environments**
- **Result: Up to 7-fold increase in risk of motor vehicle accident**
- **Exacerbated by**
 - **Strong association of OSA with (increasing) BMI**
 - **Lack of awareness, both patient and physician**

Obesity* Among U.S. Adults

BRFSS, 2009

(*BMI ≥ 30 , or ~ 30 lbs. overweight for 5' 4" person)



The Good News – It's Treatable

- Treatment with CPAP (titration)**
 - Many cognitive deficits reversible**
 - Canadian study → reduced risk of accidents**

- Operational experience**
 - Large trucking company**
 - Instituted screening/diagnosis/treatment**
 - Reported win-win – fewer accidents, lower health care costs, increased driver retention, reduced training**

NTSB Accident Investigations

- **The NTSB has investigated accidents and incidents in every major mode of transportation in which undiagnosed or undertreated obstructive sleep apnea was cited in the probable cause**
- **In last 15 years, these include**
 - **Railroad accidents (4)**
 - **Highway crashes (3)**
 - **Rail transit collisions (2)**
 - **Aviation events (2)**
 - **Major marine accident (1)**

Sample Highway Accident

- Miami, OK –
June 2009
- Vehicle queue
after minor
accident on
interstate
- Tractor-trailer hit queue at 69 mph, no brakes applied
- Overran several vehicles, 10 fatalities
- Continued 270 feet after initial impact



Highway Accident (con't)

- **Truck driver**
 - Age 76
 - Just below typical OSA screens
 - Typical driving shift was nocturnal
 - Transition back to diurnal during weeks off
 - This trip was first return to early morning shift after weeks off
 - Acute sleep deprivation previous evening
- **NTSB Probable Cause: the driver's acute sleep loss, circadian disruption associated with his shift work schedule, and mild sleep apnea**

Transit Accident

- Newton, MA – May 2008
- MBTA train struck another at 38 mph
- Operator of striking train killed, one passenger seriously injured
- Disregarded signal
- Struck train visible more than 1000 ft away



Transit Accident (con't)

- **Last employer medical exam: 5'5½", 243 lbs (BMI 38.6)**
- **Prevalence of sleep apnea more than 50% in patients with an average BMI of 40.0**
- **NTSB report noted that the operator was “at a high risk for having undiagnosed sleep apnea, and she may have been chronically fatigued as a result of the condition.”**
- **NTSB probable cause – failure of the operator of the striking train to comply with the controlling signal indication, likely as a result of becoming disengaged from her environment consistent with experiencing an episode of micro-sleep**

Marine Accident



- **Inside Passage, AK – June 1995**
- **Ran aground well-known charted rock, damages \$27M**

Marine Accident (con't)

- **Pilot (local mariner): 6'1", 310 lbs. (BMI 40.9)**
- **Long history of sleepiness, despite 8-9 hrs sleep/night**
- **Urge to nap frequently, snored loudly in all positions**
- **Treated for depression**
- **Polysomnography: RDI 68.1; with CPAP, RDI 1.1**
- **NTSB Probable Cause: Pilot's poor performance, which may have been exacerbated by chronic fatigue from sleep apnea**

Rail Accident

- **Clarkston, MI – November, 2001**
- **Southbound train proceeded through stop signal from a siding, 13 mph**
- **Northbound train at 30 mph**
- **2 crew killed; 2 injured**
- **OSA was diagnosed or suspected in both southbound crew**



Rail Accident (con't)

- **Engineer (5'11" and 262 lbs – BMI 36.5):**
 - Uncontrolled diabetes
 - Sleep study recommended by MD, ENT
- **Conductor: diabetes, depression**
 - Sleep study 5 yrs prior – AHI 89
 - CPAP, no titration, persistent snoring, somnolence
- **NTSB probable cause:**
 - The crewmembers' fatigue, which was primarily due to the engineer's untreated and the conductor's insufficiently treated obstructive sleep apnea

Aviation Incident

- Honolulu to Hilo – Feb 2008
- 50 minute flight
- Stopped responding to ATC
- Overflow destination
- 26 miles past destination,
Captain called ATC
- Returned for landing



Aviation Incident (con't)

– Captain

- Prior cockpit napping (> once/week)
- Snored loudly; his MD advised regular bedtimes, weight loss, relaxation (no sleep study suggested)
- Most recent certification examination: 6'2", 250 lbs (BMI 32.1); BP 138/80 (on two medications)
- Sleep study: severe OSA – RDI 68.5

– NTSB probable cause:

- The captain and first officer inadvertently falling asleep during the cruise phase of flight. Contributing to the incident were the captain's undiagnosed obstructive sleep apnea and the flight crew's recent work schedules

Most Recent Major Accident

- **Metro-North passenger train derailment, December 1, 2013**
 - **Four fatalities, 61 injuries**
- **Probable Cause**
 - **Engineer [entered a 30 mph curve at 82 mph because he] had fallen asleep due to undiagnosed, severe obstructive sleep apnea, exacerbated by a recent circadian rhythm shift required by his work schedule**



NTSB Recommendations

- **NTSB has made recommendations to all modal transportation administrations (FAA, FMCSA, FRA, FTA, USCG), starting 2001**
- **NTSB generally recommended:**
 - **Identify diagnosis or risk factors for OSA**
 - **Screening programs and treatment**
 - **Guidance for operators, employers and physicians**
 - **Emphasize that employees who are treated routinely return to work**

Responses from Regulators

- **No mode has refused to implement NTSB's OSA recommendations**
- **Coast Guard (marine)**
 - **Changed CG medical form to include OSA question, issuing alert to all personnel re risks of OSA**
 - **Increased ability of merchant marine medical evaluators to identify applicants with high risk of OSA**
- **FMCSA (trucking and motor carriers)**
 - **Convened industry conference to discuss OSA, promised more concrete actions in the future**

Regulator Responses (con't)

– FRA (rail)

- Issued safety advisory concerning issues associated with sleep disorders
- Conducted, and is analyzing results of, study of sleep disorders in rail occupations

– FAA (aviation)

- Screening of pilots for OSA or risk factors has not yet begun
- Developing guidance for pilots and medical examiners to identify OSA and to alert all to risks

Regulator Responses (con't)

– FTA (transit)

- Working with FRA to develop options to address NTSB recommendations
- Some transit operators have
 - Revised medical history and examination forms to elicit specific information about past diagnosis of or risk factors for OSA
 - Identified and treated operators at high risk for OSA

Railroads

- **Least developed medical certification system**
- **FRA requires ONLY vision and hearing testing every 3 years**
- **No requirements for reporting:**
 - **Medical conditions**
 - **Most medications**
 - **Signs or symptoms of OSA**

NYCT Screening Program

- **Based upon NTSB recommendations after Bronx fatal accident in December 2013:**
 - **Protocols include OSA evaluation and treatment**
 - **Medical history form includes 4 OSA related questions**

Recommendation to Physicians

- **To the American College of Physicians and the American Academy of Family Physicians:**
 - **Enhance initial and ongoing training to ensure that Board-Certified Physicians can successfully identify the risk factors for, evaluate, and effectively treat obstructive sleep apnea among their patients**

Conclusion

- **OSA is**
 - **A major safety issue in all modes of transportation**
 - **Treatable**
- **Diagnosing and treating OSA can result in improving not only safety but also productivity in transportation**

Thank You!!!



Questions?