NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

July 28, 2017

Nicholas Webster, MD, MPH
Medical Officer

A. ACCIDENT: DCA16FR008 - Panhandle, Texas

Accident Type:	Head-on Train collision between two BNSF Railway trains
Location:	MP 525.6 Panhandle Sub-division, Panhandle, Texas
Date:	June 28, 2016
Time:	8:21 a.m. CDT
Carrier:	BNSF Railway
Vehicle #1:	Eastbound train (Striking train) S-LACLPC1-26K
Vehicle #2:	Westbound train (Struck train) Q-CHISBD6-27L

B. GROUP IDENTIFICATION:

Nicholas Webster, MD, MPH
Medical Officer
National Transportation Safety Board

Laura Gillis, MD, MPH
Medical Officer
BNSF Railway

C. RELEVANT REGULATIONS

BNSF physical examination are conducted in accordance with Federal Railroad Administration (FRA) regulations; Title 49 *Code of Federal Regulations* (CFR) Part 240.121. Triennially, railroad engineers are required to meet the following criteria:

> (b) *Fitness requirement.* In order to be currently certified as a locomotive engineer, except as permitted by paragraph (e) of this section, a person's vision and hearing shall meet or exceed the standards prescribed in this section and appendix F to this part.

Per 49 CFR 242.117, triennially, railroad conductors are required to meet the following criteria:

(g) *Fitness requirement.* In order to be currently certified as a conductor, except as permitted by paragraph (j) of this section, a person's vision and hearing shall meet or exceed the standards prescribed in this section and Appendix D to this part.

These FRA regulations do not require railroad engineers or conductors to report a medical history, describe their use of medications, or undergo any other physical examination, additional testing, review of their health or screen for risk factors including those associated with obstructive sleep apnea.

In addition to the regulatory requirements, BNSF includes guidance on medical conditions in the company safety rules, which state: *"All employees are responsible to ensure their personal medical condition does not interfere with their ability to safely perform their duties. Employees with medical conditions (such as uncontrolled diabetes, high blood pressure, sleep disorders including apnea, visual impairment, hearing impairment, etc.) that may adversely affect their ability to work safely must inform their medical practitioner of their job duties. The medical provider must then determine if any prescribed treatment including medication will impair the employee from safely performing their job duties. The employee must also notify their personal physician/medical provider if prescribed treatment and/or medication is affecting their ability to safely perform their job duties."*[1] Further, the safety rules states: *"The Medical Department will determine when medical examinations are necessary, the content of such examinations, and requirements for participation as the needs arise. Employees subject to these examinations must follow any and all requirements as issued."*[2]

Additionally, the General Code of Operating Rules, to which BNSF is a party states, *"These rules herein govern the operations of the railroads listed and must be complied with by all employees regardless of gender whose duties are in any way affected thereby."*[3] The rules governing the use of medications state: *"The use or possession of intoxicants, over-the-counter or prescription drugs, narcotics, controlled substances, or medication that may adversely affect safe performance is prohibited while on duty or on company property, except medication that is permitted by a medical practitioner and used as prescribed. Employees must not have any prohibited substances in their bodily fluids when reporting for duty, while on duty or while on company property."*[4]

Furthermore, BNSF provided periodic training to employees on the science of sleep and fatigue which includes discussion of multiple sleep related topics including sleep apnea. BNSF transportation employees requiring FRA certification must complete a 40-minute web-based training program addressing sleep and fatigue every two (2) years as part of the Transportation Year - A Training. This training includes a self-assessment to help employees in deciding if they are at risk for a sleep disorder. (Attachment 1) Training records documented the crew members in this accident were in compliance with fatigue training requirements. Finally, BNSF provides wellness and health advocacy information to employees that discuss sleep disorders, sleep medications, and sleep apnea. (Attachment 2)

Obstructive Sleep Apnea

Obstructive sleep apnea (OSA) is a chronic disease in which patients experience episodes of airway obstruction while sleeping. During each episode, the person stops breathing for a period of time which causes oxygen levels to drop and carbon dioxide levels to rise. When the buildup of carbon dioxide gets too high, the brain detects it and the person arouses or awakens in order to breathe.

[1] BNSF Train Yard and Engine Crew (TY&E) Safety Rules. S-1.2.11 Medical Conditions – January 1, 2015.
[2] BNSF Train Yard and Engine Crew (TY&E) Safety Rules. S-1.2.12 Medical Conditions – January 1, 2015.
[3] General Code of Operating Rules, Seventh Edition. Cover Page. Effective April 1, 2015 BNSF Updated Edition.
[4] General Code of Operating Rules, Seventh Edition. 1.5 Drugs and Alcohol. Effective April 1, 2015 BNSF Updated Edition

The end result is fragmented sleep. Risk factors for OSA include, male gender, age, obesity, hypertension, large neck circumference (greater than 16 inches in women and 17 inches in men), a waist to hip circumference ratio of greater than 1 for men and 0.85 for women, and snoring.[5,6,7,8,9] A task force created by the American Academy of Sleep Medicine developed a Clinical Guideline for the Evaluation, Management, and Long Term Care of Obstructive Sleep Apnea in Adults which was published in 2009.[10] The task force reached consensus that patients with obesity, congestive heart failure, atrial fibrillation, treatment refractory hypertension, type 2 diabetes, stroke, nocturnal dysrhythmias, pulmonary hypertension, those who were members of high-risk driving populations (such as commercial truck drivers), and those being evaluated for bariatric surgery were either at increased risk of having OSA, having serious complications of OSA, or having undiagnosed OSA complicate their medical care. Patients with any of these conditions or situations were identified as "high risk," suggesting increased vigilance for the diagnosis. Furthermore, persons with OSA have a significantly increased risk of motor vehicle crashes and other occupational injuries.[11,12,13] Treatment of OSA includes weight loss, devices that help support an open airway while sleeping including oral appliances and positive pressure airway machines (CPAP, APAP, and BiPAP), and may involve surgery to help maintain an open airway.[14] Underscoring the importance of treatment compliance is a study of accident risk for truck drivers with diagnosed OSA who were compliant with appropriately treatment. Compliant drivers' crash risk was compared to the crash risk of noncompliant drivers and drivers without OSA. The compliant individual showed no greater risk of crashes than those who did not have OSA while drivers who were noncompliant with treatment showed about a fivefold increase in crash risk.[15]

D. **DETAILS OF INVESTIGATION**

Purpose

This investigation was performed to evaluate the train crews for any medical conditions, use of medications/illicit drugs, or the presence of any toxins.

Methods

The crews' occupational health records, an interview with the surviving engineer, the striking train crew's personal medical records, surviving engineer's Federal Railroad Administration (FRA)

[5] Peppard PE, et al. Increased prevalence of sleep-disordered breathing in adults. Am J Risk factors for obstructive sleep apnea in adults Epidemiology. 2013;177(9):1006-14.
[6] Seidell JC. Waist circumference and waist/hip ratio in relation to all-cause mortality, cancer and sleep apnea. Eur J Clin Nutr. 2010;64(1):35-41.
[7] Young T, et al. Sleep Heart Health Study Research Group. Predictors of sleep-disordered breathing in community-dwelling adults: The Sleep Heart Health Study. Arch Intern Med. 2002;162(8):893-900.
[8] Olson LG, et al. A Community Study of Snoring and Sleep-disordered Breathing Prevalence. Am J Respir Crit Care Med 1995; 152:711-6.
[9] Young T, et al. Risk factors for obstructive sleep apnea in adults. JAMA. 2004;291(16):2013-6.
[10] Adult Obstructive Sleep Apnea Task Force of the American Academy of Sleep Medicine. Clinical Guideline for the Evaluation, Management, and Long-Term Care of Obstructive Sleep Apnea in Adults. J Clin Sleep Med. 2009;5(3): 263-276.
[11] Mulgrew AT, et al. Risk and severity of motor vehicle crashes in patients with obstructive sleep apnea/hypopnea. Thorax. 2008; 63(6):536–541.
[12] Lindberg E, et al. Role of snoring and daytime sleepiness in occupational accidents. Am J Respir Crit Care Med 2001;164 (11): 2031–2035.
[13] Basoglu OK, Tasbakan MS. Elevated risk of sleepiness-related motor vehicle accidents in patients with obstructive sleep apnea syndrome: a case-control study. Traffic Inj Prev. 2014;15(5):470-6.
[14] Park JG, et al, Updates on Definition, Consequences, and Management of Obstructive Sleep Apnea, Mayo Clin Proc. June 2011;86(6):549-555
[15] Burks SV, et al. Nonadherence with Employer-Mandated Sleep Apnea Treatment and Increased Risk of Serious Truck Crashes. SLEEP, Vol. 39, No. 5, 2016

postaccident toxicology report and postaccident medical treatment records, autopsies, and Federal Aviation Administration (FAA) Bioaeronautical Sciences Research Laboratory forensic toxicology reports were reviewed.

Neither an autopsy nor toxicology testing was conducted for the conductor of the struck train, as her remains were not found in the wreckage.

Engineer Striking train – Fatal

BNSF Medical File

Employment records from June 1994 until July 2015 where reviewed. A pre-employment physical examination and health questionnaire dated June 28, 1994 did not identify any significant medical conditions. The 52-year-old male engineer's most recent FRA required medical examination was dated July 21, 2015 and documented bilateral hearing loss requiring amplification to meet FRA hearing acuity requirements. No abnormalities were identified in visual acuity, visual field or color vision testing. The record from the most recent examination does not include height, weight, vital signs, nor review of medications, medical history, or evaluation of sleep apnea risk. BNSF records did not include any reports from the engineer disclosing fatigue, sleep disorders, OSA, treatment of OSA with a BiPAP machine, or use of medication to counter fatigue.

History from Widow

The investigation received a statement from the engineer's widow about his health. She wrote he was generally a healthy person and used prescription thyroid and cholesterol medication and had been prescribed armodafinil 1 tablet daily in May 2016. Additionally, he had used a breathing machine and mask at night for snoring. She stated that he used the machine until he had his tonsils out in 2014. After his tonsillectomy, he did not use his machine but continued to snore.

Personal Medical Records

Primary Care Providers

The investigation received medical records from the engineer's primary care physicians dated from August 2013 to May 2016. According to these records, on a visit dated October 23, 2015 the 52-year-old male engineer was 68 inches tall and weighed 188 pounds and his body mass index (BMI) was 28.6 kg/m^2.[16] He had a history of gallbladder removal in 2002, insomnia, gastroesophageal reflux disease, hypothyroidism, hypertension, hypercholesterolemia, and allergic rhinitis. There was no documentation that the engineer was asked about sleep apnea risk factors or snoring and no documentation of a history of OSA or prior treatment for OSA. His usual medications included: (simvastatin a cholesterol lowering medication that is often marketed as Zocor);[17] levothyroxine (a replacement thyroid hormone marketed as Synthroid);[18] loratadine (an oral non-sedating allergy medicine that is marketed under

[16] According to the National Institute of Health, Body Mass Index (BMI) is a measure of body fat based on height and weight; a BMI of between 25 - 29.9 kg/m^2 is considered overweight and increases the risk of developing health problems, including heart disease, high blood pressure, type 2 diabetes.

[17] National Library of Medicine (U.S.). 2016. *DailyMed*. Bethesda, MD. Zocor - simvastatin tablet. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=fdbfe194-b845-42c5-bb87-a48118bc72e7 Accessed 06/29/2017

[18] National Library of Medicine (U.S.). 2016. *DailyMed*. Bethesda, MD. Synthroid - levothyroxine sodium tablet. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=1e11ad30-1041-4520-10b0-8f9d30d30fcc Accessed 06/29/2017

various names including Claritin).[19] Finally, since October 2014, the engineer was prescribed eszopiclone (3 mg) a short acting sleep aid that is marketed as Lunesta. It is a central nervous system depressant and carries warnings that in some cases it can impair daytime function the following day and in some cases pharmacodynamic tolerance or adaptation to some adverse depressant effects of eszopiclone may develop; patients using 3 mg should be cautioned against driving or engaging in other hazardous activities or activities requiring complete mental alertness the day after use.[20]

On July 21, 2015 (*about one year prior to the accident*), the engineer complained to his primary care provider of fatigue. A laboratory test documented a low-normal testosterone level and he was prescribed testosterone replacement (a topical replacement hormone that is marketed as AndroGel).[21] The records for his evaluation for fatigue contained no documentation of an evaluation for sleep disorders including OSA or questions about any history or treatment of OSA.

The engineer's most recent clinic record documented a phone call with the provider on May 13, 2016. The engineer requested a prescription for armodafinil. The treating physician had never prescribed him this medication but the engineer told the provider he had taken the medication in the past and "it helped him stay awake." The provider prescribed armodafinil every morning with two refills. Pharmacy records revealed the engineer received 21 tablets (150 mg each) of armodafinil on May 25, 2016 (34 days before to the accident) but there was no evidence that the prescription was refilled. The investigation did not find any evidence of past use of armodafinil, nor a recent evaluation for any sleep disorders, or any follow up evaluation after starting the medication.

Armodafinil is a long acting Schedule IV controlled stimulant used to treat excessive sleepiness in patients with narcolepsy, sleep apnea, and shift work disorder. It is marketed as Nuvigil. It carries the following warning; "Patients with abnormal levels of sleepiness who take Nuvigil should be advised that their level of wakefulness may not return to normal. Patients with excessive sleepiness, including those taking Nuvigil, should be frequently reassessed for their degree of sleepiness and, if appropriate, advised to avoid driving or any other potentially dangerous activity. Prescribers should also be aware that patients may not acknowledge sleepiness or drowsiness until directly questioned about drowsiness or sleepiness during specific activities."[22]

Respiratory Services Company

The investigation received copies of records from a medical equipment supply company dated February 9, 2007. The records included a prescription for a BiPAP

[19] National Library of Medicine (U.S.). 2016. *DailyMed*. Bethesda, MD. Claritin - loratadine tablet. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=ac32d6f9-f553-4d5c-ad36-575af5ea56de Accessed 06/29/2017

[20] National Library of Medicine (U.S.). 2016. *DailyMed*. Bethesda, MD. Lunesta - eszopiclone tablet. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=fd047b2b-05a6-4d99-95cb-955f14bf329f Accessed 06/29/2017

[21] National Library of Medicine (U.S.). 2016. *DailyMed*. Bethesda, MD. Androgel - testosterone gel. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=8677ba5b-8374-46cb-854c-403972e9ddf3 Accessed 06/29/2017

[22] National Library of Medicine (U.S.). 2016. *DailyMed*. Bethesda, MD. Nuvigil - armodafinil tablet. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=d878aed0-ddbf-8fa1-abf7-d3e480260845 Accessed 06/29/2017

device and associated mask and tubing.[23] The records included a family practice provider prescription dated February 6, 2007 documenting a diagnosis of "Obstructive Sleep apnea" and use instructions. The records did not include a sleep study or any follow up of the engineer's BiPAP machine use or compliance. The investigation contacted the family practice clinic to obtain copies of records related to the diagnosis and treatment of sleep apnea and was told the prescribing health care provider no longer worked at the clinic and the clinic's records retention policy was limited to seven years and the records of this engineer's visits to this provider were not available.[24]

Urgent and Emergent and Inpatient Care Records

The investigation received urgent care, emergency care, and hospital treatment records for the engineer from February 2009 to March 2016. The records documented evaluation and treatment for acute orthopedic, gastrointestinal, upper respiratory, and non-cardiac chest pain. Additionally, the records documented evaluation and treatment of elevated cholesterol and hypothyroid disease but no other chronic or potentially impairing medical conditions. The most recent visit was an urgent care clinic visit dated March 26, 2016 (3 month before the accident) for a left eye corneal abrasion. His documented height was 68 inches, weight was 193 pounds and BMI was 29.4 kg/m^2. The examination documented his corrected visual acuity was 20/25 right eye and 20/70 left eye with a small scratch to the left medial cornea. He was diagnosed with a corneal abrasion and treated with eye drops but there were no records of a follow up for this condition. There were no other urgent or emergent visits after this date. Of note was a visit to the urgent care clinic in 2011 for a Boy Scout physical exam. On that examination, the engineer checked yes to a box asking about sleep problems and checked a box indicating he did not use a CPAP machine. The records contained no reported history by the engineer of OSA or use of a CPAP or BiPAP machine.

Ear Nose and Throat (ENT) Provider

The investigation received medical records from the engineer's ENT provider dated from December 2008 to March 2014. According to these records the engineer complained of allergies, repeated sore throat and snoring. His allergies were treated with fluticasone nasal steroid spray and montelukast an oral prescription anti-inflammatory allergy medication marketed as Singulair.[25,26] His repeat sore throats were treated with antibiotics then a tonsillectomy in March 2014. While the records documented snoring, there was no documentation about the engineer's history of obstructive sleep apnea or use of BiPAP.

[23] BiPAP is an advanced positive airway pressure device used to treat OSA, it provides two distinct pressures one for inhalation and the other for exhalation. Like a CPAP device, the air pressure generated by the compressor is delivered through tubing to a mask the covers the nose or nose and mouth and helps prevent obstruction of the airway while sleeping.

[24] This was the same family practice clinic that had recently managed the engineer's health care and where his prescription for armodafinil was written.

[25] National Library of Medicine (U.S.). 2016. *DailyMed*. Bethesda, MD. Veramyst - fluticasone furoate spray.https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=f16a9f33-45ca-4e16-0ebe-157b71abb8df Accessed 06/29/2017

[26] National Library of Medicine (U.S.). 2016. *DailyMed*. Bethesda, MD. Singulair - montelukast. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=8c166755-7711-4df9-d689-8836a1a70885 Accessed 06/29/2017

Autopsy

According to the autopsy report from South Plains Forensic Pathology, the cause of death was blunt force injuries. The Carson County Texas Justice of the Peace determined the manner of death was accident. The autopsy was limited due to the extent of the thermal and blunt force injuries and precluded the identification of any natural disease.

Toxicology

Postaccident toxicology testing was conducted by the FAA Bioaeronautical Sciences Research Laboratory. Testing was limited to a muscle specimen and did not detect any ethanol or tested-for-drugs.[27,28]

FRA postaccident toxicology testing was not conducted due to limited specimens.

Conductor Striking Train - Fatal

BNSF Medical File

The conductor's pre-placement medical examination was conducted by the Atchison, Topeka and Santa Fe Railroad Company on March 26, 1990. The examination included a review of medical conditions and a multi-system physical examination and did not identify any significant medical conditions.

According to occupational health records, the 59-year-old male conductor's most recent FRA required medical examination was performed on February 10, 2014. His corrected distant vison was recorded as 20/30 both eyes, 20/25 right and 20/30 left. He met hearing standards and no abnormalities were found in visual field or color vision testing. The record from the most recent examination does not include height, weight, vital signs, review of medications, medical history, or evaluation of sleep apnea risk.

Following a return to work after an illness in January 2013, BNSF requested personnel medical records which documented a hospitalization on January 01, 2013 for a gastroesophageal bleed from esophageal varices secondary to alcoholic cirrhosis of the liver. The records also documented an alcohol history with ingestion of 12 beers a day for decades; the hospital course was complicated by alcohol withdrawal. He was treated with banding of the varicosities and the physicians note states, "he will remain off alcohol". Additionally, records documented a history of insomnia and the patient was started on temazepam 15 mg at bedtime (temazepam is described below).

Alcoholic cirrhosis is a liver disease caused by excessive alcohol intake but not all individual who drink develop this condition. Patients with the condition may report jaundice (yellow skin and eyes), weakness, swelling of the abdominal and legs, or symptoms of gastrointestinal bleeding, disturbances in their sleep pattern, and confusion.

[27] Specimens are analyzed using immunoassay, chromatography, GC/MS, HPLC/MS, or GC/FTIR. Concentrations (ug/mL) at or above those in () can be determined for, but not limited to, the following drugs: amphetamines (0.010), opiates (0.010), marijuana (0.001), cocaine (0.020), phencyclidine (0.002), benzodiazepines (0.030), barbiturates (0.060), antidepressants (0.100), and antihistamines (0.020). Drugs and/or their metabolites, that are not impairing or abused, may be reported from the initial tests. See the CAMI Drug Information Web Site for additional information (http://jag.cami.jccbi.gov/toxicology/).

[28] In an email dated February 21, 2017, the acting director of the CAMI laboratory stated that testing is able to detect modafinil / armodafinil and eszopiclone in muscle with routine testing.

Once the disease starts, it is progressive and there are few therapies. The single most important prevention of progression of the disease is complete abstinence from alcohol.[29]

The patient completed a medical status form on Jan 15, 2013 which was signed by his treating physician clearing him to full duty with no restrictions. On January 17, 2013, the BNSF employee assistance program (EAP) evaluated the conductor and documented "…He reports that he had his last drink of alcohol on December 29, 2012 and is resigned to remain alcohol free. [The conductor] reports that he has been warned by his MD that returning to alcohol use (at any level) will kill him. [The conductor] appears to believe this to be true and is motivated to remain alcohol free. Social supports are also in place to assist [the conductor] if needed. [He] is released from EAP to return to [the medical department] for return to work clearance. He will remain open to EAP to monitor his needs following his return to work." On January 25, 2013, he was returned to full duty with no restrictions but with the provision that he provides follow up medical information to ensure compliance with his physician's recommendations. While the conductor continued operating in a safety sensitive position, EAP monitored his sobriety through phone calls following his return to work on February 7 and again on March 7, 2013 and determined no further EAP follow-up was necessary unless the medical department had indication of elevated liver enzymes (indicative of liver damage due to alcohol use). The medical department monitored his liver function through periodic laboratory studies for nine months and on September 12, 2013 decided no further follow up was needed. There is no documented evidence of formal referral for evaluation or treatment of alcohol dependence and no comment was made on his diagnosis of insomnia or his use of temazepam.

Temazepam is a Schedule IV controlled substance of the benzodiazepine class. It is a sedative intended for the short-term treatment of insomnia; another common name for it is Restoril. As with all benzodiazepines, temazepam carries warnings that the type and duration of hypnotic effects and the profile of unwanted effects during administration of benzodiazepine hypnotics may be influenced by the biologic half-life of the administered drug. Although temazepam is primarily excreted unchanged through the urine and is not significantly affected by liver metabolism, its half-life ranges from about 3 to 13 hours in different individuals.[30] The package information carries additional warnings – "… [temazepam] is a federally controlled substance (C-IV) because it can be abused or lead to dependence. Keep [temazepam] in a safe place to prevent misuse and abuse... Tell your doctor if you have ever abused or been dependent on alcohol..." When half-lives are long, the drug may accumulate during periods of nightly administration and be associated with impairments of cognitive and/or motor performance during waking hours; the possibility of interaction with other psychoactive drugs or alcohol will be enhanced.[31] The patient warnings add, "…You may still feel drowsy the next day after taking [temazepam]. Do not drive or do other dangerous activities after taking [temazepam] until you feel fully awake. You may have withdrawal symptoms if you stop taking [temazepam] suddenly. Withdrawal symptoms can be serious and include seizures. Mild withdrawal symptoms include a depressed mood and trouble sleeping…"[31]

[29] Friedman SL Clinical manifestations and diagnosis of alcoholic fatty liver disease and alcoholic cirrhosis. In: UpToDate, Runyon BA (Ed), UpToDate, Waltham, MA. (Accessed on 02/03/2017.)
[30] Baselt RC, Disposition of Toxic Drugs and Chemicals in Man, Tenth Edition, Copyright 2014, Biomedical Publications, Seal Beach, California
[31] National Library of Medicine (U.S.). 2016. DailyMed. Bethesda, MD. Restoril - temazepam capsule https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=bc56f7fd-1aaf-48ff-8aa7-d467e59e1015 Accessed 06/29/2017

Personal Medical Records

The investigation received medical records from the conductor's gastroenterologist dated from September 2013 until February 2016. According to last record dated February 2, 2016 (5 months before the accident), the 59-year-old male conductor's recorded height was 75 inches, weight was 272 pounds, BMI was 34 kg/m^2.[32] He was routinely seen for follow up of his alcoholic cirrhosis with esophageal varices. Treatment included alcohol avoidance and diuretic use; visit notes documented good compliance with treatment. He reported no fatigue, abdominal pain or swelling, jaundice, leg swelling or weight change. The review of systems recorded that he had no inability to concentrate and his neuropsychiatric exam documented his mood and affect as normal. Additionally, he reported he quit drinking in December 2012. The physician's assessment was alcoholic cirrhosis without ascites (stable), numbness and tingling in his extremities, and chronic insomnia. His usual medications included temazepam 30 mg at bedtime (started November 23, 2015), gabapentin 300 mg at bed time (started in 2013), furosemide 20 mg daily (started January 4, 2016), and spironolactone 100 mg daily (started May 26, 2015).

Temazepam is described above. Gabapentin is an antiseizure medication that is also used to treat chronic pain and is marketed under various names including Neurontin.[33] It is a central nervous system depressant and may cause sedation. It carries the warning "Prescribers and patients should be aware that patients' ability to assess their own driving competence, as well as their ability to assess the degree of somnolence caused by gabapentin, can be imperfect."[33]

Interview with wife

According to an interview with the conductor's wife, he routinely took his temazepam, furosemide, spironolactone, but not his gabapentin. Additionally, she stated he continued to have the occasional beer. The quantity and frequency was not determined.

Autopsy

According to the South Plains Forensic Pathology autopsy report, the cause of death was blunt force injuries and the Carson County Texas Justice of the peace determined the manner of death was accident. The autopsy was limited due to the extent of the thermal and blunt force injuries and precluded the identification of any natural disease.

Toxicology

Postaccident toxicology testing conducted by the FAA Bioaeronautical Sciences Research Laboratory detected diphenhydramine in muscle and lung and temazepam 0.065 ug/g in lung.[34] Testing did not detect ethanol in the muscle or lung.

Temazepam is described above. Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over the counter under the trade names Benadryl and Unisom. Diphenhydramine carries the following FDA warning: may impair mental and/or physical ability required for the performance of potentially hazardous tasks

[32] According to the National Institute of Health a BMI of between 30 - 40 kg/m^2 indicates an obese condition and places the individual at increase the risk of Type II diabetes, high blood pressure and cardiovascular disease.
[33] National Library of Medicine (U.S.). 2016. DailyMed. Bethesda, MD. Neurontin - gabapentin. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=ee9ad9ed-6d9f-4ee1-9d7f-cfad438df388 Accessed 06/29/2017
[34] In an email dated February 21, 2017, the acting director of the CAMI laboratory stated that testing is able to detect gabapentin in muscle with routine testing.

(e.g., driving, operating heavy machinery).[35] Compared to other antihistamines, diphenhydramine causes marked sedation; this is the rationale for its use as a sleep aid. Altered mood and impaired cognitive and psychomotor performance may also be observed. In fact, in a driving simulator study, a single 50 mg dose of diphenhydramine impaired driving ability more than a blood alcohol concentration of 0.100.[36] Additionally, diphenhydramine and temazepam are both CNS depressants and used in combination may enhance the adverse toxic effects of the individual medications.[37]

FRA postaccident toxicology testing was not conducted due to limited specimens.

Engineer Struck Train – Survivor - Minor Injuries

BNSF Medical File

A pre-employment physical examination and health questionnaire dated August 2002 did not find any significant medical conditions.

According to occupational medicine records, the 32-year-old male, the engineer's most recent FRA required medical examination was dated December 11, 2015 and no abnormalities were noted on the hearing test. Vision testing recorded the Engineer's corrected distant visual acuity as, 20/20 in right eye and 20/25 left eye. The record from the most recent examination does not include height, weight, vital signs, review of medications, medical history, or evaluation of sleep apnea risk.

Postaccident Medical Treatment Records

Postaccident inpatient treatment records from June 28, 2016 through June 30, 2016 were reviewed. The 32-year-old male engineer was treated for minor injuries including abrasions and a scalp laceration. Postaccident treatment included staples to close laceration and he was treated with albuterol for breathing difficulty. Imaging did not identify fractures or internal injuries. The engineer was admitted for further evaluation but at that time no additional injuries were identified and he was discharged less than 48 hours following admission.

Postaccident interview

According to an interview with the surviving engineer, he was in good health but had had an irregular heart rhythm associated with excess caffeine that he had used to stay awake. He reported that his physician advised him to stop caffeine and prescribed him armodafinil, a long acting schedule IV controlled stimulant for treatment for excessive sleepiness due to shift work disorder (described above). He reported no adverse effects from the medication and had used the medication on the morning of the trip.

Toxicology

FRA postaccident toxicology testing conducted by Quest laboratories did not identify any tested for drugs in the urine or alcohol in the blood.[38]

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[35] Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Diphenhydramine. http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=50 Accessed 06/29/2017.
[36] Weiler JM, et al. Effects of fexofenadine, diphenhydramine, and alcohol on driving performance. A randomized, placebo-controlled trial in the Iowa Driving Simulator. Ann Intern Med. 2000;132(5): 354-63.
[37] Lexicomp Online, Lexi-Interact Online, Hudson, Ohio: Lexi-Comp, Inc.; November 1, 2016
[38] Quest laboratory tests urine specimens for amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, MDMA/MDA, methadone, opiates/opioids, phencyclidine, tramadol, brompheniramine, chlorpheniramine, diphenhydramine, doxylamine, and pheniramine.

Clinical toxicology testing conducted by Northwest Texas Hospital did not detect any tested-for-drugs in the urine (collected 11:11 CDT June 28, 2016) or ethanol in the blood (collected 0943 CDT June 28, 2016).[39]

Toxicology testing conducted by the FAA Bioaeronautical Sciences Research Laboratory detected albuterol in the urine but not the serum, lidocaine in the urine and modafinil in the urine.

Albuterol is an inhaled medication that dilates airways; the medication was used during the postaccident breathing treatment. Lidocaine is an anesthetic used during wound closure. The presence of modafinil in the urine specimen indicates the individual used modafinil or its structurally related medication armodafinil. The engineer reported using armodafinil, which is described above.

Conductor Struck Train – Missing - Fatal

BNSF Medical File

A pre-employment physical examination and health questionnaire dated March 2004 did not identify any significant medical conditions.

According to occupational medicine records, the 45-year-old female conductor's most recent FRA required medical examination prior to the accident was dated April 02, 2014 records. Her corrected distant vison was recorded as 20/40 right and 20/35 left. She met hearing standards and no abnormalities were identified in visual field or color vision testing. The record from the most recent examination does not include height, weight, vital signs, review of medications, medical history, or evaluation of sleep apnea risk.

Autopsy

The conductor's body from the westbound train was not found and an autopsy was not performed. The Carson County Texas Justice of the peace determined the cause of death was a catastrophic train collision and the manner was accident.

Toxicology

The conductor's body was not found and postaccident toxicology testing could not be conducted.

[39] The urine was tested for amphetamines, barbiturates, cannabinoids, cocaine, opiates, PCP, and benzodiazepines.

E. SUMMARY OF FINDINGS

The engineer of the struck train was medically certified for his duties. Postaccident urine drug testing detected modafinil / armodafinil. The engineer reported he was prescribed armodafinil to help him stay alert during shift work and had taken medication on the day of the accident.

The conductor of the struck train was medically certified for her duties. She died as a result of the accident but the conductor's remains were not recovered.

The engineer of the striking train was medically certified for his duties. Additionally, he had a history of snoring had been diagnosed with OSA in February 2007 and treated with a BiPAP device but the investigation was unable to determine the severity of the condition because diagnostic and treatment records were no longer available. During a 2011 physical examination for Boy Scout camp he noted an unspecified sleep disorder but denied use of a CPAP device. He had a history of recurrent tonsillitis treated with a tonsillectomy in 2014. The engineer's wife reported that he continued to snore after the tonsillectomy but no longer used the BiPAP device. In 2015, he reported fatigue to his primary care provider who attributed it to low testosterone and treated it with testosterone. Additionally, he was prescribed the short acting sleep aid eszopiclone. Moreover, five weeks before the accident, he again complained to his primary care physician of continued fatigue, requested armodafinil, and the provider wrote him a prescription for the stimulant, which was filled by the engineer. Records did not contain evidence of prior use of armodafinil or additional medical evaluation for fatigue or sleep disorders. Furthermore, the engineer was treated for a corneal abrasion in his left eye three (3) months before the accident but did not complain of visual symptoms to his primary care provider office during his call five (5) weeks before the accident. Finally, BNSF provides educational programs and information about fatigue and sleep apnea and the railroad's rules require reporting of sleep disorders including sleep apnea but there was no documentation that the engineer had reported his OSA, the use of a BiPAP machine, or the use of medications to treat fatigue. Due to the extent of thermal injuries, postaccident toxicology was limited to testing of muscle only. Testing did not identify any toxins, medications, drugs of abuse or alcohol.

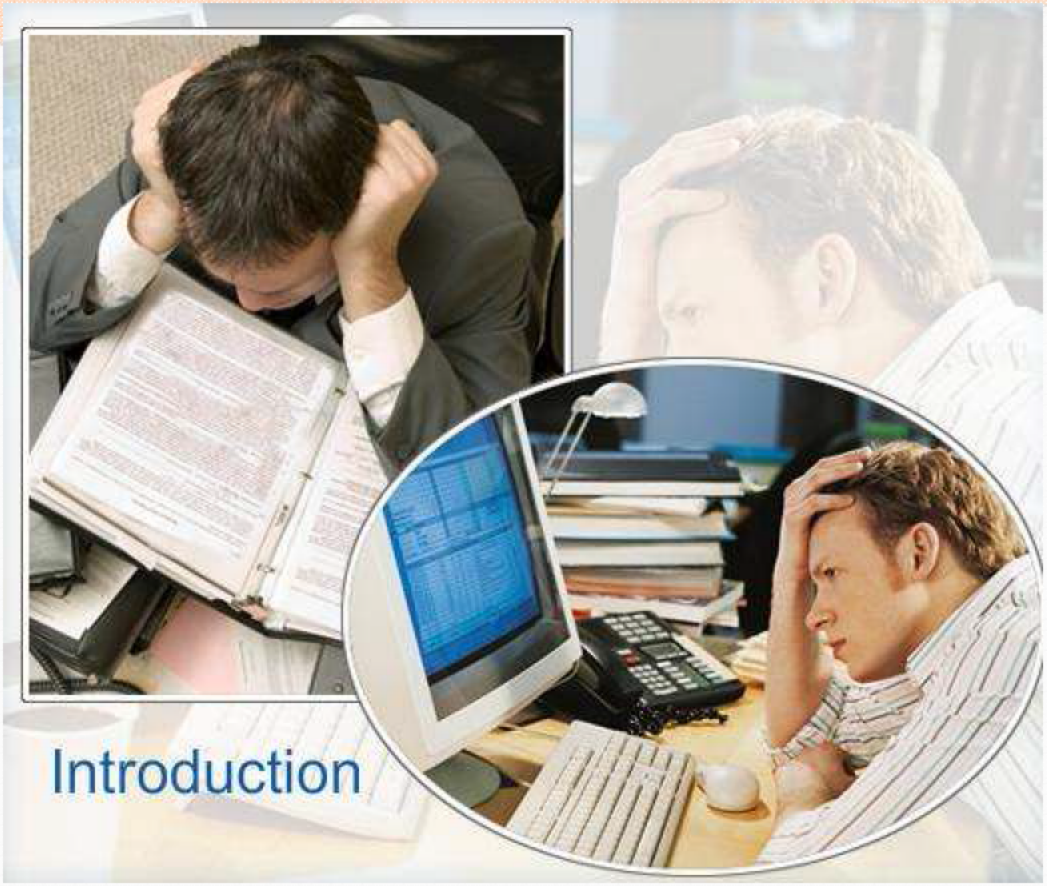
The conductor of the striking train was medically certified for his duties. He had a history of alcohol dependence with alcoholic cirrhosis complicated by esophageal varices and peripheral neuropathy but there was no documented evidence of a neuropsychiatric deficit on an examination five (5) months prior to the accident. Furthermore, according to his wife, the conductor continued to consume the occasional beer despite being advised to abstain from alcohol. However, postaccident toxicology testing did not detect alcohol. Additionally, the conductor had insomnia treated with the sedating benzodiazepine temazepam and postaccident testing detected it and the sedating antihistamine diphenhydramine in his tissues.

The Science of Sleep and Fatigue

Part 1. The Causes of Fatigue

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 1



Script Text:

Introduction

This training is designed to address the problems of managing Fatigue and Alertness in the railroad industry.

People have become accustomed to the advantages of extended hours of operation for everything from grocery stores to banking services.

People who work in hospitals, police and fire departments, and other emergency-related occupations must be available at all hours. The same applies to people in the manufacturing and transportation sectors, including, of course, the railroad industry.

The railroad industry, and BNSF in particular, have recognized the need to help its employees be rested and stay alert, so that they can work and live safely and productively.

Graphic Notes:

Use the template for Objective screen and create a collage of relevant images related to sleep and fatigue.

Branching

Next Slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 2

Script Text:

Lesson Objective

After successfully completing this lesson, you will be able to:

•discuss the science of fatigue and alertness.

•describe the states of sleep and sleep cycle.

•explain Circadian Rhythm.

•discuss how sleep loss affects the railroad worker.

•determine how much sleep you need.

•explain the cumulative effects of sleep loss.

•judge your own level of sleepiness and alertness.

•list substances that can disrupt sleep.

•avoid misconceptions about sleep.

•decide whether or not you could be suffering from a sleep disorder.

Graphic Notes:

Animate relevant images in sync with audio.

Branching

Next Slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 3

Script Text:

Note to construction/graphic: Full screen graphic. There will be no script text only Note will be shown at the bottom of screen.

Note: Much of the information here was originally developed by NASA for the aviation industry. Later, it was adapted to other safety-sensitive industries, including the railroad.

Fatigue

Fatigue:

- may be manifested by sleepiness, tiredness, physical discomfort, or mental distraction.
- on the job can be dangerous and contribute to accidents and injuries and impair job performance.

Fatigue

Research shows people suffering from fatigue:

- have slower reaction times.
- poorer physical coordination.
- foggier mental processes.

*For more information about fatigue research, see **Note** below.*

Graphic Notes:

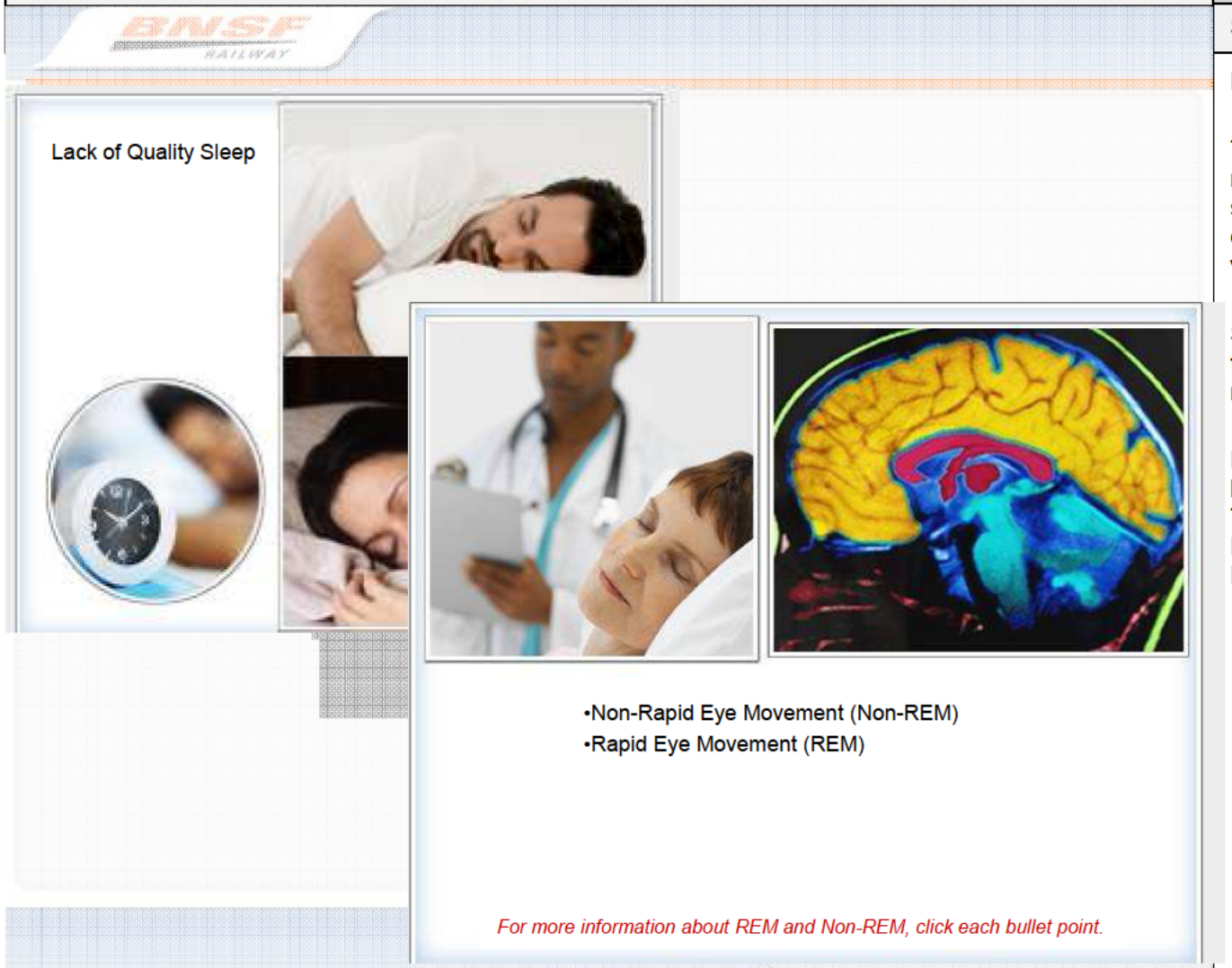
Animate images and OST in sync with audio.

Branching

Next Slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 4



Script Text:

Fatigue: Non-REM and REM

There are various causes for fatigue, but the most basic and direct cause is lack of quality sleep. Sleep is a primal drive, just like hunger or thirst. Human beings cannot function without proper sleep.

Sleep is a highly complex physiological cycle that must play itself out in order to rest and refresh us.

During sleep, the brain and the body alternate between the two states of activity and quiet. These two states are called Non-Rapid Eye Movement (Non-REM) and Rapid Eye Movement (REM).

Graphic Notes:

Animate images and OST in sync with audio.

In the second screenshot, two bullets will appear at the bottom. Link these bullets with branch pages 4.1 and 4.2.

Branching

Bullet#1: Linked to Page 4.1

Bullet#2: Linked to Page#4.2

Next button will be linked to Page 5.

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 4.1

Script Text:

No Text <Full screen graphic>

Non-REM Sleep

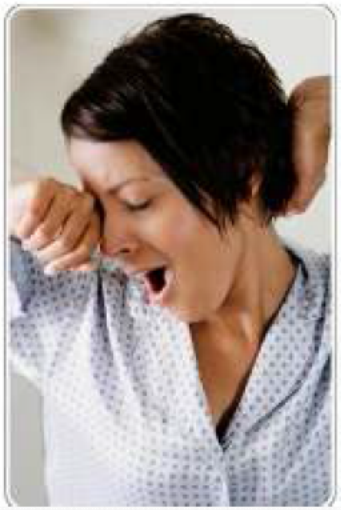
Non-REM Sleep

- Physiological & mental activities slow down
- Heart rate & breathing rate decrease, become regular
- Divided into four stages of sleep
- Deepest in stages three and four
- Therapeutic sleep

Non-REM Sleep

Awakened in Non-REM Stage 3 or 4

- Difficulty waking
- Continue to feel sleepy, groggy, disoriented for 10 or 15 minutes
- Called "sleep inertia"



Graphic Notes:

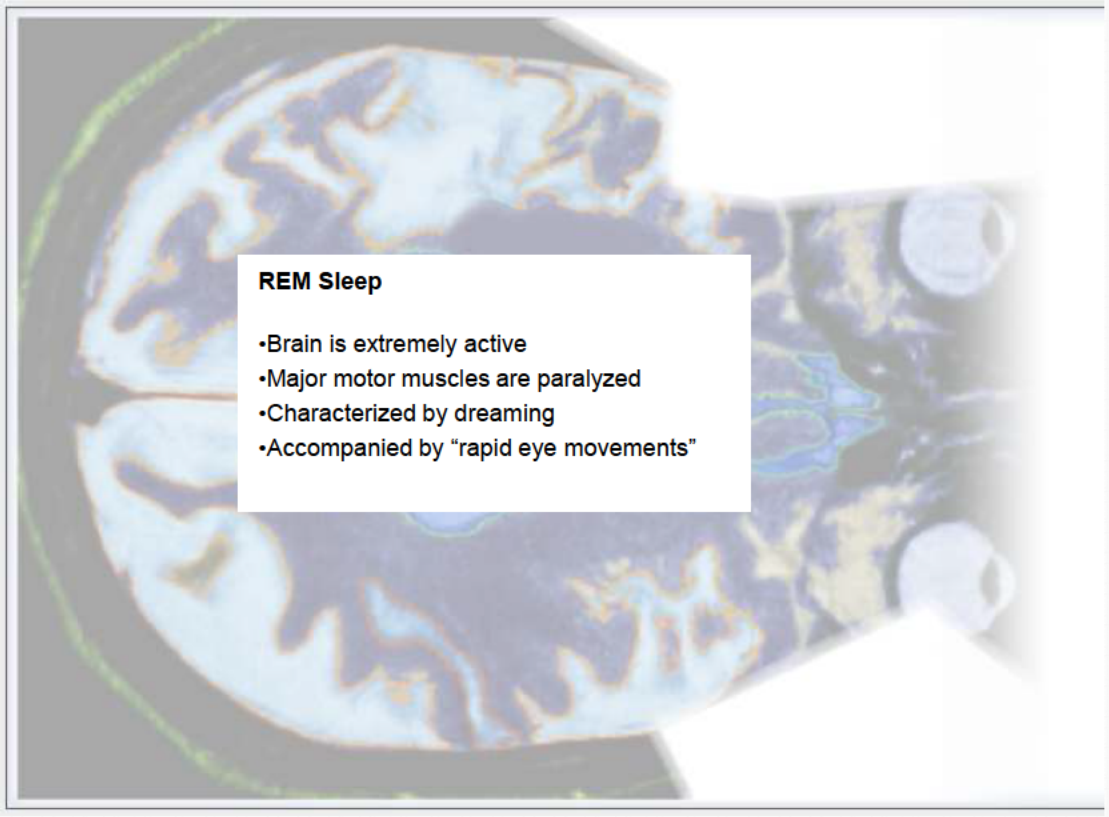
This is a full screen graphic. Animate images and OST in sync with audio.

Branching

Main branch launch page (Page 4)

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 4.2



Script Text:

No Text <Full screen graphic>

Graphic Notes:

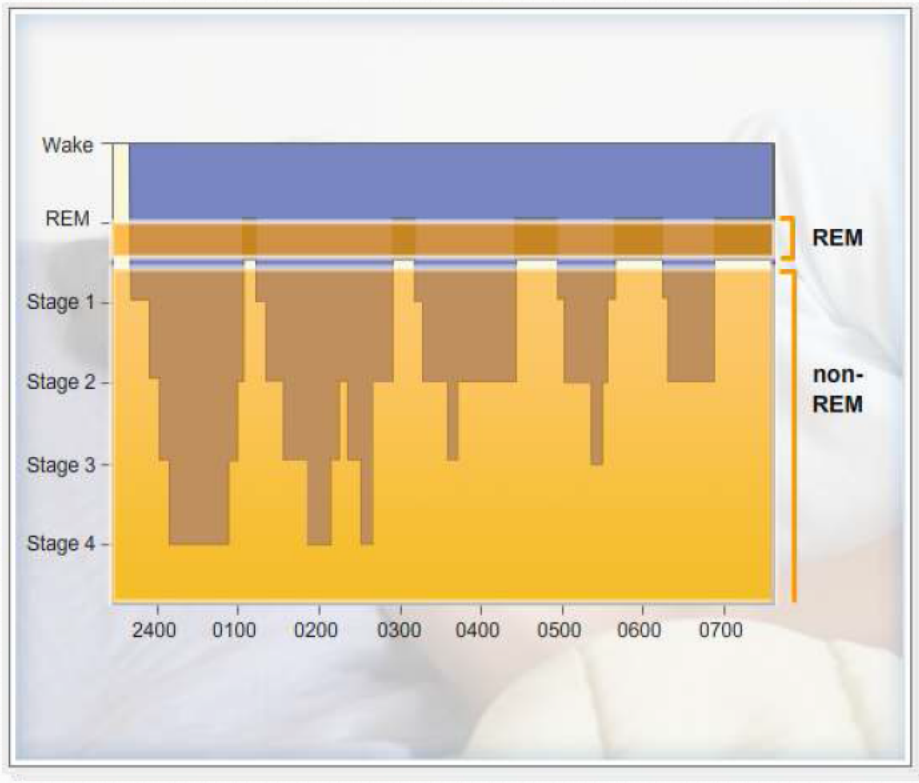
This is a full screen graphic. Animate graphic for brain and OST in sync with audio.

Branching

Main branch launch page (Page 4)

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 5



Script Text:

Non-REM and REM Sleep

Non-REM and REM sleep occur in 90-minute cycles that repeat throughout the sleep period. Within each 90-minute cycle, there is a stage of Non-REM and a stage of REM sleep. The Non-REM stage is longer than the REM stage.

Graphic Notes:

Create the diagram as shown and highlight relevant area. Animate highlighters in sync with audio. For animation, run this slide in PowerPoint show mode.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 6

Circadian Rhythm Dips

- 1 P.M.- 3 P.M.
- 3 A.M. - 5 A.M.
- 2 A.M. - 6 A.M - Nocturnal Window
- 6 P.M. - 8 P.M. – No Sleep Zone

Script Text:

Circadian Rhythm

- Influences our daily cycles of temperature, digestion, performance, hormones and sleeping and waking patterns

- "Biological Clock"

Graphic Notes:

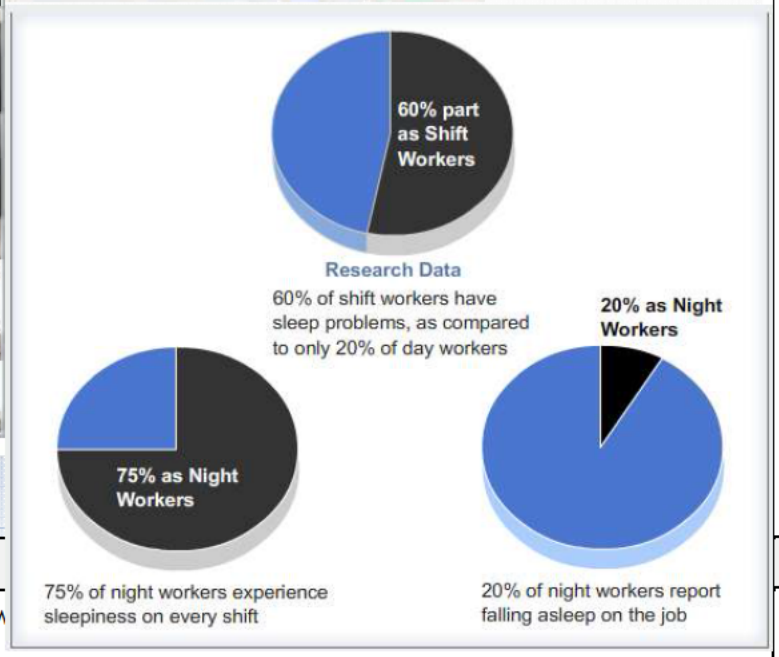
Animate relevant images in sync with audio.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 7



Graphic Notes:

Animate relevant images and diagram in sync w

Script Text:

Night Workers

People working at night

•Must override Circadian clock

•Work/rest schedule may reset body's clock

•May feel influence of daytime & nighttime cues

•Society will pull person back toward daytime activity

•Most shift workers revert to normal waking/sleeping schedules on days off

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 27

Script Text:

The human body is programmed to be awake during daylight and asleep during nighttime.

*Select the correct option and click the **Check Answer** button.*

A.True
B.False

Correct Answer: [redacted]

<Feedbacks>

That's correct/ That’s incorrect. The Circadian Clock influences the human body to be active during the day and sleep during the night.

Graphic Notes:

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 28

Script Text:

When is the Circadian Rhythm most likely to cause sleepiness?

*Select the correct options and click the **Check Answer** button.*

A.Between 1 p.m. and 3 p.m.
B.Between 1 a.m. and 3 a.m.
C.Between 6 p.m. and 8 p.m.
D.Between 3 a.m. and 5 a.m.

Correct Answers: Option A and D
<Feedbacks>
That's correct/ That's incorrect/ That's partial correct. The Circadian Rhythm causes sleepiness between 1 p.m. and 3 p.m. and between 3 a.m. and 5 a.m.

Graphic Notes:

Branching

Next slide

Course name:		
	Date:	Page#:
	Script Text:	

This concludes the review of this lesson.

If you exit with incomplete lessons, you will not get credit for completing the course.

To ensure you have completed all lessons, click "Menu" and check for a completed status. Completed lessons will be indicated by a check mark.

Graphic Notes:	Branching

Course name:

Date:

Page#:

Script Text:

The Science of Sleep and Fatigue

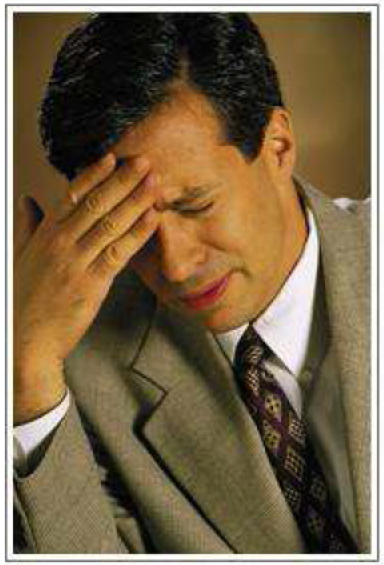
Part 2. Sleep Requirement

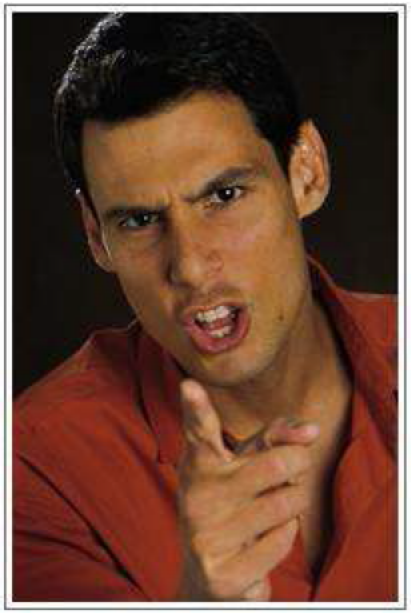
Graphic Notes:

Branching

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 8





Script Text:

Signs and Symptoms of Fatigue

•Forgetfulness

•Poor decision making

•Slowed reaction time

•Reduced vigilance

•Poor communication

•Becoming fixated (tunnel vision)

•Apathy

•Bad moods

•Nodding off

Graphic Notes:

Show existing image

Branching

Next page

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 9

Script Text:

Sleep Requirement

The amount of sleep a person needs changes over their life span. See the Amount of Sleep Needed chart on screen.

Adult Sleep Needed

•8 hours in 24 hour period
• Average only 6:57 during week
• Average only 7:31 on weekends
• With age - sleep less deep
• Sleep more disrupted
• Total amount of nocturnal sleep decreases
• Consolidated & continuous nocturnal sleep decreases
• Napping is effective

Graphic Notes:

Show existing image. Fade out the images and show OST

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 10

Script Text:

Sleep: Physiological Need

Sleep Loss

•Occasional sleep loss without serious consequences

• Cannot experience sustained sleep loss

•Sleep loss is additive and can result in a cumulative sleep debt

•Sleep loss will accumulate into sleep debt - affects judgement & performance

Graphic Notes:

Animate relevant images in sync with audio.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 11

Script Text:

Sleep Debt

Sleep must be repaid. It was once thought that you have to "make-up" for lost sleep by sleeping a number of hours equal to the number of hours of lost sleep.

Research shows that recovery sleep is deeper rather than longer.

In other words, more Non-REM stages 3 and 4 sleep. During recovery sleep, an individual may sleep somewhat longer but deeper sleep is key feature.

Graphic Notes:

Show existing image

Branching

Next slide

Effect of Sleep on Task Performance

Belenky et al, J. Sleep Res. 2003

New Slide 2.

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 12

Script Text:

Sleep

Two ways to evaluate sleepiness and fatigue.

•Objective: Objective is your actual physiological state with regard to sleep. Objective sleepiness can be scientifically measured by monitoring the activity of your heart and brain, using medical tests, such as EKG or EEG.

•Subjective: Subjective sleepiness is your introspective self-report of that status. You might rate your sleepiness on a scale from "wide awake and alert" to "extremely sleepy, ready to nod off."

Self Report

•Physiological sleepiness can be concealed (activity, caffeine, etc.)
•Usually more alert than physiologically valid
•Difficult to reliably estimate quantity or quality of sleep or waking alertness
•You are more likely to be sleepier than you think or report

Graphic Notes:

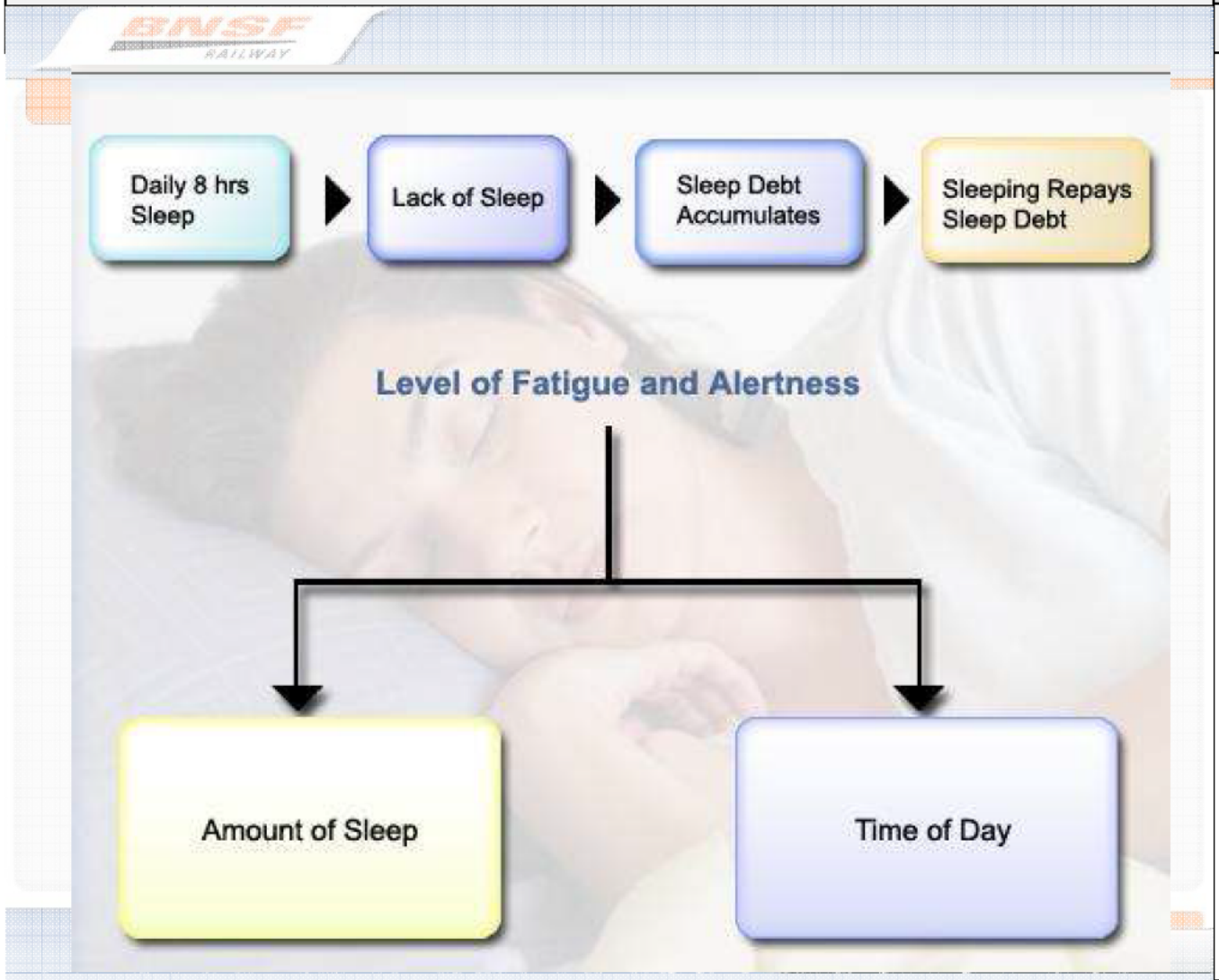
Show images and OST in sync with audio.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 13



Script Text:

Sleep (Cont.)

To avoid sleepiness most adults need 8 hours of sleep in every 24-hour period.

The quality of the sleep you get is as important as the amount of sleep you receive. If you get eight hours of sleep, but the sleep is constantly disrupted, you will still suffer the effects of fatigue during your waking hours.

Graphic Notes:

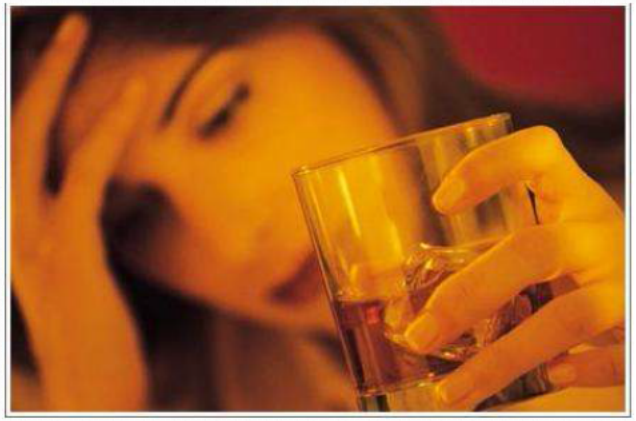
Recreate the diagram as shown above.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 14



Script Text:

Sleep Disrupting Factors

Biological Programming

•People sleep during night - dark, quiet and cool

Environmental Factors Affect Sleep

•Sleep disrupted by light, noise, temperature

Substances can Disrupt Sleep

•Alcohol most widely used sleep aid
•Initially helpful but interferes with sleep cycle
• Sleepy people will be more affected by alcohol
• Rx & OTC medications can impair sleep
• Sleep aids can have serious side effects
• None should be taken without the advice of a physician

Graphic Notes:

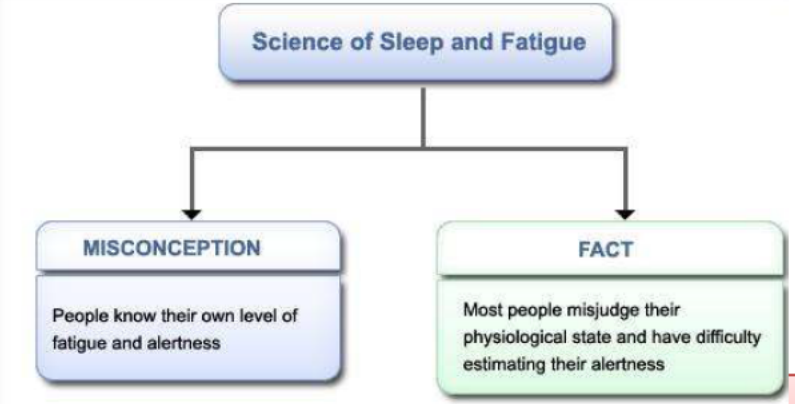
Show relevant images in sync with audio.

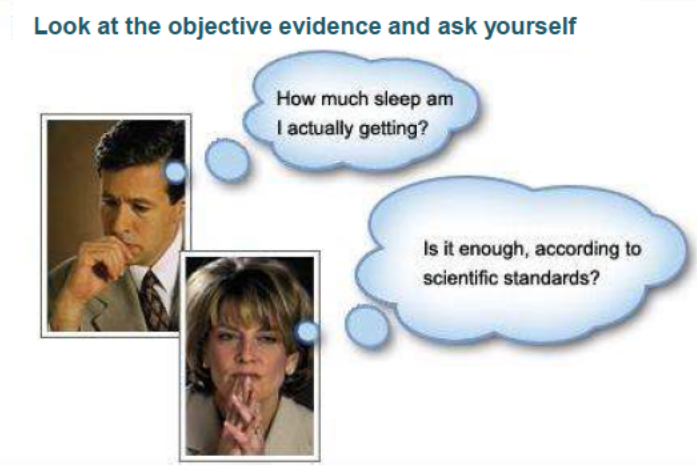
Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 15





Script Text:

Science of Sleep & Fatigue

If you are not getting the prescribed amount of sleep, you should take steps to remedy the situation, because every time you go to work sleepy or fatigued, your performance and your safety are compromised.

For more information about science of sleep and fatigue, see Note below.

Note to construction/graphic: Note will be shown at the bottom of screen.

Note: Remember, most adults need 8 hours of sleep in every 24 hours. In addition, 9 hours in bed is equal to 8 hours sleep for the average individual.

Graphic Notes:

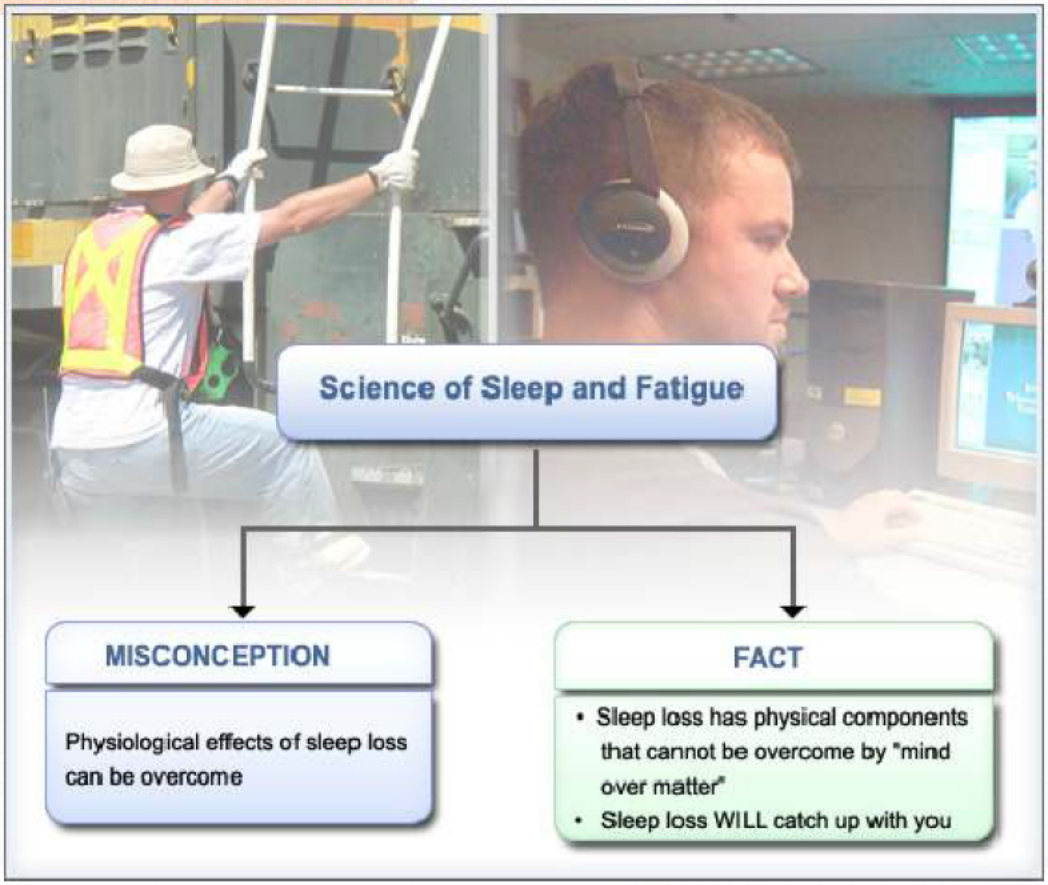
Show images and diagram as shown above in sync with audio.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 16



Script Text:

Science of Sleep & Fatigue (Cont.)

Another misconception is that you can overcome the physiological effects of sleep loss by determination, motivation, and experience.

The fact is sleep loss has physical components that cannot be overcome just by putting "mind over matter." In addition, you cannot determine that you won't be sleepy later since you are wide awake now.

Sleep loss will catch up with you, but you cannot predict when. You have to plan to get sufficient rest, so you will not succumb to fatigue.

Graphic Notes:

Show existing image and OST.

Branching

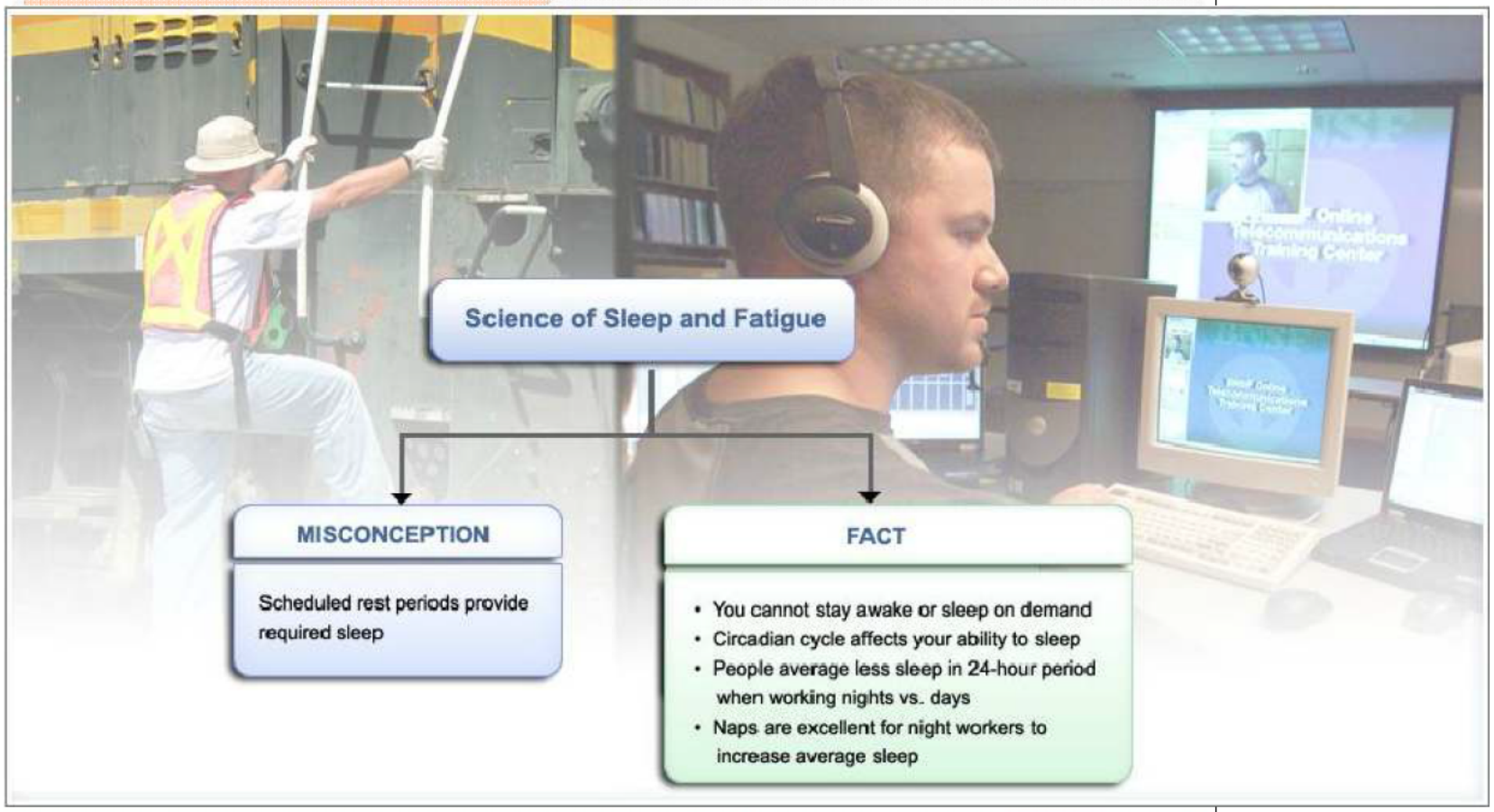
Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 17

Script Text:

No script text. Full screen graphic.



Graphic Notes:

Show existing image with OST as shown above.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 18

•There are NO magic bullets.
•Be diligent about getting the rest you need

Script Text:

Science of Sleep & Fatigue (Cont.)

You should also be warned about believing in a "magic bullet" that will effortlessly alleviate the sleep loss and fatigue that is often associated with railroad operations.

Beware and be skeptical of any claims to a "cure" for fatigue. The best remedies remain the tried-and-true methods that require you to be as diligent about getting needed rest as you are about all the other responsibilities in your life.

Graphic Notes:

Show existing image and OST.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 29

Script Text:

All adults have different daily sleep requirements.

*Select the correct option and click the **Check Answer** button.*

A. True
B. False

Correct Answer: [redacted]

<Feedbacks>
That's correct/ That's incorrect. To be well-rested, most adults need eight hours of sleep in a 24-hour period.

Graphic Notes:

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 30

Script Text:

To obtain 8 hours of sleep, how much time must the average adult spend in bed?

*Select the correct option and click the **Check Answer** button.*

A.9 hours
B.8 hours

Correct Answer: [redacted]
<Feedbacks>
That's correct/ That's incorrect. For the average adult, 9 hours in bed is equal to 8 hours sleep.

Graphic Notes:

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 31

Script Text:

You can judge your own sleepiness and alertness by the way you feel.

*Select the correct option and click the **Check Answer** button.*

A. True
B. False

Correct Answer: [redacted]

<Feedbacks>

That's correct/ That’s incorrect. Research shows that people are unable to accurately judge their own states of sleepiness and alertness.

Graphic Notes:

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 32

Script Text:

The factors that most affect your level of fatigue and alertness are:

*Select the correct options and click the **Check Answer** button.*

A.Personal sleep requirements
B.Amount of sleep in a 24-hour period
C.Time of day

Correct Answers: [redacted]

<Feedbacks>

That's correct/ That's incorrect. Your level of fatigue and alertness is affected by the amount of sleep you have had and the time of day.

Graphic Notes:

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 33

Script Text:

Which of the following is not a factor in aiding or disrupting sleep?

*Select the correct option and click the **Check Answer** button.*

A.Alcohol
B.Sleep environment
C.Will power
D.Medications

Correct Answer: [redacted]

<Feedbacks>

That's correct/ That’s incorrect. Alcohol and medications can disrupt sleep. A proper environment can aid sleep. You cannot force yourself to sleep or to stay awake by will power alone.

Graphic Notes:

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 34

Script Text:

Having a scheduled rest period will assure you of getting your required sleep.

*Select the correct option and click the **Check Answer** button.*

A.True
B.False

Correct Answer: [redacted]

<Feedbacks>

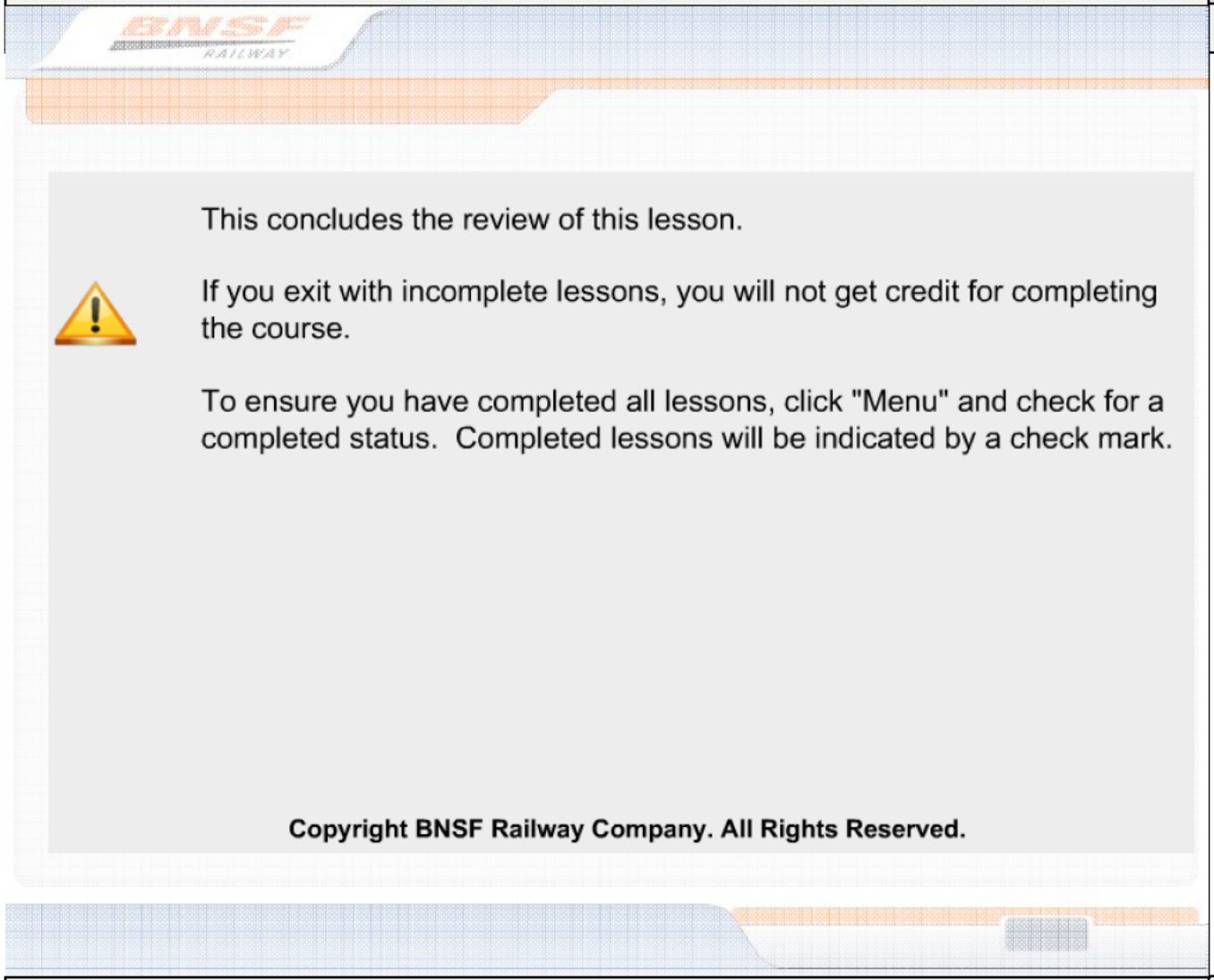
That's correct/ That's incorrect. Because of the Circadian Rhythms it may be difficult to get enough sleep if you work non-traditional hours.

Graphic Notes:

Branching

Next slide

Course name:		
	Date:	Page#:
	Script Text:	



Graphic Notes:	Branching

Course name:

Date:

Page#:

Script Text:

The Science of Sleep and Fatigue

Part 3. Alertness Strategies & Sleep Disorders

Graphic Notes:

Branching

Course name:

Date:

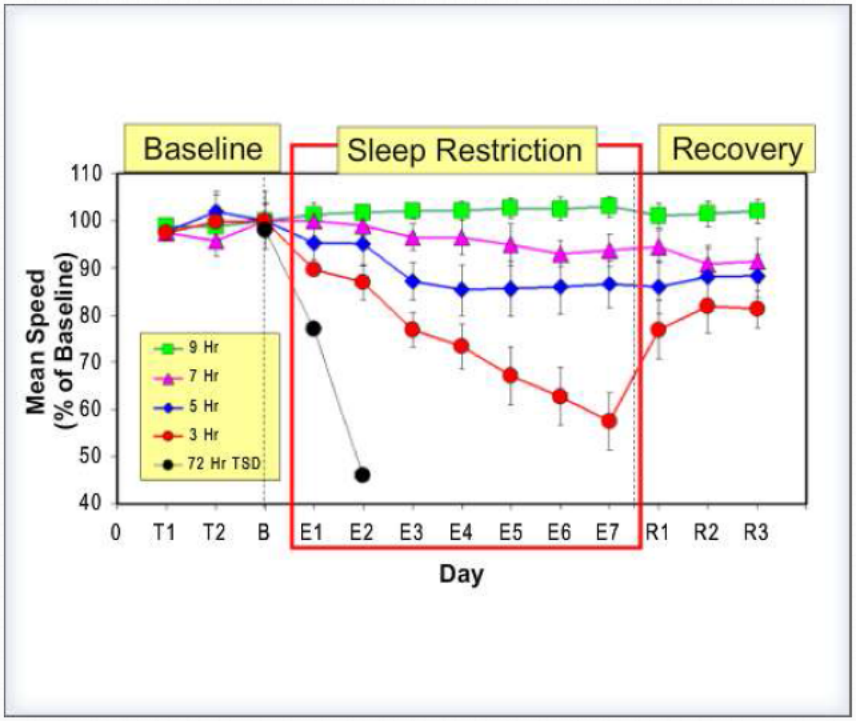
Page#:

Script Text:

Effect of Sleep on Task Performance

As you have learned, the need for sleep is not something that can be overcome by will power. We know that everyone needs 6 to 8 hours of sleep in every 24 hours to maintain vigilance and research has shown that getting less than your required daily rest can affect performance.

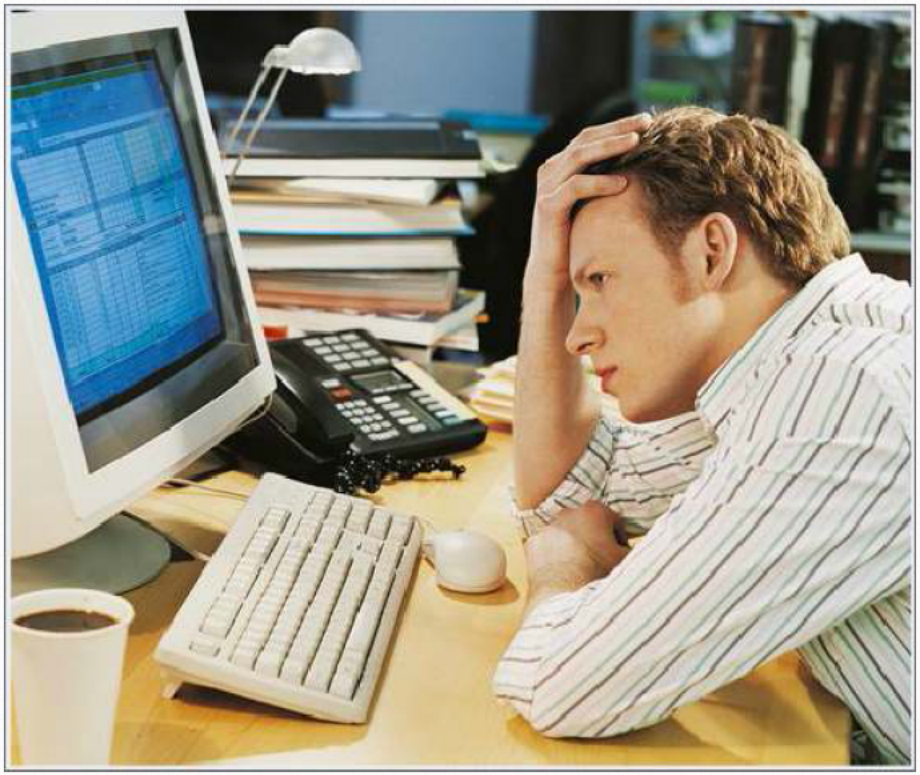
Sometimes getting your needed rest can take careful planning of your off duty hours and require communication with family and friends to let them know how important it is for you to get your sleep. Be mindful of over-booking your at-home time with events that will cause you to reduce your sleep opportunity.



Graphic Notes:

Branching

Course name:		
	Date:	Page#:



Script Text:

Alertness Strategies

At some point in time you may find that you are tired when on duty and may need to use Alertness Strategies to help you in maintaining vigilance. None of these strategies can restore wakefulness as well as getting proper rest but Alertness Strategies can be an effective way to increase alertness if you feel fatigue may interfere with work performance.

Graphic Notes:	Branching

Course name:

Date: | Page#:

- Taking a Nap
  - Napping will increase alertness and performance as long as they are at least 10 minutes.
  - An approved nap as per GCOR 1.11.1 should last no longer than 45 minutes. Familiarize yourself with this rule and take advantage of it when possible.
  - Be sure to set aside up to 15 minutes to "wake up" after a nap period to dissipate the effects of "Sleep Inertia."

Script Text:

Napping

Napping has been shown to restore alertness as long as they are greater than 10 minutes long.

GCCOR 1.11.1 Napping allows for TY&E employees to take a nap up to 45 minutes. Be familiar with this rule to be sure your circumstances qualify for an Opportunity Nap.

Be aware of "Sleep Inertia" that can make it difficult for some employees to wake up completely at the end of a nap. The length of Sleep Inertia varies according to each circumstance and can cause temporary disorientation that will gradually dissipate over time.

Graphic Notes:

Branching

New Slide 4

Alertness Strategies

Caffeine

Here are some estimates of the amount of caffeine in typical beverages:

• Espresso 1 serving 1.5 oz	100 mg
• Brewed Coffee, 8 oz	80-200 mg
• Instant Coffee, 8 oz	27-173 mg
• Decaf Coffee, brewed, 8 oz	4-7 mg
• Decaf Coffee, instant, 8 oz	2-3 mg
• Tea, iced, 12 oz,	70 mg
• Tea, brewed, 8 oz,	40-120 mg
• Nestea Iced Tea, 12 oz,	26 mg
• Coca-Cola Classic, 12 oz,	35 mg
• Red Bull, 8.3 oz,	76 mg
• Monster Energy, 16 oz,	60 mg
• Hershey's Special Dark chocolate bar, 1.45 oz,	31 mg

New Slide 5

Course name:

Date:

Page#:

Script Text:

Alertness Strategies

- Drink an ice-cold glass of water
- Sensible Snacks
- Expose yourself to bright light
- Get up and move around
- Stay cold by opening a window or splashing cold water on your face
- Brush your teeth and or chew gum
- Engage in conversation
- Medications

Graphic Notes:

Branching

New Slide 6

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 19

Script Text:

Sleep Problems

Sleep problems can be solved by lifestyle changes. But, sometimes, there is an underlying cause that must be identified and treated. If you have a history of sleep problems, you may have a sleep disorder.

Sleep disorders are medical problems that can disturb your sleep and impair your alertness; both on the job and in your life.

Graphic Notes:

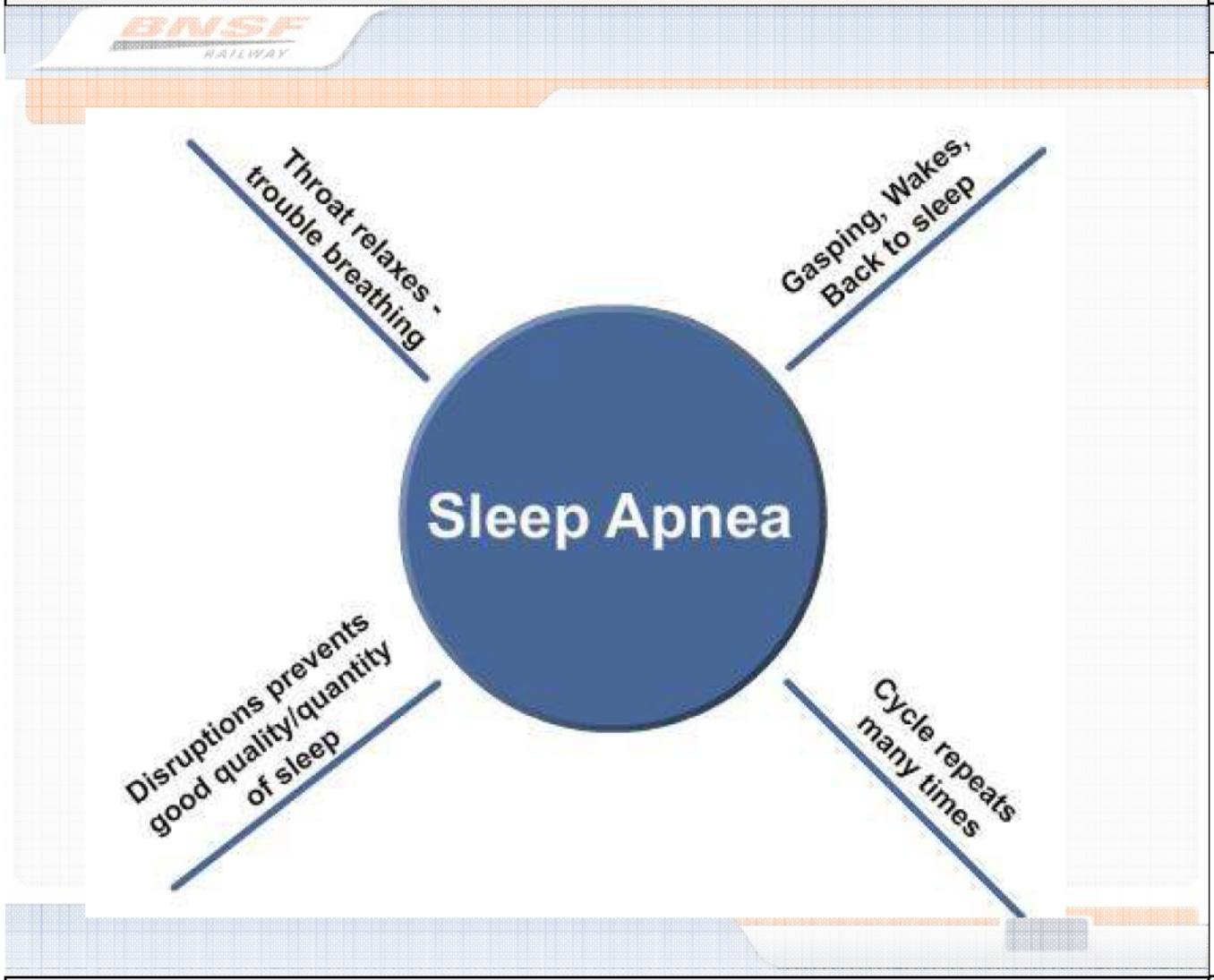
Show collage of existing images.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 20



Script Text:

Sleep Apnea

There are over 50 sleep disorders. One of the most common and most serious is Sleep Apnea.

Sleep Apnea:

•The sleeper's throat relaxes so deeply that it causes trouble breathing.

•The sleeper gasps, wakes up to breath, and then falls back to sleep, without ever realizing it.

This cycle of gasping, awakening, and going back to sleep can occur as many as 600 times during a sleep episode. Because of the constant disruptions, the person never gets enough sleep.

Graphic Notes:

Recreate the diagram as shown above.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 21

Script Text:

Sleep Apnea (Cont.)

•Snoring loudly

•Gasping or choking in your sleep

•Spending 8 or 9 hours in bed, but still feeling sleepy

• Taking frequent, sometimes unintended, naps

• Falling asleep at inappropriate times

• Trouble getting to sleep or staying asleep

• Breathing problems reported by your sleep partner

Graphic Notes:

Show collage of existing images.

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 22

Script Text:

<Full screen graphic. No script text>

Sleep and Fatigue Self – Assessment

In the next section you have the opportunity to take a personal self-assessment of your sleep patterns and how it may affect your health. The questionnaire consists of 29 items and takes approximately 5-7 minutes to complete. This self-assessment is provided only for your personal benefit, **your responses are not recorded.** The purpose of this assessment is to help you determine if you should discuss sleep issues with your physician.

Graphic Notes:

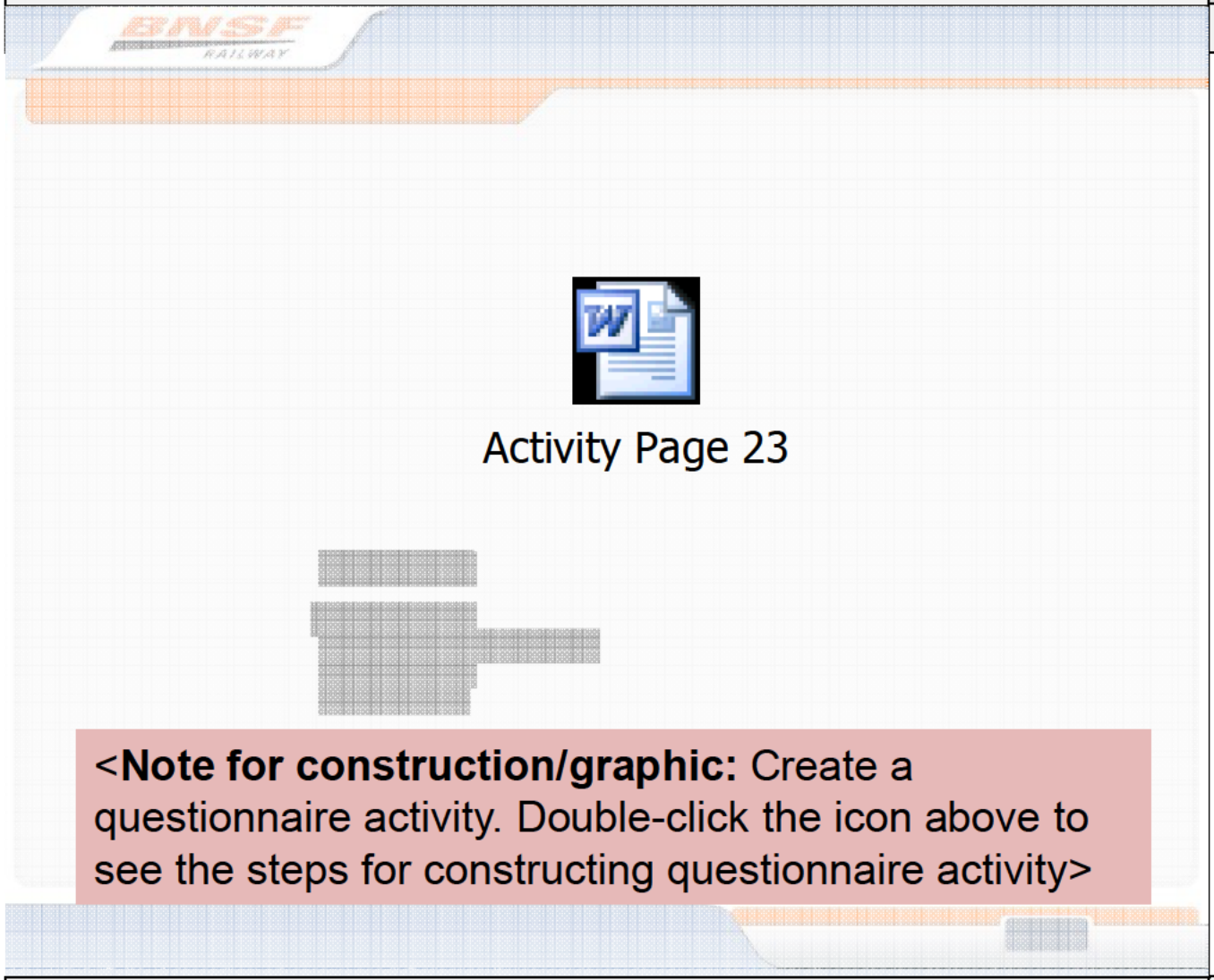
Show existing images and OST

Branching

Next slide

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 23



Script Text:

No text. Full screen graphic.

Graphic Notes:

Create the questionnaire activity. Double-click the document attached above for text details. You can refer flash course for reference.

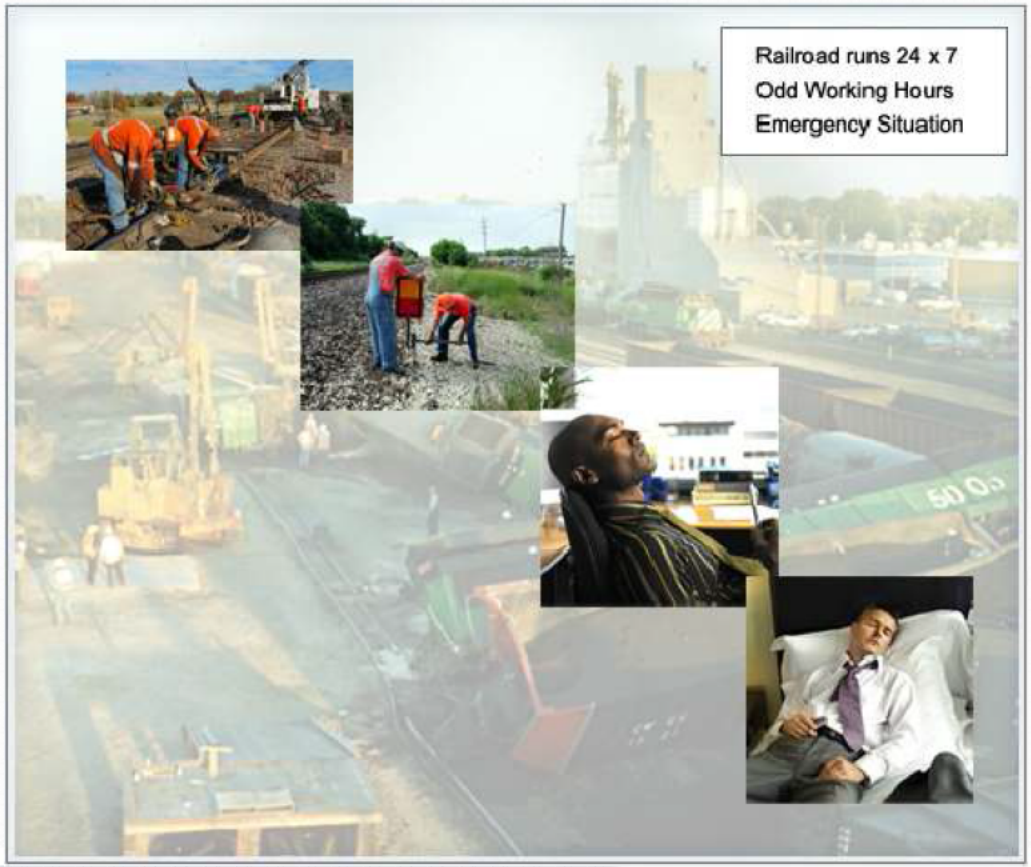
Branching

Next button will be active only after learner completes the entire activity.

Next slide.

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 24



Script Text:

Job Requirements

The demands of railroad operations can present a challenge to railroad employees who need to be well-rested to perform their professional and personal responsibilities.

The railroad runs 24 hours a day, seven days a week.

Many employees are required to work at night, or during other unusual and unpredictable times. During emergencies and other situations, employees may also have to work long hours and extended schedules.

Graphic Notes:

Show collage of existing images.

Branching

Next slide.

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 25

Script Text:

Job Requirements (Cont.)

Job requirements makes it difficult to get the 8 to 9 hours of sleep in every 24-hour period.

Circadian Rhythms can make it difficult to achieve sound, sustained sleep episodes.

Fatigue develops and alertness declines when sleep loss persists.

Employees are in danger of making a mistake that could lead to an accident.

Employees should avoid sleep loss and stay alert and safe on the job.

Graphic Notes:

Show collage of existing images.

Branching

Next slide

Course name:		
	Date:	Page#:
	Script Text:	

You can maintain your vigilance with less than 6 hours of sleep a night.

*Select the correct option and click the **Check Answer** button.*

A.True
B.False

Correct Answer: [redacted]
<Feedbacks>
That's correct/ That’s incorrect. You must get at least 6 hours of sleep in every 24 hours to maintain your vigilance.

Graphic Notes:	Branching

Course name:		
	Date:	Page#:
	Script Text:	

Which alertness strategies temporarily increase alertness:

*Select the correct option and click the **Check Answer** button.*

A. Napping
B. Caffeine
C. Drink cold water
D. Eat sensible snacks
E. All of the above
F. A and B

Correct Answer: [redacted]

<Feedbacks>

That's correct/ That's incorrect. Additionally, you may get up and move around, splash water on your face or expose yourself to bright light, or engage in conversation to help keep you awake.

Graphic Notes:	Branching

Course name:		
	Date:	Page#:
	Script Text:	

Over the counter and prescription medications can make you sleepy.

*Select the correct option and click the **Check Answer** button.*

A. True
B. False

Correct Answer: [redacted]

<Feedbacks>

That's correct/ That's incorrect. Both over the counter and prescription medications can make you sleepy. In fact they may have undesirable interactions when combined with each other. Consult your pharmacist to best understand which medications can make you sleepy and those with undesirable combined effects.

Graphic Notes:	Branching

Course name: The Science of Sleep and Fatigue

Date: 09/15/10 | Page#: 35

Script Text:

If you continually have problems falling asleep and staying asleep you may have a medical problem.

*Select the correct option and click the **Check Answer** button.*

A.True
B.False

Correct Answer: [redacted]

<Feedbacks>

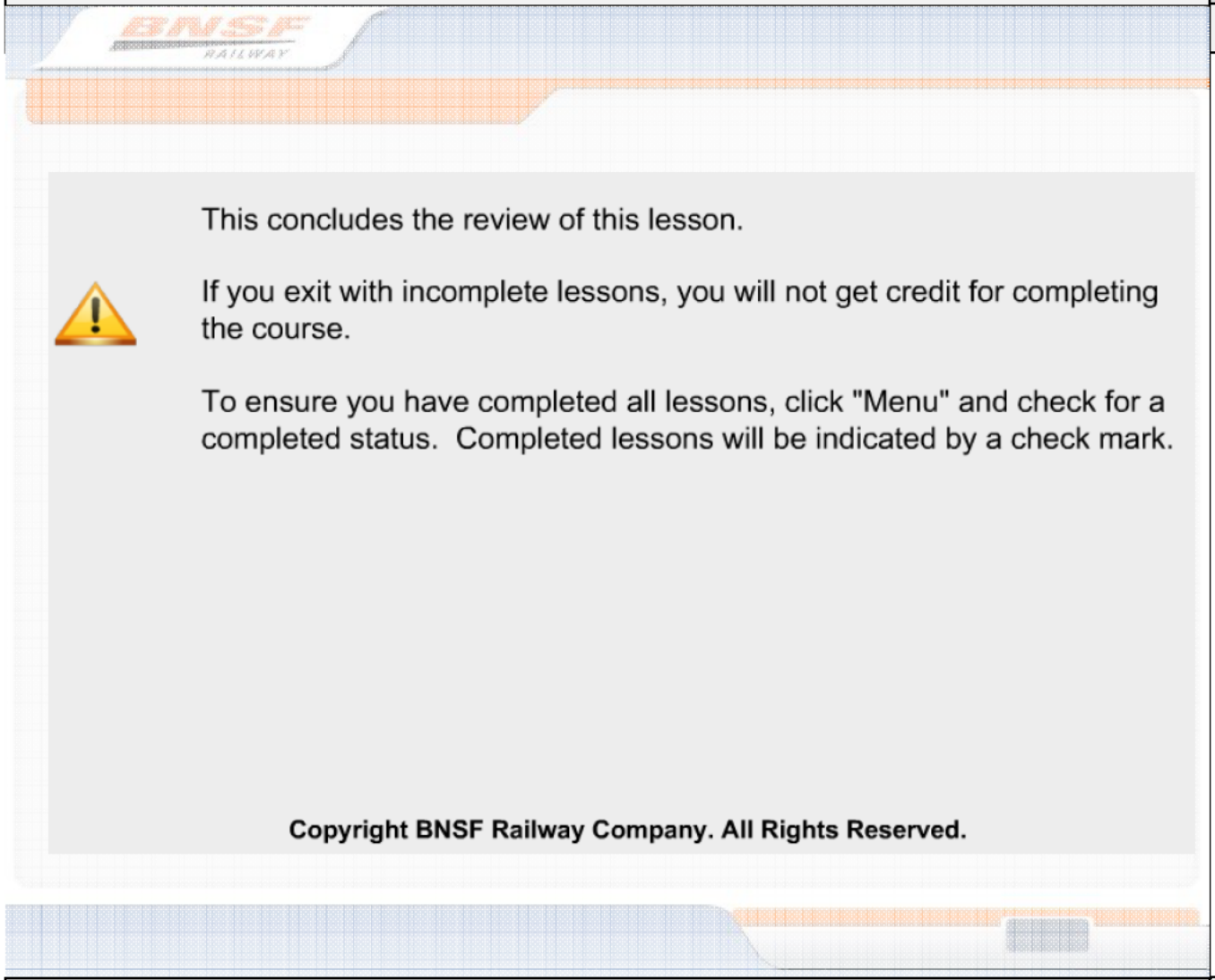
That's correct/ That’s incorrect. Chronic sleep problems may be caused by a sleep disorder that should be diagnosed and treated medically.

Graphic Notes:

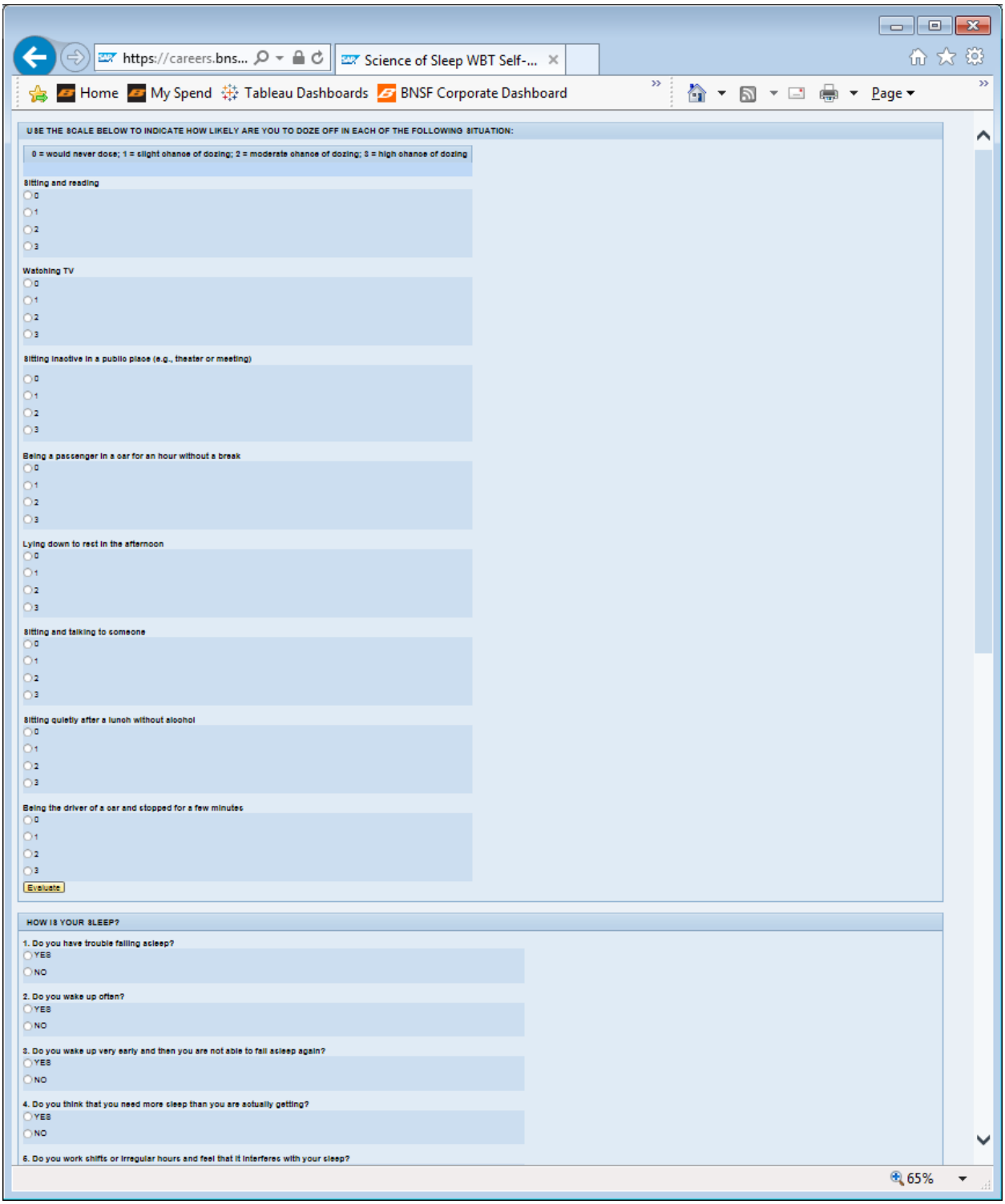
Branching

Next slide

Course name:		
	Date:	Page#:
	Script Text:	



Graphic Notes:	Branching


https://careers.bns...
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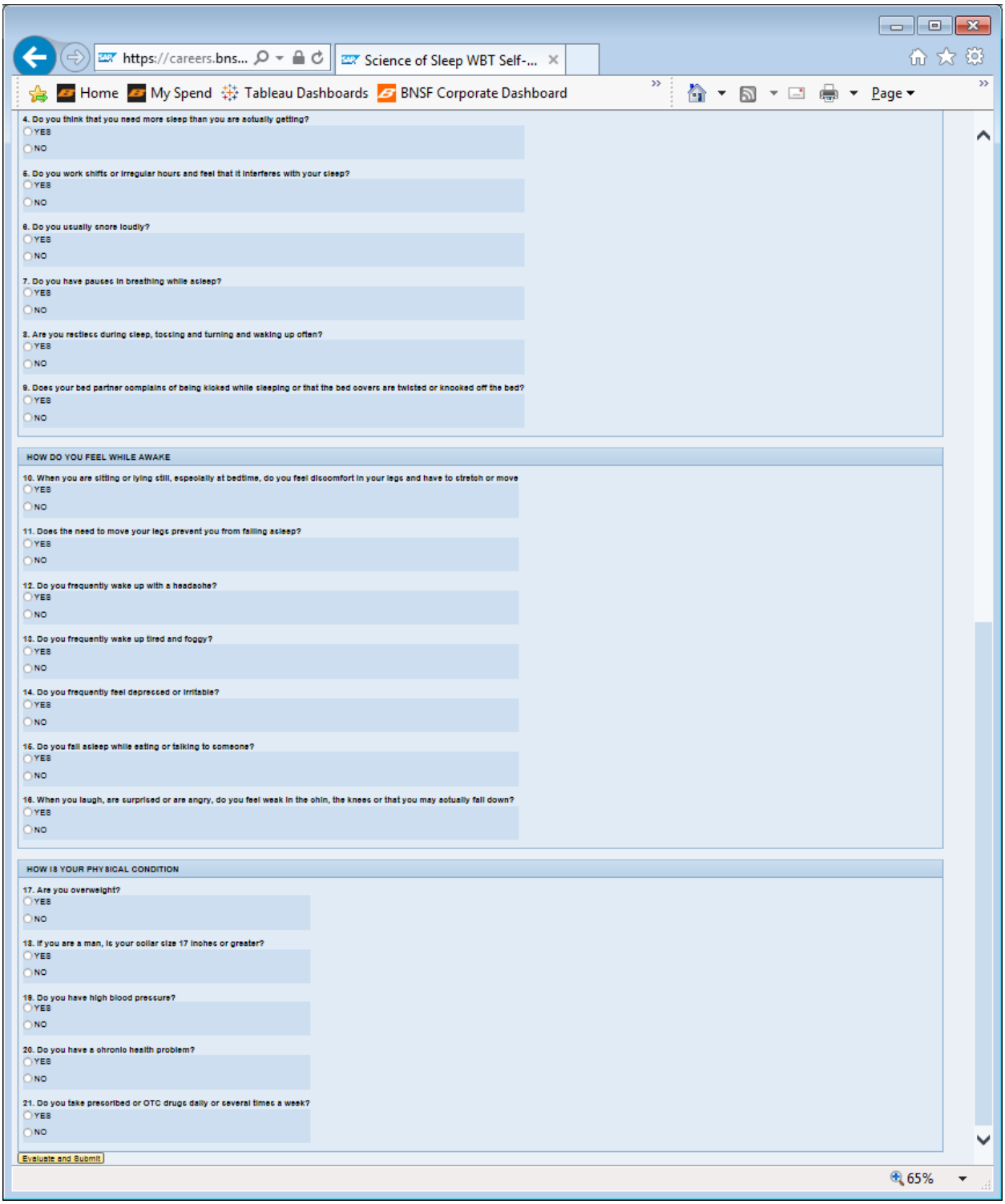
Home
My Spend
Tableau Dashboards
BNSF Corporate Dashboard
Page
USE THE SCALE BELOW TO INDICATE HOW LIKELY ARE YOU TO DOZE OFF IN EACH OF THE FOLLOWING SITUATION:
0 = would never dose; 1 = slight chance of dozing; 2 = moderate chance of dozing; 3 = high chance of dozing
Sitting and reading
0
1
2
3
Watching TV
0
1
2
3
Sitting inactive in a public place (e.g., theater or meeting)
0
1
2
3
Being a passenger in a car for an hour without a break
0
1
2
3
Lying down to rest in the afternoon
0
1
2
3
Sitting and talking to someone
0
1
2
3
Sitting quietly after a lunch without alcohol
0
1
2
3
Being the driver of a car and stopped for a few minutes
0
1
2
3
Evaluate
HOW IS YOUR SLEEP?
1. Do you have trouble falling asleep?
YES
NO
2. Do you wake up often?
YES
NO
3. Do you wake up very early and then you are not able to fall asleep again?
YES
NO
4. Do you think that you need more sleep than you are actually getting?
YES
NO
6. Do you work shifts or irregular hours and feel that it interferes with your sleep?
65%

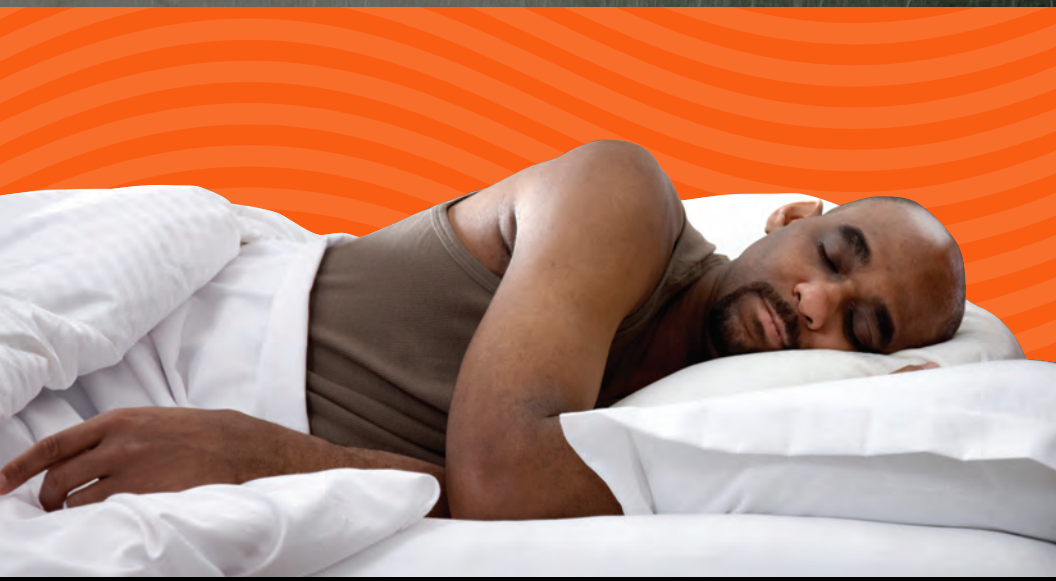

https://careers.bns...
Science of Sleep WBT Self-...
Home
My Spend
Tableau Dashboards
BNSF Corporate Dashboard
Page
4. Do you think that you need more sleep than you are actually getting?
YES
NO
6. Do you work shifts or irregular hours and feel that it interferes with your sleep?
YES
NO
8. Do you usually snore loudly?
YES
NO
7. Do you have pauses in breathing while asleep?
YES
NO
8. Are you restless during sleep, tossing and turning and waking up often?
YES
NO
9. Does your bed partner complains of being kicked while sleeping or that the bed covers are twisted or knocked off the bed?
YES
NO
HOW DO YOU FEEL WHILE AWAKE
10. When you are sitting or lying still, especially at bedtime, do you feel discomfort in your legs and have to stretch or move
YES
NO
11. Does the need to move your legs prevent you from falling asleep?
YES
NO
12. Do you frequently wake up with a headache?
YES
NO
13. Do you frequently wake up tired and foggy?
YES
NO
14. Do you frequently feel depressed or irritable?
YES
NO
15. Do you fall asleep while eating or talking to someone?
YES
NO
16. When you laugh, are surprised or are angry, do you feel weak in the chin, the knees or that you may actually fall down?
YES
NO
HOW IS YOUR PHYSICAL CONDITION
17. Are you overweight?
YES
NO
18. If you are a man, is your collar size 17 inches or greater?
YES
NO
19. Do you have high blood pressure?
YES
NO
20. Do you have a chronic health problem?
YES
NO
21. Do you take prescribed or OTC drugs daily or several times a week?
YES
NO
Evaluate and Submit
65%

BNSF WELLNESS

Medical Factual Report
DCA16FR008
Attachment 2

BETTER SLEEP

RAILROADERS' GUIDE TO IMPROVING QUALITY OF SLEEP



BNSF RAILWAY

This guide offers simple advice to help those who need better quality sleep and more of it. The tips in this guide can help you, regardless of your sleep and work schedule.

It's important not to deprive yourself of quality sleep, even if you feel like you can get by without it. Sleep loss can affect judgment, performance and safety. Contrary to popular belief, you cannot overcome sleep loss through determination, motivation or experience.

TIPS FOR GETTING BETTER SLEEP

SEVEN TO NINE HOURS OF QUALITY SLEEP

Most people need seven to nine hours of quality sleep every 24 hours to function at their best.

For some railroaders, as well as many others in our country, adjusting to irregular bedtimes can make it more challenging to get seven to nine hours of sleep in a 24-hour period. But there are things you can do to get better sleep.

THE #1 CAUSE OF FATIGUE: LACK OF QUALITY SLEEP

AVOID COMMON "SLEEP DISRUPTORS"

- **Family and friends** – Speak with your family and friends and ask them to avoid disturbing your sleep, except for emergencies.

- **Alcohol** – Although it may help you fall asleep, alcohol diminishes the length and quality of sleep. If you drink, stop at least six hours before sleeping.
- **Medications** – Some prescription and over-the-counter medications can interfere with sleep. Ask your doctor or pharmacist about the effects of medications.

- **Caffeine** – Drinks with caffeine can be an effective alertness strategy, but avoid them at least six hours before bed.
- **Nicotine** – Acts as a stimulant. Tobacco users, note that the body can crave nicotine while you sleep and wake you up.
- **Too many liquids before bed** – Increases the likelihood that you will awaken to go to the restroom.
- **Big meals** – Digesting a full stomach of food while trying to sleep causes restlessness. Avoid heavy foods at least four hours before bedtime.

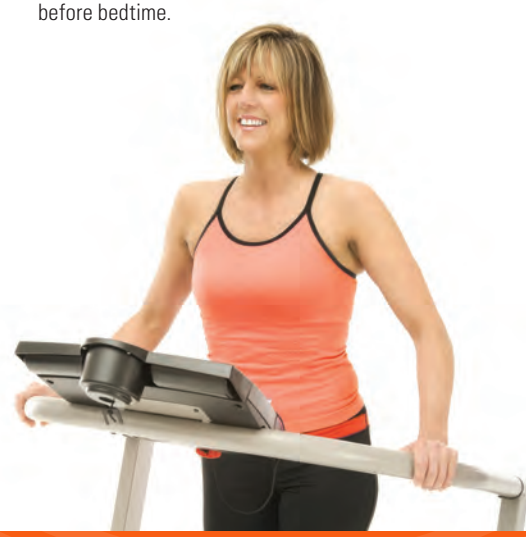
CREATE AN IDEAL SLEEP ENVIRONMENT

- **Seek absolute darkness** – Use thick curtains or wear eye shades that are available at many pharmacies.

- **Block out noise** – Wear earplugs, disconnect the phone when not on call, and turn off other electronic devices or create "white noise" such as a fan running at low speed to mask other sounds.
- **Keep cool** – Make sure your bedroom doesn't get too warm and that air circulates freely. Experts recommend a room temperature of 65 to 67 degrees for deep sleep.

LIFESTYLE CHANGES THAT CAN HELP YOU SLEEP BETTER

- **Use naps** – Naps have shown to be nearly as restorative as traditional sleep. TY&E and Maintenance Of Way employees have operating rules in place that allow for up to a 45-minute nap. Be familiar with this rule to be sure your circumstances qualify for an Opportunity Nap.
- **Exercise** – Regular exercise will help you fall asleep faster, stay asleep longer and get better quality sleep. But to wind down for sleep, you may need to complete your exercise at least four hours before bedtime.



DO YOU HAVE A SLEEP DISORDER?

Despite all your efforts, if you still have trouble getting enough quality sleep, you may have a sleep disorder. Many sleep disorders are treatable. You can find out more about sleep disorders and their treatment by visiting the **Sleep Better** section of the BNSF Online Wellness Center at employee.bnsf.com > Employee tab > Wellness subtab.

BNSF'S COMMITMENT

Achieving and maintaining good health is important for you, your family and your fellow railroaders. BNSF is committed to providing railroader-focused information and programs on a variety of health and wellness topics. It's up to you to take advantage of them. Find out more about the resources available to you at employee.bnsf.com > Employee tab > Wellness subtab.

JUST HOW SLEEPY ARE YOU?
THE EPWORTH TEST

The Epworth Sleepiness Scale is used to determine the level of sleepiness during a person's usual waking hours. For each situation listed, choose the most appropriate number from this scale:

0 = Would NEVER doze or sleep
1 = SLIGHT chance of dozing or sleeping
2 = MODERATE chance of dozing or sleeping
3 = HIGH chance of dozing or sleeping

___ Sitting and reading

___ Watching TV

___ Sitting inactive in a public place

___ Being a passenger in a motor vehicle for an hour or more

___ Lying down in the afternoon

___ Sitting and talking to someone

___ Sitting quietly after lunch (no alcohol)

___ Stopped for a few minutes in traffic while driving

___ **TOTAL SCORE**

A score of 10 or more is considered sleepy. A score of 18 or more is very sleepy. If you score 10 or more on this test, you should consider whether you are obtaining adequate sleep, need to improve your sleep hygiene, and/or need to see a sleep specialist. You should discuss your score with your personal physician.

Source: Circadian Workforce Solutions

BNSF Wellness

On employee.bnsf.com,
go to Employee tab > Wellness subtab.

yourhealthmatters@bnsf.com

817-352-1639

BNSFWELLNESS

SLEEP APNEA

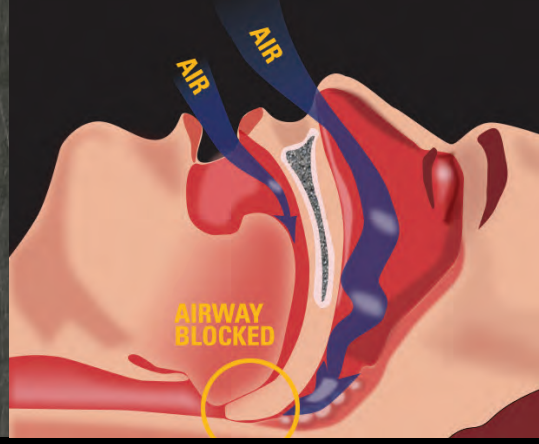
RAILROADERS' GUIDE TO UNDERSTANDING SLEEP APNEA

BNSF RAILWAY

Sleep apnea is one of the most common sleep disorders, affecting about 18 million Americans. It is also one of the most serious sleep disorders that, left untreated, can contribute to excessive sleepiness, high blood pressure, heart attack and stroke.

Obstructive sleep apnea (OSA) is a medical condition that results when muscles in the back of the throat relax to a degree that the airway becomes blocked. The brain senses that breathing has stopped and briefly wakes the sleeper to reopen the airway.

These brief awakenings are usually not noticed by the sleeper; however, the disruptions, which can range from five to more than 100 every hour, keep the sleeper from getting deep, quality sleep that the mind and body need.



YOU MAY HAVE SLEEP APNEA IF…

You or your sleep partner notice one or more of these symptoms:

- Loud, chronic snoring (a strong indicator of sleep apnea but not always).
- Choking, gasping or snorting during sleep.
- Observed episodes of breathing cessation during sleep.
- Waking up with shortness of breath, chest pains, headaches, nasal congestion or a dry throat.
- Morning headache.
- Excessive daytime sleepiness.
- Difficulty staying asleep.

Most people with sleep apnea do not realize their sleep time has been repeatedly interrupted.

APNEA = "WITHOUT BREATH"

FACTORS THAT MAY INCREASE
YOUR RISK OF DEVELOPING OBSTRUCTIVE SLEEP APNEA

EXCESS WEIGHT
Fat deposits around the upper airway may obstruct breathing.

NECK CIRCUMFERENCE
A neck circumference greater than 17 inches for men and 16 inches for women is associated with an increased risk of sleep apnea.

RECESSED CHIN, SMALL JAW OR LARGE OVERBITE
These physical traits are commonly associated with a narrowed airway and increased risk.

HIGH BLOOD PRESSURE (HYPERTENSION)
Sleep apnea is more common among people who have high blood pressure.

FAMILY HISTORY
Those who have family members with sleep apnea may be at increased risk.

BEING MALE
Men are twice as likely as women to have sleep apnea. However, a woman's risk increases if she is overweight or has experienced menopause.

AGE
Although the risk increases at age 40, sleep apnea occurs two to three times more often in adults older than 65.

ALCOHOL, SEDATIVES OR TRANQUILIZERS
These substances relax the muscles in the throat and can narrow the airway.

SMOKING
Smokers are three times more likely to have obstructive sleep apnea. Smoking may increase the amount of inflammation and fluid retention in the upper airway.

OTHER TYPES OF SLEEP APNEA
Less common are central sleep apnea and complex sleep apnea. Both are attributed to an abnormality in the brain that fails to properly control breathing during sleep, rather than a blockage in the airway.

Do not delay contacting a doctor if you suspect you have sleep apnea.

SUSPECT YOU HAVE SLEEP APNEA?
Sleep apnea is treatable but potentially life threatening if left untreated. Sleep apnea can lower blood oxygen, increasing the risk of heart problems. If you suspect you have sleep apnea, contact a doctor immediately. Only a doctor can diagnose a sleep disorder.

BNSF'S COMMITMENT

Achieving and maintaining good health is important for you, your family and your fellow railroaders. BNSF is committed to providing railroader-focused information and programs on a variety of health and wellness topics. It's up to you to take advantage of them. Find out more about the resources available to you at employee.bnsf.com > Employee tab > Wellness subtab.

IS IT SNORING OR SLEEP APNEA?

Use the following scale to choose the most appropriate answer for each question:

1 = Never 2 = Sometimes 3 = Usually

___ Does your snoring disturb your bed partner?

___ Do you snore in all sleeping positions?

___ Do you ever wake suddenly because of snoring?

___ Are you tired when you wake up from a sleep period?

___ Are you tired during the day?

___ Do you fall asleep while at the movies or reading?

___ Do you stop breathing for several seconds between snores?

___ **TOTAL SCORE**

Between 7 and 10 points
Your snoring falls into the mild annoyance category.

Between 11 and 15 points
Your snoring is probably disturbing you and your bed partner and may require treatment.

Between 16 and 21 points
Your snoring is significantly disrupting your sleep and may be putting you at risk for more serious problems.

Source: Circadian Workforce Solutions

BNSF Wellness

On employee.bnsf.com,
go to Employee tab
> Wellness subtab.

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817-352-1639

Sounding Off for Sound Sleep

As a University of Chicago medical student, William C. Dement stumbled into a research career that would eventually make him one of the world's foremost experts on sleep. But at the time -- the mid-1950s -- most scientists had doubts when the young researcher announced that our brains are active through the night.

Over the years, Dr. Dement's persistence and scholarship won over skeptics -- and launched today's science of sleep research.

By tracking brain wave activity and eye movements, he discovered rapid eye movement (REM) and mapped the architecture of sleep, learning that we pass through a consistent set of stages during our night's rest.

In 1963, Dr. Dement became a professor of psychiatry at California's Stanford University. By 1970 he had set up the world's first sleep disorders clinic, where patients stayed overnight while doctors monitored their slumber. The result: groundbreaking insights into disorders such as narcolepsy, insomnia and sleep apnea.

Dr. Dement also has campaigned to increase public awareness of sleep problems. He founded the American Sleep Disorders Association in 1975 and served as its president for 12 years. Until recently, he chaired the National Commission on Sleep Disorders Research, and he remains chairman of the National Program on Insomnia and Sleep Disorders.

Q: How important is sleep to overall health?

Dr. Dement: I like to say there's a triumvirate of health: nutrition, physical fitness and sleep. For the most part, sleep gets ignored.

Q: What percentage of us have sleep problems?

Dr. Dement: At least half the population has a sleep disturbance at any given time. Stress-induced insomnia is probably the most common, though it's not a sleep disorder in the clinical sense -- it's more of a symptom.

Q: What's the most common serious sleep disorder?

Dr. Dement: Obstructive sleep apnea. I believe it progresses to death if it isn't treated. It affects 30 million Americans. I think that makes it the No. 1 serious chronic illness.

Q: How can you tell whether you're getting enough sleep?

Dr. Dement: If you feel good all day long -- wide awake and alert -- you're getting enough sleep. If you're feeling pretty drowsy after lunch and it's pretty hard to get up in the morning and you have a glass of wine and it hits you pretty hard, then you've got a sleep debt -- you're not getting as much sleep as you need.

Q: What are the most vital things you can do to sleep well consistently?

Dr. Dement: The first thing is to really take it seriously. What we find is that in our busy lives, people generally don't even think about "will I be able to get enough sleep?"

Q: What are some other habits that ensure good, consistent sleep?

Dr. Dement: Regularity is good. Allowing time to get the sleep you need, planning so that happens, not allowing yourself to get too sleep deprived, avoiding things that you take into your body that disturb sleep -- caffeine being No. 1, alcohol probably being No. 2 -- and realizing that you don't fall asleep when you're all excited or angry.

Q: The bedroom should be reserved for sleeping?

Dr. Dement: Right. And you should have a ritual that favors sleep. People should know when they're getting sleepy. If you pay attention, you'll notice that you get drowsy at the same time.

Q: Does the amount of sleep needed vary a lot from person to person?

Dr. Dement: There's kind of a bell-shaped curve. Eight hours is pretty much the average. Almost everybody is between six and nine. The problem is, with the longer sleepers, there's so much demand to sleep less.

Q: We seem to admire people who can get by on very little sleep.

Dr. Dement: Absolutely, but almost all of them don't really get by. It can kill people. People who don't get enough sleep are impaired. They can't function as well mentally.

Q: What are some effects of sleep deprivation?

Dr. Dement: Mood is negatively affected. Cognition is negatively affected. Reaction time is increased. Human interactions are impaired. You can start to have micro-sleeps, which can be very dangerous. Motivation is impaired -- you become apathetic. There's inconsistency in performance. You make errors of omission and commission.

Q: When do those impairments kick in?

Dr. Dement: You can start to measure them after just a couple of hours of sleep loss.

Q: Do you follow your own advice on sleep?

Dr. Dement: Pretty much. I try to get at least seven hours. I'm the kind of person who will leave a dinner party, will leave guests. I'll say, "It's my bedtime folks, sorry." If I don't respect sleep, who will?

Sleep Disturbances

"To sleep -- perchance to dream," wrote Shakespeare in his masterpiece play, Hamlet. It's a nice concept. For some people, however, the elusive road to slumberland is anything but a dream.

For many, the road is paved with obstacles -- often a sleep disorder, ranging from insomnia to restless legs syndrome to sleep apnea, during which individuals usually snore, experience fitful sleep, and may stop breathing for short periods, in some instances hundreds of times a night. The consequences of sleep deprivation, specifically the "problem sleepiness" during the day that normally follows, can have extremely serious, even life-threatening consequences.

Considering we spend nearly one-third of our lives tucked in bed, you would think we would know how to get a good night's rest. Not so for many. If you have sleep difficulties, you're not yawning alone -- chances are some of your family members, coworkers and neighbors also have a "sleep debt," the cumulative effect of not getting the quantity or quality of sleep that one needs. As many as 40 million Americans are afflicted with more than 70 types of sleep-related problems.

While some sleep disturbances may be linked to biological changes associated with aging or certain physical diseases, especially those that cause pain, others may be associated with a mental health disorder such as depression or anxiety. Poor sleep may also stem from "bad" habits such as napping too long or too late in the day, or doing shift work, which applies to nearly one quarter of the population, according to the National Center on Sleep Disorders Research. The center is part of the National Heart, Lung and Blood Institute, a unit of the National Institutes of Health (NIH). On the other hand, you may simply not be giving yourself the opportunity to acquire ample shuteye.

Nature of sleep deprivation

Why isn't America getting a better night's rest? "It's a two-part problem," James P. Kiley, Ph.D., director of the National Center on Sleep Disorders Research explains. "First, we have a society that's on a 24-hour cycle -- with multiple jobs in many cases and multiple responsibilities both at work and home. When you're pushed for time, as many people are, the first thing that usually goes is sleep." When you sacrifice hours this way, however, you frequently end up paying for it in terms of decreased productivity and an increased risk for errors in judgment and accidents, according to Dr. Kiley.

He said that the second part of the problem relates to actual sleep disorders. Insomnia --the inability to fall asleep and remain there -- affects many millions of people. "For sleep apnea, easily another 10 to 15 million. Narcolepsy [falling asleep uncontrollably during the day], perhaps 250,000. We don't even know how many people have restless legs syndrome [RLS]. In general, society is not well rested, and looking at these numbers and their causes, you begin to see why," Dr. Kiley explained.

While people of any age may be affected, there seems to be a large prevalence of sleep disturbances among elderly men and women. Sleep studies reveal that they get less REM (deep) sleep over time. With aging, sleep becomes more fragile, that is, it doesn't take much disturbance to awaken the individual. Women may first notice this during menopause.

Lack of sleep and its link to accidents -- automobile and on-the-job -- now appears to be a problem of far greater magnitude than previously believed. Fatigue leads to diminished mental alertness and concentration. According to Dr. Kiley, it's the resultant "near miss" (in a motor vehicle or otherwise) that sometimes makes people recognize they have a problem and need to seek professional help.

He says there could be as many as 1,500 sleep-related automobile fatalities annually in the United States. Shift workers are especially prone to this problem. "Their biological clock is ticking at the wrong time, and they typically drive home after work when they're extremely tired. Young males under 25 also have a disproportionate number of auto accidents related to sleepiness. We want to target them through education; in fact, we're currently working on a program with the U.S. Department of Transportation that we hope will be very effective in this area," said Dr. Kiley.

What about napping?

In some countries, a siesta or short daytime rest is a respected, time-honored daily ritual. Dr. Kiley also indicated it may have an important role. "With older people in particular, napping is a good practice. Because their sleep is fragmented and they get less of it at night, they typically make up for it with naps during the day. Napping works, it definitely has a role," he explained, adding that it can increase productivity and help restore your ability to think.

What about waking up too early, like before the birds' first chirp? While such "early morning awakenings" may be a sign of depression or other treatable emotional disorder, the passage of time may be the culprit. "As you age, your biological clock ticks at a slightly different rate. Because of this, you run into people with an advanced sleep syndrome -- they go to bed early and then wake up too early," said Dr. Kiley. "Again, sleep is very fragile with age and we really don't know why." In some cases, going to bed a bit later may help reset your biological clock and allow you to sleep later.

How many hours per night should you sleep? NIH sleep experts believe you should get 7 to 8 hours of sleep a night. This figure varies considerably across the age span and from person to person. Still, if you're getting less than 6 hours of sleep per night regularly, chances are you're building up your "sleep debt," and may be compromising your health and welfare, sleep authorities contend.

If you're having chronic sleep difficulties, should you merely lie there and take it? No. Dr. Kiley suggests you practice sensible sleep habits. If you've done all you can, however, and still aren't getting good, quality sleep, talk with your family doctor. If you need additional help, ask for a referral to a sleep specialist. This may be needed, in particular, for more complex conditions such as narcolepsy. While this disease is not curable, it is treatable, though the regimen with carefully prescribed medications is complicated, and best handled by a sleep specialist. On the other hand, "we've made great strides in the sleep apnea area. General practitioners now do a pretty good job of diagnosing this condition," Dr. Kiley said.

Source: National Institutes of Health

Sensible Use of Sleep Aids

From time to time, almost everyone has a bad night when sleep is elusive. Short-term insomnia lasts only a few days and is usually not a cause for concern. However, if you cannot sleep on most nights for 2 to 3 weeks, talk to your health care provider. Insomnia that lasts this long usually continues until the cause is treated. For short-term problems getting to sleep or staying asleep, taking an over-the-counter (OTC) sleep aid can be a safe and effective way to get a good night's sleep.

A good night's sleep for most adults is about eight hours long, although some people may need as few as four hours or as many as 10. How do you know how much sleep you need? Think of how you feel in the morning. If you feel refreshed upon awakening, you've had enough sleep.

What's in a sleeping pill?

Most OTC sleep aids contain antihistamines. Some common antihistamines found in OTC sleep aids are benadryl (diphenhydramine) and doxylamine. The primary use of antihistamines is to block the effect of histamine on the nasal passages reducing congestion, sneezing and coughing. A side effect of antihistamines is the induction of drowsiness so they are sometimes used to treat insomnia. They may give people a groggy feeling the next morning. Antihistamines should also be avoided in people with heart disease and in older people. Older people may become confused with antihistamines and older men can develop problems urinating.

Prescription sleeping pills are different, they act in areas of the brain to help promote sleep. Since the 1970s, the most commonly prescribed are benzodiazepines, such as valium. They work on a molecular level with the brain chemical known as GABA. GABA opens chloride channels, quieting brain activity and allowing sleep. Benzodiazepines work in conjunction with GABA to enhance sleep. Some benzodiazepines used as sleep aids are Halcion (triazolam), Prosom (estazolam) and Restoril (temazepam).

Newer sleep medications are unrelated to benzodiazepines but block the same receptors and therefore mimic benzodiazepines. Ambien (zolpidem), Sonata (zaleplon) and Lunesta (eszopiclone**)** are newer, non-benzodiazepine medications used to treat insomnia. These drugs have fewer side effects and are being prescribed more commonly than the benzodiazepines. Other prescription drugs are in the “pipeline” for approval to treat insomnia.

In 2005, the U.S. Food and Drug Administration (FDA) approved Rozerem (ramelteon) for the treatment of insomnia characterized by difficulty falling asleep. It acts as a selective agonist at two melatonin receptors

If you are taking a prescription or OTC sleep aid, don't ever take more than the recommended dose, don't drink alcohol while taking them, and don't combine different kinds. Pregnant women should avoid sleeping pills altogether.

Two dietary supplements -- the valerian root and melatonin -- have recently been touted as "natural" sleep aids, but few studies have been conducted to determine their effectiveness, how they work or possible side effects. Melatonin, which is the most widely used supplement, is secreted by the brain's pineal gland in response to darkness, resulting in a lowered body temperature and drowsiness. Initial reports indicate the supplement is best used to regulate the body's internal clock when adjusting to jet lag of about an hour or to shift work.

Coping with sleeplessness

Peter Hauri, Ph.D., a sleep expert and author of "No More Sleepless Nights," says about 10 percent of the U.S. population has serious problems with insomnia that chronically affects their daily functioning. How he works with his patients may also help those with occasional sleep problems. "Insomniacs typically stay in bed too long in a shallow sleep, when they're half awake," he says. "It's not restful or restorative.

"It's a paradox," Dr. Hauri adds. "Most good sleepers don't stay in bed long enough, but most insomniacs stay in bed too long."

The clock is another problem. "A clock in the bedroom is poisonous if you can't sleep," he says. "You just keep looking at it. Set the alarm and then hide it."

Dr. Hauri also suggests that if you are having trouble sleeping, try a warm bath or glass of warm milk before bedtime. There may be an underlying medical or psychological problem that needs to be addressed. You may get too much caffeine, not get enough exercise or not unwind before you go to bed. "Some people worry so much about falling asleep that it makes it even more difficult," he says.

Taking a sleeping pill is appropriate when used according to directions during those rare occasions when sleeping is difficult. Examples are adjusting to jet lag; changes in your shift-rotation; a personal crisis, such as the loss of a loved one; or stress related to a specific event, such as giving a presentation.

There are two major drawbacks to taking sleep aids chronically:

- The pills start to lose their effectiveness.
- When a person stops taking the pill, it becomes even harder to sleep.

Remember that you may even have unrealistic assumptions or expectations about how much sleep you need. "You don't need much more than 71/2 hours of sleep a night," Dr. Hauri says.

Sleep Apnea

Sleep apnea is a disorder in which breathing stops and starts during sleep. More than half of all cases are diagnosed in people age 40 or older. Sleep apnea is more common in men than women. It is a major cause of daytime sleepiness and can potentially have serious consequences.

Causes

Anyone can have sleep apnea, but you are at higher risk if you:
- Are male
- Are over age 40
- Snore loudly
- Are overweight or obese
- Have high blood pressure
- Have a structural abnormality in your nose, throat or other parts of your upper airway that causes blockage or have nasal allergies and/or chronic nasal congestion
- Have a family history of sleep apnea
- Use alcohol, tobacco or sleeping pills

Symptoms

If you or someone else notices you that you stop and start breathing while sleeping, you may have sleep apnea. Other signs and symptoms include:
- Excessive daytime sleepiness
- Poor concentration
- Depression or irritability
- Early morning headaches

Types of Sleep Apnea

There are two types of sleep apnea: obstructive, which is common, and central, which is extremely rare.
- Obstructive sleep apnea occurs when the throat muscles and tongue relax during sleep. This can block the opening of your airway, causing breathing to become difficult or to stop altogether. When your brain senses you aren't getting enough oxygen, it briefly wakes you enough to resume breathing. This cycle can repeat itself as many as 20 or 30 times an hour. For most people with obstructive sleep apnea, each awakening is so brief they are not aware it happened. Although you may not be aware that your sleep was interrupted, this condition prevents you from reaching a deep, restful sleep. Most people with obstructive sleep apnea also snore, although not everyone who snores has sleep apnea.
- Central sleep apnea is much less common than obstructive sleep apnea. This condition occurs when the brain fails to send the proper signals to the muscles that control breathing. Unlike the obstructive type, which is intermittent, central sleep apnea is a constant problem and is frequently present from birth. Congenital central hypoventilation syndrome is an inherited condition that results in both daytime apnea and more profound apnea at night. The responsible gene has been isolated. Most people with central sleep apnea require assisted ventilation during sleep.

Treatment

If you have symptoms of sleep apnea, you may have a test called polysomnography. During this test, you are hooked up to equipment that records a variety of body functions during sleep such as pulse rate, respiratory rate, oxygen saturation and EEG activity. Early diagnosis and treatment of sleep apnea is important, because the condition may be associated with irregular heartbeat, high blood pressure, heart attack and stroke.

Treatment for sleep apnea varies, depending on your medical history, the physical examination and the results of your polysomnography.

The most common treatment for sleep apnea is continuous positive airway pressure (CPAP). In this treatment, you wear a mask over your nose during sleep, and slight pressure from a compressor forces air through the nasal passages. The air pressure is adjusted so it is just enough to prevent your throat from collapsing during sleep.

Some people who have sleep apnea may need surgery. Several surgical procedures can be used to increase the size of the airway. This may include the correction of structural deformities or the removal of:
- Adenoids and tonsils (especially in children)
- Nasal polyps (noncancerous tumors) or other growths
- Excess tissue in the airway

Self-Care

If you have obstructive sleep apnea, there are several steps you can take that may help your condition.
- Lose excess weight. Even a 10 percent weight loss can reduce the occurrence of sleep apnea. An ideal body mass index (BMI) is 18.5 to 24.9. If your BMI is 25 or higher, losing weight may improve or stop sleep apnea.
- If you usually sleep on your back, try sleeping on your side. Special pillows and other devices are available to help you sleep in a side position.
- Don't use alcohol, tobacco, sleeping pills or other medication that cause drowsiness or sedation. These substances can make the airway more likely to collapse during sleep and prolong the periods of sleep apnea. Sleeping pills or sedatives can prevent you from waking up enough to breathe.

Decision Guide for Sleep Apnea

Symptoms/Signs	Action
Observed episodes of sleep apnea	 See provider
Daytime sleepiness	 See provider
Choking or gasping for breath	 Emergency: Call 911

Becoming Aware of Obstructive Sleep Apnea

People who feel exhausted during the day may suffer from obstructive sleep apnea, a sleep disorder that's only become widely recognized in the last few years. In sleep apnea breathing stops or gets very shallow during sleep. Each pause typically lasts 10-20 seconds or more. These pauses can occur 20 to 30 times or more an hour. The most common type of sleep apnea is obstructive sleep apnea. In this form the throat briefly collapses, causing pauses in breathing. The pauses in breathing, causes the oxygen level in the blood to drop and the carbon dioxide level to rise. Normal breaths then start again with a loud snort or choking sound. The other type of sleep apnea is called central apnea. It is rare and happens when the area of the brain that controls breathing doesn't send the correct signals to the breathing muscles.

The body needs sleep for rest and rejuvenation. "Sleep is an essential part of your life. If your sleep is disrupted or you do not have enough sleep, you'll be less alert during the day and perhaps suffer serious consequences for your health in general," says Dr. Vishesh Kapur, an assistant professor of pulmonary and critical care medicine at the University of Washington School of Medicine. Untreated sleep apnea can increase the chance of having high blood pressure, a heart attack or stroke. It can also increase the risk of diabetes and the risk for work-related accidents and driving accidents. A study in the Nov 10, 2005 New England Journal of Medicine reported that in patients with sleep apnea the rate of both stroke and death was twice as high, over a three year period, as that in people with normal sleep patterns.

In sleep apnea, it may be the bed partner who notices the problem first. Often, its victims do not know they have a sleep disorder. They only know they wake up wishing that they could go back to bed. They may also not get enough sleep to begin with, a common problem in today's society, Dr. Kapur says. They may assume their problem is that they need more sleep, and take naps in the afternoon or sleep extra long hours on weekends. But the real problem is their quality of sleep.

It's often up to the bed partner to notice the chief symptom of sleep apnea: snoring. What makes apnea different from other types of snoring is that in apnea, the soft palate and soft tissues of the pharynx block the airway so much that the person simply stops breathing. The build up of carbon dioxide and interruption of oxygen eventually causes the sleeper to arouse enough to gasp for a breath of air and then the cycle begins again. This disruption prevents the sufferer from getting high-quality sleep.

Many snorers, but not all, have apnea. There is first the distinctive, rhythmic snoring sound. There's the regular snore -- then a pause. The person has stopped breathing. Then the air rushes back in with a distinctive, loud snort, and then a breath. Many people do this a few times an hour, Dr. Kapur says, and that's OK if they feel alright in the morning. But apnea needs treatment if the person stops breathing dozens of times an hour, and wakes up exhausted.

One of the chief causes of apnea is obesity. The weight of extra soft tissue in your throat and an obese chin presses down on what is already a narrow airway to begin with, Dr. Kapur says. But thin people can get apnea, too. In part, it's a sign of aging. The muscles lose their resting tension. Other cause are large tonsils and adenoids and a small mouth and throat area.

The first thing to do if you think you have apnea or any other sleep disorder is to discuss the matter with your health care provider. He or she may refer you to a sleep specialist. The sleep specialist will interview you. If the sleep disorder is affecting your life or threatening your health, you may be invited into a sleep lab. There, you'll be connected to monitors and fall asleep in a comfortable bedroom-like highly instrumented hospital room. Staff will measure everything from your breathing and brain waves to the tone of your chin muscles. As you doze, they'll diagnose you.

Doctors may suggest many solutions to apnea, including weight loss. One popular treatment is the CPAP, Continuous Positive Airway Pressure machine. The CPAP mask is worn over your nose. As you sleep, the staff calibrates the CPAP so it blows just the right amount of air into your body, propping open your airways. Then, you take the machine home to use at night.

People suffering exhaustion from apnea are often delighted with the CPAP, Dr. Kapur says. Sometimes, people with less severe cases find the machine uncomfortable and not worth the effort. Some of these people may get a dental appliance, which is installed to pull out the jaw enough to open the airway.

Snoring

Although often depicted as cute or comic in television shows, theater and movies, snoring is not funny. It can disturb sound, restful sleep both for the person snoring and anyone within earshot of his or her rough, hoarse, nightly orchestrations. About 35 million Americans snore at some time, to some degree, during sleep.

The snoring sound occurs through a fairly complex, mechanical process. The first requirement is a narrowing of the upper airway passages or a looseness or flapping in the throat. Narrow upper air passages force a person to work harder at breathing during sleep, pulling in air with greater force to try to overcome the narrowing, or obstruction. Greater airflow through a narrow or obstructed passage causes a drop in pressure, pulling the walls of the throat inward. The flexible walls of the throat begin to recoil and vibrate, setting off the sound we know as snoring.

Snoring can be caused by one factor or by many, depending on the individual. And, it can be it's own problem or indicate other medical conditions, some of them serious. The list of causes and aggravating factors is a lengthy one. Leading the list of causes is a narrowing of the upper air passages from an increase in size of throat tissues, such as large tonsils and adenoids; an enlarged or long uvula; an enlarged tongue; an increased neck size, especially in people who are overweight; narrowed nasal passages, from allergies, infection, polyps or tumors; and a deviated septum. Other causes and aggravating factors include obesity, poor muscle tone in the throat, fatigue, medication, alcohol consumption, smoking and sleeping on your back.

Because snoring is a breathing problem, it can mean you get less oxygen during sleep, causing you to wake up feeling tired. In many cases, snoring can be a warning sign of obstructive sleep apnea, a potentially dangerous medical condition in which breathing actually stops for 10 seconds to more than a minute, hundreds of times a night. "Apnea" is a Greek word that means "without breath." This interruption in breathing lowers oxygen levels and raises carbon dioxide levels in the blood, a condition doctors call hypoxia.

Sleep apnea can have serious consequences for someone with a heart condition or circulatory problem; for others, it can mean chronic fatigue -- affecting work and home life. In fact, the fatigue from sleep apnea boosts the risk of traffic accidents sevenfold, a risk eclipsed only by driving while intoxicated. Ten to 15 percent of people who snore have obstructive sleep apnea to a mild, moderate or severe degree.

What to Do

If your snoring is loud enough or frequent enough to disturb others in your home, or if it leaves you feeling fatigued during the hours of the day during which you need to be awake and alert, make an appointment to see your physician. Your health care provider may make several suggestions or may recommend that you see a specialist for an evaluation of your problem. If you feel chronically tired during the day, ask your sleeping partner or housemates whether you snore. Keep a sleep diary, recording the time you go to bed, the time you awaken, how you felt the next day and whether you recall awakening during the night. Record whether you had a large meal or drank alcohol within a few hours of bedtime and whether you had symptoms of a cold or allergy, and which, if any, medications you took, including over-the-counter medications.

Use Medicine Effectively

Depending on the cause of your snoring, a physician may prescribe medication. If nasal allergies or infection is causing the problem, effective medicines are available. If you're taking over-the-counter medications to help you sleep, stop and call your health care provider to discuss. If you have allergies or a cold, take over-the-counter medications, when appropriate. If you smoke, your provider also may prescribe medication to help you quit smoking. A specialist may prescribe a special mask, known as a CPAP device, to be worn at night. The device creates constant positive air pressure on your upper airway.

Other Treatements for Snoring

The American Academy of Otolaryngology says other possible treamtents for snoring. include: Laser Assisted Uvula Palatoplasty (LAUP), a surgical procedure that removes tissue obstructing the airway and Injection snoreplasty, a nonsurgical treatment for snoring that involves injecting a hardening agent into the upper palate.

Self-care Steps for Snoring

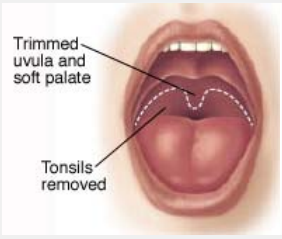
- If you're overweight by 10% or more, try to lose weight if you're overweight by 10 to 20 percent of your body weight.
- If you smoke, quit.
- Sleep on your side or stomach; sleeping on your back can worsen snoring.
- Do not eat a large meal or drink alcohol within three hours of bedtime
- Be careful about using over-the-counter devices and medications to stop snoring unless advised to try one by your health care provider.
- Cut back on caffeine or cut it out.

Decision Guide For Snoring

Symptoms/Signs	Action
Adult who snores occasionally and not too loudly	 Use self-care
Adult who snores routinely and/or loudly	 Call provider's office
Snoring that is accompanied by gasping for breath or brief cessation in breathing	 See provider
Obese adult or child who snores	 Call provider's office
Adult or child who snores and is routinely fatigued	 Call provider's office
Not getting routine exercise	 Use self-care
Consuming too much caffeine	 Use self-care

Surgical Treatment for Snoring and Sleep Apnea

The goal of most surgeries for breathing problems is to widen the airway. This is done by taking out or shrinking excess tissue where the mouth meets the throat. Nasal and jaw surgery can help correct nose or jaw problems that contribute to snoring and apnea. This sheet describes procedures that may be recommended for you.



UPPP trims the uvula and removes other tissue from the back of the mouth.

UPPP (Uvulopalatopharyngoplasty)

This is the most common procedure for sleep apnea. It trims the soft palate and uvula, and removes the tonsils and other tissue. It is major surgery performed in a hospital.

Risks and Complications of UPPP

• Bleeding • Throat pain • Scarring	• Nasal-sounding speech • False feeling that something is in throat • Liquids sometimes going into nose when swallowing

LAUP (Laser-Assisted Uvulopalatoplasty)

This procedure helps relieve snoring. It may also be used in some cases of mild apnea. The doctor uses a laser or electric current to remove some of the soft palate and part or all of the uvula. This treatment may be done over several sessions in the doctor's office.

Risks and Complications of LAUP

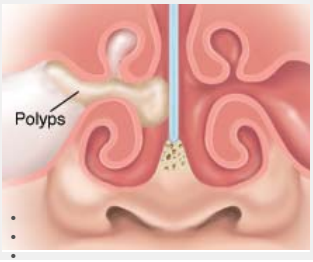
The risks and complications are the same as for UPPP, but less likely to occur.

RFA (Radiofrequency Ablation)

This procedure helps relieve snoring. The doctor uses radio waves to reduce the size of the turbinates or uvula, nearby tissue, and sometimes the back of the tongue.

Risks and Complications of RFA

• Mouth ulcer • Nerve pain	• Swelling in airway • Pocket of pus (abscess) on tongue

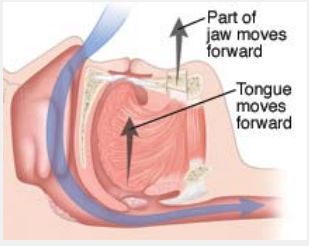


Nasal Surgery

Problems in the nose can make snoring or sleep apnea worse. They can also make CPAP (a common treatment for snoring and sleep apnea) harder to use. If blockages in your nose are severe, surgery can improve the airflow. It can reduce the size of the turbinates, straighten a deviated septum, and remove any polyps (overgrowths of sinus lining.)

Risks and Complications of Nasal Surgery

- Bruising
- Bleeding
- Damage to or perforation of septum
- Dryness in nose



Jaw Surgery

If your jaw sits too far back, your tongue may also be too far back. That makes the tongue more likely to block the airway when you sleep. Moving the jaw forward moves the tongue forward and widens the airway overall.

Risks and Complications of Jaw Surgery

In some cases, the jaw does not heal in the desired position. Your doctor can tell you more about this. Other possible complications include:

- Loss of teeth or need for orthodontic treatment to realign teeth.
- Loss of feeling in jaw or teeth.
- Change in facial appearance.

More Severe Cases

If your apnea is severe and no other treatment helps, other kinds of surgery may help. Your doctor can tell you about them. Be sure you understand their risks, as well as their benefits.

The Story Behind Sleep Apnea

Do you snore at night or feel tired during the day? If so, you could be suffering from obstructive sleep apnea, a disorder that affects millions of Americans. Most people with sleep apnea aren't aware they have it.

When you have obstructive sleep apnea, your breathing becomes shallow or stops because your throat briefly collapses while you're asleep, temporarily closing your airway. Pauses can last 20 seconds or more and can occur 30 times or more every hour, according to the American Sleep Apnea Association (ASAA).

When these pauses happen, the amount of oxygen in your blood may drop. Eventually, your brain tells your upper airway to reopen. Normal breathing starts again with a loud snort or choking sound. When you start breathing again, you may not wake up completely, but your sleep is disrupted.

Obstructive sleep apnea occurs in both adults and children.

Another form of sleep apnea, called central sleep apnea, happens when the area in your brain that controls breathing doesn't send the proper signals to the muscles that help you breathe, according to the National Heart, Lung and Blood Institute. Central sleep apnea is rare.

Common symptoms

Snoring and daytime fatigue are two common signs of obstructive sleep apnea, but there are others, as well. And not everyone with obstructive sleep apnea snores. A headache or dry throat when you first wake up, trouble remembering or concentrating, and irritability or moodiness also may be symptoms.

Sleep apnea occurs twice as often in men as in women. But, after menopause, a woman's risk doubles or triples, the ASAA says. Most people who have sleep apnea are overweight, snore loudly and may make snorting sounds while they're asleep. That's why a spouse or other family member may notice the problem first.

If you have high blood pressure, a family history of sleep apnea or narrow air passages in your nose, throat or mouth, you may be more likely to develop the condition. A history of injury or nasal allergies also increases your risk.

Health effects

Research indicates that sleep apnea increases your risk of high blood pressure. It also has been linked to other serious health problems, including stroke, congestive heart failure, obesity and diabetes. In one study, there was a 50 percent increase in heart attack risk. Because you're so tired, you may be at risk of having an accident at work or while driving.

What to do

Changes in your daily activities or habits may help you breathe better at night:

- Avoid alcohol and medications that cause drowsiness. They make your throat muscles relax.
- Lose excess weight. Even a 10 percent drop in body weight may help. If less soft tissue is around your airway, it's less likely to close.
- Sleep on your side instead of your back so that your tongue can't relax into the back of your throat.

If symptoms persist, you may need treatment. The most common treatment for adults with obstructive sleep apnea is continuous positive airway pressure (CPAP). A mask that fits over your nose blows air into your airway to keep it open while you sleep. A custom-made mouthpiece is another alternative. If these approaches don't work, others, including surgery, may be recommended.