

# Overview of the field of Somnology And Impact to Population Health



Robyn Woidtke MSN, RN, RPSGT, CCSH

# Objectives

- ∞ At the completion of this module, the learner will
  - Explain the history of the field of somnology
  - Identify the importance of breakthrough research in somnology
  - Consider the applicability in today's healthcare environment
  - Recognize the impact of sleep health on workplace productivity
  - Consider implement sleep promoting programs in the community

# What is Somnology and Sleep Medicine?

- ∞ The branch of **science** devoted to the study and the physiology of sleep, the behavioral dimensions of sleep and the consequences of sleep loss and sleep disorders on an individuals and the general populations health, performance, safety and quality of life.
- ∞ Sleep Medicine is a branch of clinical **medicine** devoted to the diagnosis and treatment of individuals suffering from chronic sleep loss or sleep disorders

# The Mystery of Sleep

## ☞ Egypt

- Survey of ancient Egyptian papyrus describe using poppy seeds as a treatment of insomnia, a strong focus on dream interpretation

## ☞ Greece

- “sleep is produced by withdrawal of blood from the surface of the body to the larger vessels”
- Hippocrates: “sleep as is usual with us in health , the patient should be awake during the day, and sleep at night”” The worst is when no sleep either night or day for it follows from this symptom, that the insomnolency is connected with sorrow and pains or that he is about to become delirious.

## ☞ China

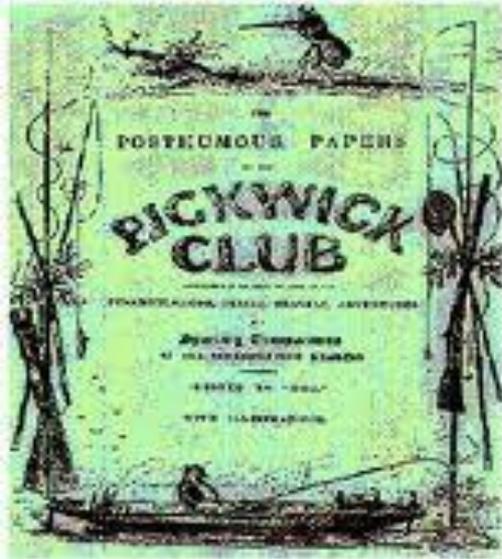
- Theory of yin and yang—sleep and wake
- Number of medications used for sleep (ephedra and ginseng)

Kirsch, D. There and Back Again: A current history of sleep  
Medicine; CHEST 2011

# Religious Writings

- ✎ Bible: Dreams were a method of prophecy
  - Mary
  - Joseph
  - Moses
- ✎ Talmud
  - “sleep is one-sixtieth death”
- ✎ Torah
  - The day and night shall consist of 24 hours, it is sufficient for a person to sleep on third thereof which consists of 8 hours

# Joe the Fat Boy-Charles Dickens 1836



- ☞ Damn that boy, he's fallen asleep again... he's always asleep. Goes on errands fast asleep and snores as he waits at the table.

# Not so Ancient



# Sleep Research Timeline

The following timeline describes some of the important milestones in the history of sleep research:

Year	Event
1875	Caton records the brain electrical activity of animals in England.
1877	The problem of narcolepsy is first described in the medical literature.
1880	Gelineau describes a group of patients in France with a problem he names "narcolepsy."
1902	Loewenfeld coins the term "cataplexy" to describe the onset of muscle weakness that often affects people with narcolepsy.
1929	Berger discovers and reports the "electroencephalogram (EEG) of man" in Germany.
1937	Loomis documents the EEG patterns of what is now called non-rapid eye movement (NREM) sleep.
1945	Ekbom describes restless legs syndrome in Sweden.
1953	Kleitman and Aserinsky at the University of Chicago describe the rapid eye movement (REM) stage of sleep and propose a correlation with dreaming.
1956	Burwell and colleagues publish a description of the obesity hypoventilation (Pickwickian) syndrome, laying the groundwork for the discovery of obstructive sleep apnea.
1957	Dement and Kleitman describe the repeating stages of the human sleep cycle.
1960	Vogel recognizes that REM sleep in narcoleptics begins near sleep onset rather than one to two hours later.
1963	Wurtman and colleagues report that melatonin synthesis in the pineal gland is under the inhibitory control of light.
1965	Oswald and Priest use the sleep laboratory to evaluate sleeping pills.
1966	Gastaut and colleagues in France, and Jung and Kuhlo in Germany discover obstructive sleep apnea (OSA).
1968	Rechtschaffen and Kales publish a scoring manual that allows for the universal, objective comparison of human sleep stage data.

# Sleep Research Timeline

The following timeline describes some of the important milestones in the history of sleep research:

1972	Studies pinpoint the suprachiasmatic nuclei (SCN) as the site of the biologic clock.
1973	First report of a narcoleptic dog.
1974	Holland gives the name "polysomnography" to the overnight sleep study.
1976	Carskadon established sleep latency as an objective measurement of sleepiness.
1981	Sullivan and colleagues use continuous positive airway pressure (CPAP) to treat OSA.
1986	Schenck, Mahowald and colleagues publish the first formal description of REM sleep behavior disorder (RBD).
1989	Rechtschaffen and colleagues find that total sleep deprivation results in the death of all rats within two to three weeks.
1991	Johns develops Epworth Sleepiness Scale to diagnose sleep disorders.
1999	Studies show that hypocretin mutations cause narcolepsy in mice and dogs.
2000	Mignot and colleagues at Stanford discover that human narcolepsy also is associated with hypocretin deficiency.
2001	Ptacek et al discover 1st human gene involved in circadian rhythms.
2003	Stickgold and colleagues publish evidence of sleep's affect on memory and learning process.
2007	American Academy of Sleep Medicine reclassifies stages of non-REM sleep into 3 categories.
2008	Young and colleagues find high mortality risk for untreated sleep-disordered breathing.
2010	Redline et al associate obstructive sleep apnea with increased stroke risk for men.

# Sleep as a Specialty

1964.  
The first sleep disorders center was established as a narcolepsy clinic at Stanford University

1975  
5 sleep centers opened, predominantly on the East Coast

1975  
Blue Shield of California recognized the significance of Sleep Medicine and began reimbursing for sleep services

1960's Association for the Psychophysiological Study of sleep:1968 R&K

1975  
First formal society for sleep medicine  
Association of Sleep Disorders Centers  
1981 First Scientific Sleep Meeting

2013  
AASM  
2500

# Professional Organizations

- ✎ American Academy of Sleep Medicine
- ✎ Sleep Research Society
- ✎ Sleep Dental Society
- ✎ American Association of Sleep Technologists (Formally, Association of Polysomnographic Technologists)
  
- ✎ Board Certification
  - Physicians and PhD
  - Sleep Technologists (RPSGT, RST, SDS)
  - New 2014: Certification in Clinical Sleep Health

# Patient Organizations

- ✎ American Sleep Apnea Association
- ✎ National Sleep Foundation
- ✎ Willis-Ekbom Foundation
- ✎ Narcolepsy Foundation
  
- ✎ Other on-line resources exist, but may not be always reliable



Everybody



Sleeps!

# Sleep Health (Defined by Buysse)

- ∞ Sleep health is a multidimensional pattern of sleep-wakefulness, adapted to individual, social, and environmental demands, that promotes physical and mental well-being. Good sleep health is characterized by subjective satisfaction, appropriate timing, adequate duration, high efficiency, and sustained alertness during waking hours.

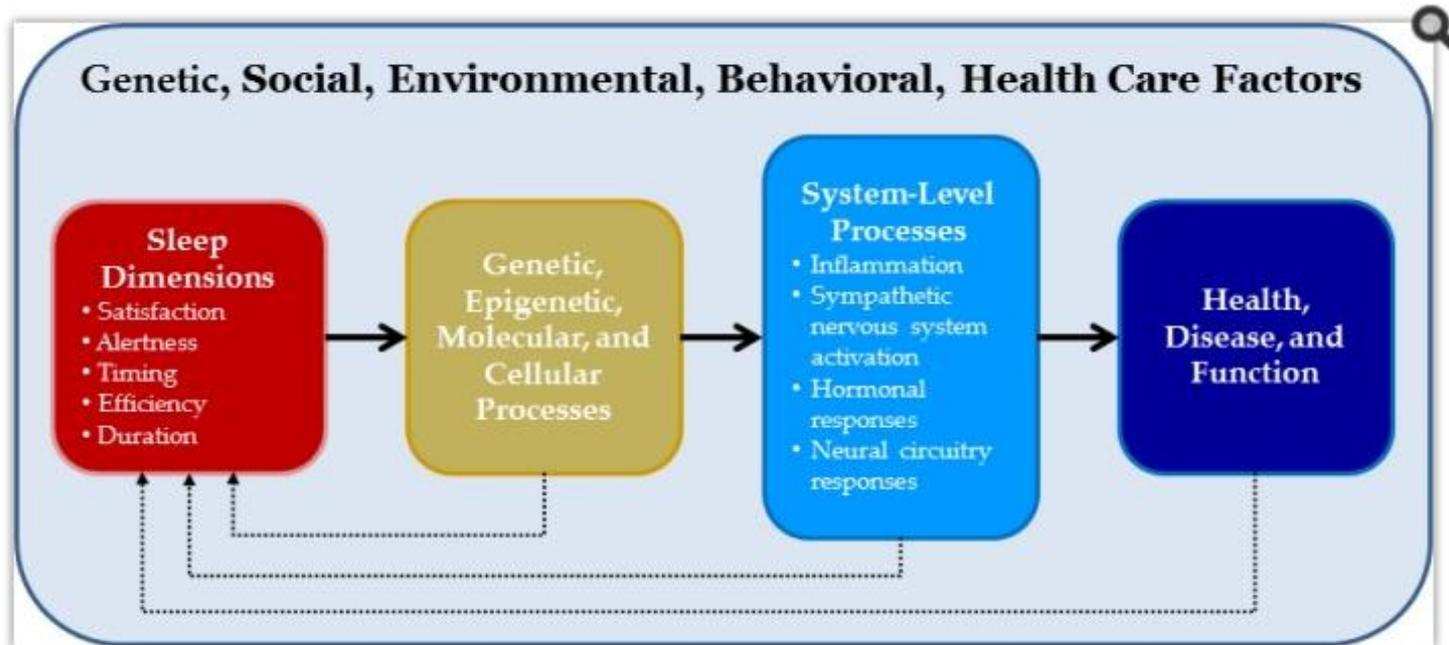
Sleep Health: Can We Define It? Does It Matter?

[Sleep. 2014 Jan 1; 37\(1\): 9-17.](#)

---

# Conceptual Model of Sleep Health

Buysse D.J, 2014



Sleep Health: Can We Define It? Does It Matter?

[Sleep. 2014 Jan 1; 37\(1\): 9-17.](#)

# Conceptual Model of Sleep Health

Buysse D.J, 2014

Sleep Measure	Associated Health Outcomes	Sample References
Satisfaction/Quality	Mortality	Kojima et al., 2000 <sup>65</sup> ; Elder et al., 2008 <sup>66</sup> ; Rod et al., 2011 <sup>67</sup> ; Hublin et al., 2011 <sup>68</sup>
	Metabolic Syndrome	Jennings et al., 2009 <sup>69</sup> ; Troxel et al., 2010 <sup>70</sup>
	Diabetes/impaired glucose metabolism	Vgontzas et al., 2009 <sup>71</sup> ; Haseli-Mashhadi et al., 2009 <sup>72</sup> ; Knutson et al., 2011 <sup>73</sup> ; Pyykkonen et al., 2012 <sup>74</sup>
	Hypertension	Vgontzas et al., 2009 <sup>75</sup> ; Fiorentini et al., 2007 <sup>76</sup> ; Rod et al., 2011 <sup>67</sup>
	Coronary heart disease	Laugsand et al., 2011 <sup>77</sup> ; Hoevenaer-Blom, 2011 <sup>78</sup> ; Appelhans, 2013 <sup>79</sup>
	Depression	Baglioni, 2011 <sup>80</sup>
Alertness/Sleepiness/ Napping	Mortality	Hays, 1996 <sup>81</sup> ; Newman et al., 2000 <sup>82</sup>
	Coronary heart disease	Newman et al., 2000 <sup>82</sup> ; Sabanayagam et al., 2011 <sup>83</sup>
	Impaired neurobehavioral performance	Dinges et al., 1997 <sup>84</sup>
Timing (e.g., shift work, chronotype)	Mortality	Åkerstedt et al., 2004 <sup>85</sup>
	Coronary heart disease	Kawachi et al., 1995 <sup>86</sup> ; Frost et al., 2009 <sup>87</sup>
	Metabolic syndrome	Karlsson et al., 2001 <sup>88</sup> ; Lin et al., 2009 <sup>89</sup> ; Pietroisti et al., 2010 <sup>90</sup>
	Diabetes/impaired glucose metabolism	Pan et al., 2011 <sup>91</sup> ; Buxton et al., 2012 <sup>92</sup> ; Reutrakul et al., 2013 <sup>93</sup>
	Accidents	Folkard and Åkerstedt, 2004 <sup>94</sup> ; Barger et al., 2005 <sup>95</sup>
Efficiency (sleep latency, wake after sleep onset)	Mortality	Newman et al., 2000 <sup>82</sup> ; Nilsson et al., 2001 <sup>96</sup> ; Mallon et al., 2002 <sup>97</sup> ; Dew et al., 2003 <sup>98</sup>
	Metabolic syndrome	Troxel et al., 2010 <sup>70</sup>
	Diabetes/impaired glucose metabolism	Cappuccio et al., 2010 <sup>99</sup> ; Engeda et al., 2013 <sup>100</sup> ; Kawakami et al., 2004 <sup>101</sup> ; Knutson et al., 2011 <sup>73</sup> ; Lou, 2012 <sup>102</sup>
	Hypertension	Vgontzas et al., 2009 <sup>75</sup> ; Javaher et al., 2008 <sup>103</sup> ; Phillips and Mannino, 2007 <sup>104</sup>
	Coronary heart disease	Laugsand et al., 2011 <sup>77</sup> ; Grandner et al., 2012 <sup>105</sup>
	Depression	Baglioni et al., 2011 <sup>80</sup>
Duration	Mortality	Wingard and Berkman, 1983 <sup>106</sup> ; Kripke et al., 2002 <sup>107</sup> ; Hublin et al., 2007 <sup>108</sup> ; Youngstedt et al., 2004 <sup>109</sup>
	Obesity	Gangwisch et al., 2005 <sup>110</sup> ; Cappuccio et al., 2008 <sup>111</sup> ; Hasler et al., 2004 <sup>112</sup> ; Buxton et al., 2010 <sup>113</sup>
	Metabolic Syndrome	Hall et al., 2008 <sup>114</sup>
	Diabetes	Ayas et al., 2003 <sup>115</sup> ; Gottlieb et al., 2005 <sup>116</sup> ; Yaggi et al., 2006 <sup>117</sup>
	Hypertension	Gottlieb et al., 2006 <sup>118</sup> ; Gangwisch et al., 2006 <sup>119</sup> ; Cappuccio et al., 2007 <sup>120</sup> ; Stranges et al., 2010 <sup>121</sup>
	Coronary heart disease	Mallon et al., 2002 <sup>97</sup> ; Ayas et al., 2003 <sup>122</sup> ; Hoevenaer-Blom et al., 2011 <sup>78</sup>
	Impaired neurobehavioral performance	Van Dongen et al., 2003 <sup>123</sup> ; Van Dongen et al., 2004 <sup>124</sup> ; Belenky et al., 2003 <sup>125</sup>

# What is Public Health?

∞ Public health is the science of protecting and improving the health of families and communities through promotion of healthy lifestyles, research for disease and injury prevention and detection and control of infectious diseases (CDC Foundation)

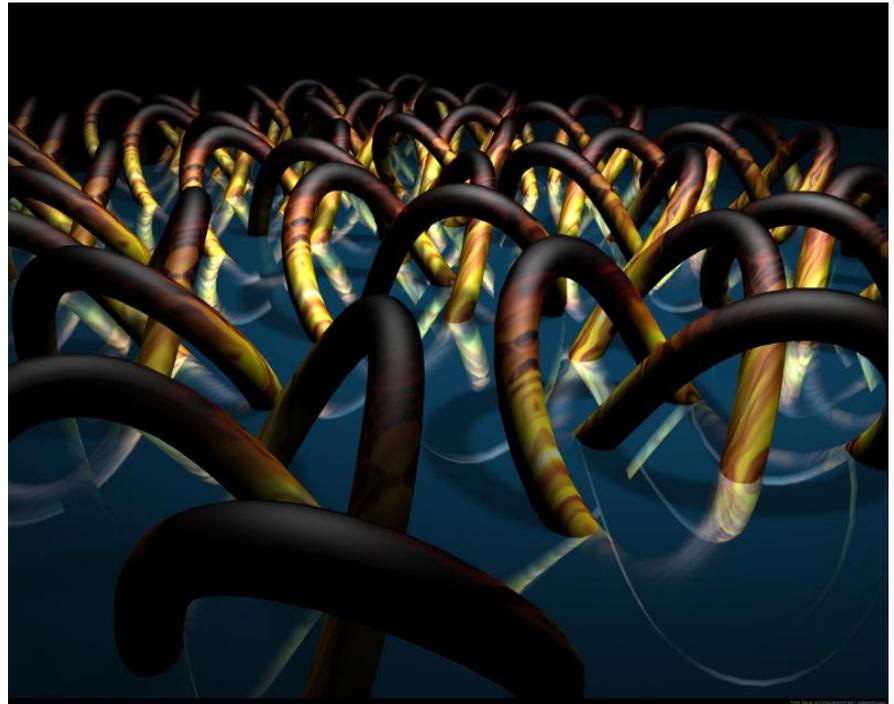
# Why is sleep an important component of population health

- ∞ “the health outcomes of a group of individuals, including the distribution of such outcomes within the group
- ∞ the overall goal of a population health approach is to maintain and improve the health of the entire population and to reduce inequalities in health between population groups

“one guiding principle of a population health approach is “an increased focus on health outcomes (as opposed to inputs, processes, and products) and on determining the degree of change that can actually be attributed to our work”

# Why learn about sleep and associated disorders?

- ∞ Sleep disorders are **chronic conditions necessitating complex treatments**. They are frequently co-morbid with other sleep disorders and other conditions (e.g., cardiovascular disease, depression, or diabetes), which, by themselves, are complex to treat.



# Sleep Disorders are Chronic Conditions

“There are numerous reasons for a **paradigm shift to chronic disease management**. Proper treatment for most sleep disorders—as for other chronic diseases such as congestive heart failure, diabetes, asthma, and depression—requires a **period of time** for fine-tuning, extended follow-up, and lifestyle changes.

IOM Report on Sleep and Sleep Deprivation 2006

# Alterations in Sleep Health

☞ Quantity

☞ Quality

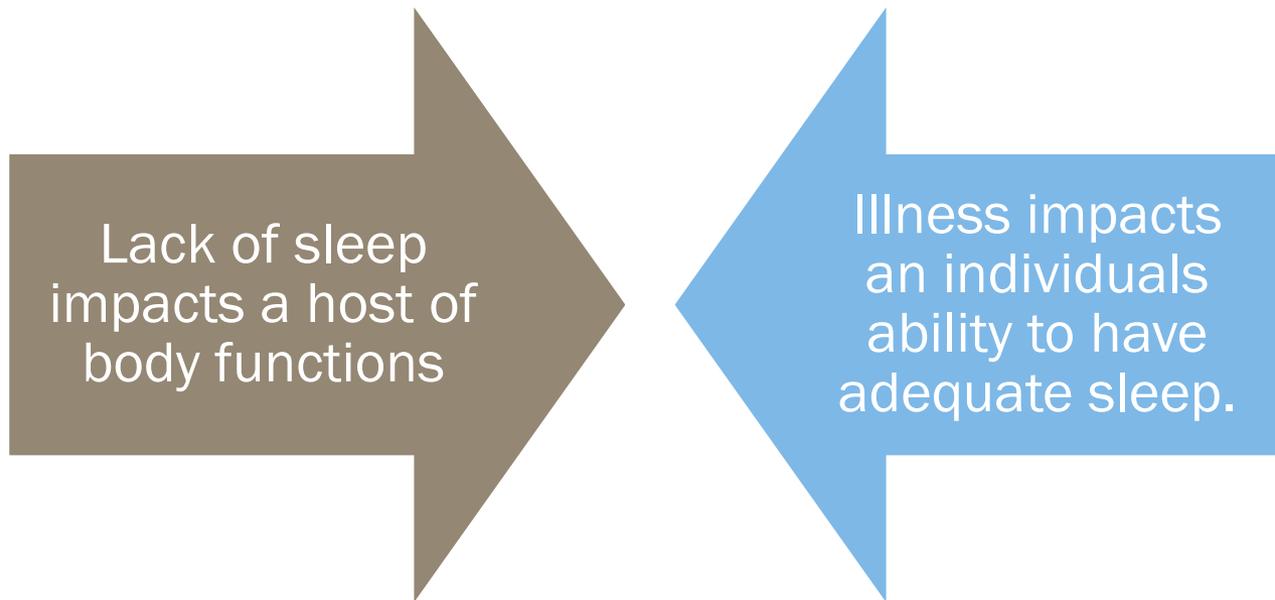
☞ Timing and  
Consistency

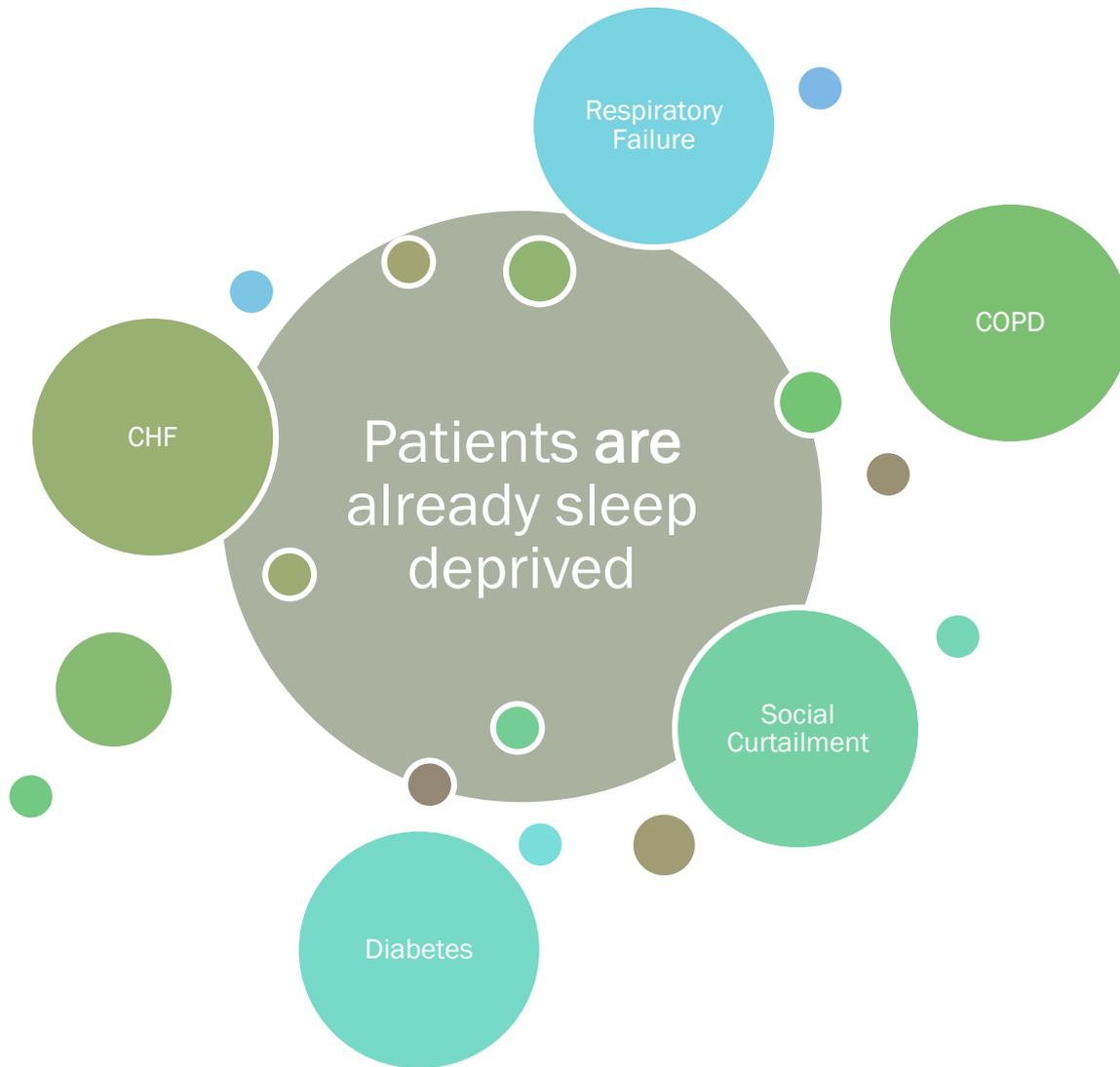
# Sleep Medicine Integration

- ∞ Make sleep inquiry an “ALWAYS EVENT”
- ∞ Bi-Directionality:
  - What is it?
  - Why is it important to other medical specialties?

# Sleep and Co-Morbidity

Bi-directional impacts





# Co-Morbidity and Sleep



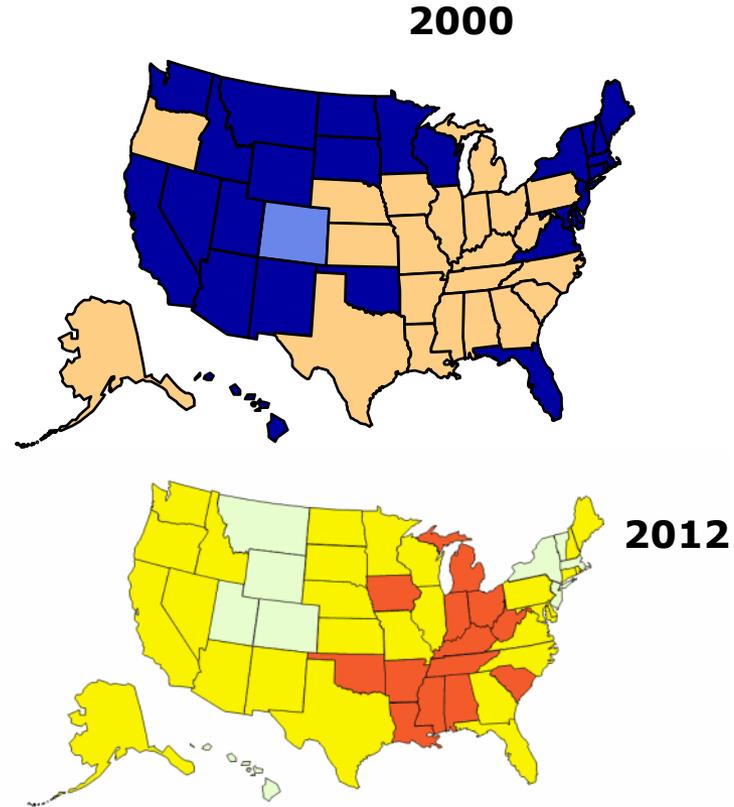
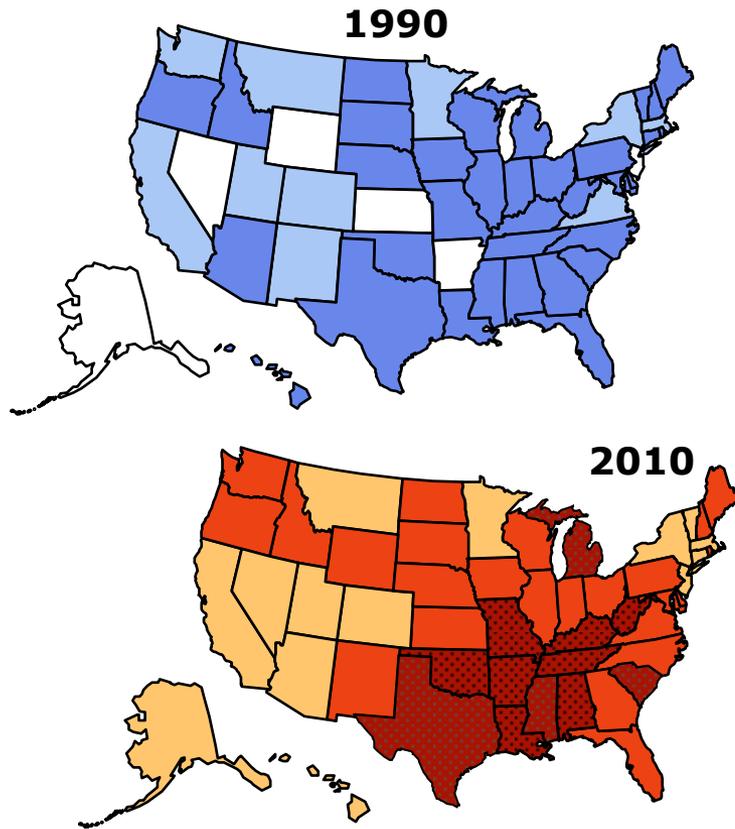
∞ Association between number of comorbid conditions, depression, and sleep quality using the Pittsburgh Sleep Quality Index: results from a population-based survey (Hayashino, 2010)

- The **number of comorbid conditions** correlated positively with **poor sleep** quality, and as the number of comorbid conditions increased, the proportion of those also suffering from depression increased.
- Recognizing the signs of depression in patients with multiple comorbid conditions is important because of its **exacerbation of poor sleep quality**.

# Obesity Trends\* Among U.S. Adults

## BRFSS, 1990, 2000, 2010

(\*BMI  $\geq 30$ , or about 30 lbs. overweight for 5'4" person)

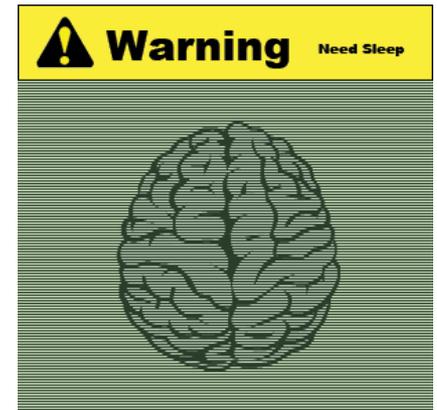


15%–20% 20%–25% 25%–30% 30%–35%  $\geq 35\%$

No Data <10% 10%–14% 15%–19% 20%–24% 25%–29%  $\geq 30\%$

# CHF and Sleep Problems

- ☞ Dyspnea
- ☞ Symptoms of RLS
- ☞ OSA/CSA
- ☞ Insomnia
  - Impacts daytime functional performance
- ☞ Short sleep duration



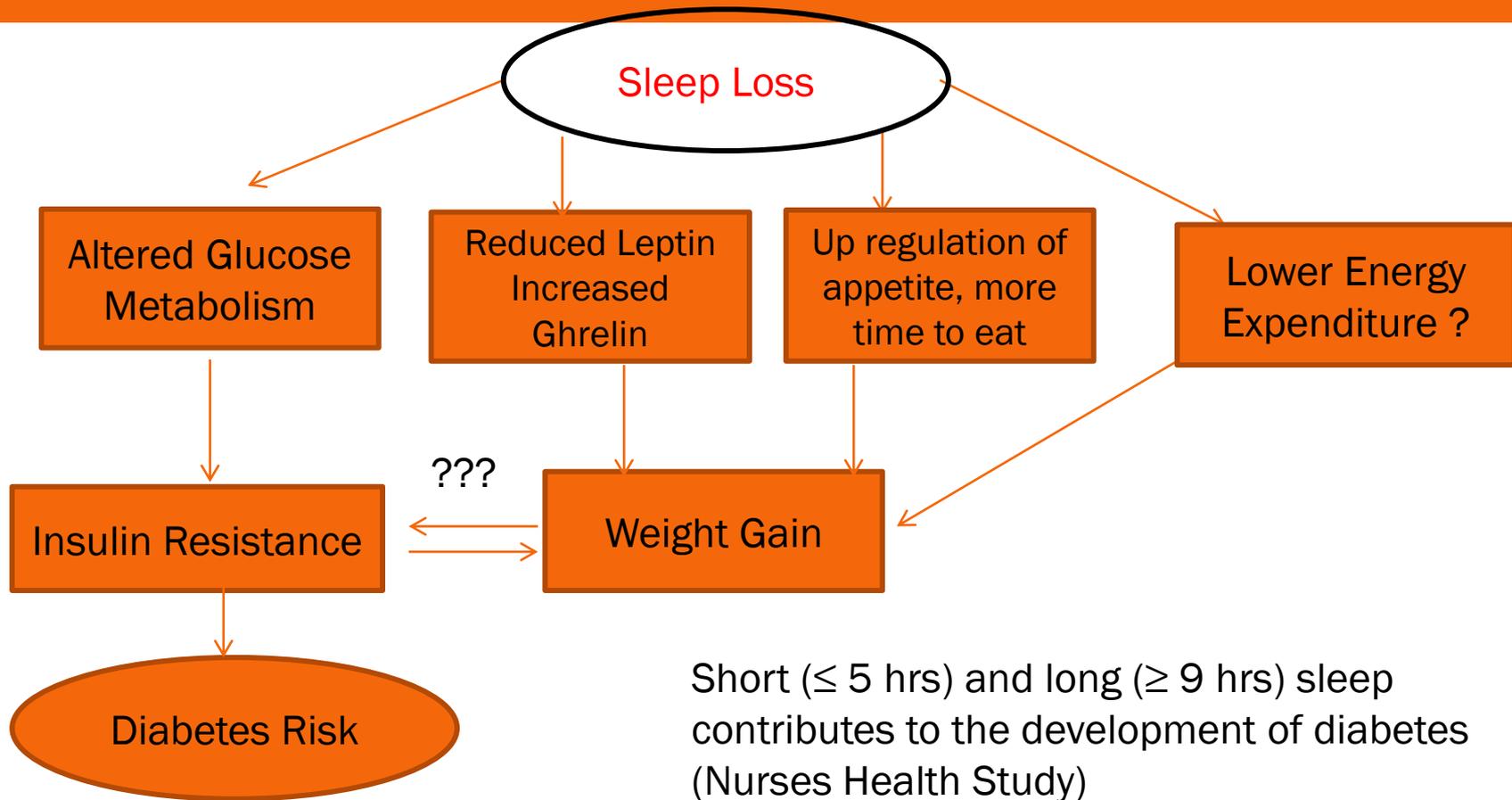
<http://sleeppatternsinthebrain.blogspot.com/2009/11/sleep-deprivation-and-death.html>

# CHF Common Medications

## ∞ Drugs

- Diuretics
  - Nocturia; leg cramps
- Beta Blockers
  - Insomnia, nighttime awakenings
- Antiarrhythmic
  - Sleep difficulties, daytime fatigue
- Ace Inhibitors
  - Fatigue, sleep problems

# Sleep Loss Diabetes



Adapted from Parker, K.P. (2011) Sleep disorders and Sleep Promotion in Nursing Practice; p. 180

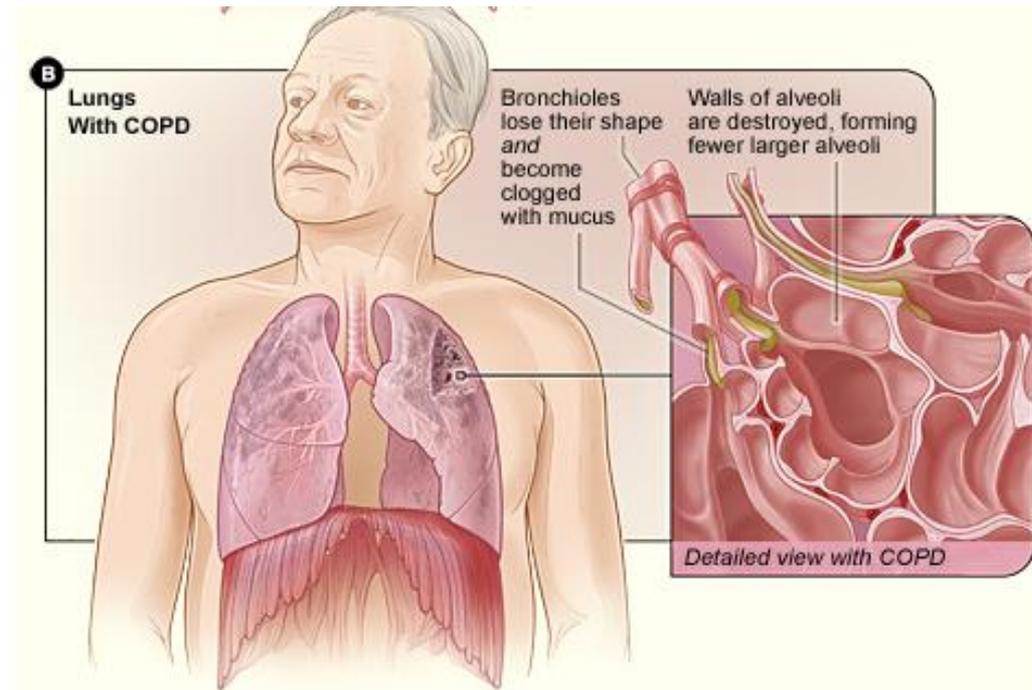
# How does diabetes contribute to poor sleep?

- ☞ Anxiety
- ☞ Depression
- ☞ Painful neuropathy
- ☞ Going to the bathroom
- ☞ Restless Legs



# Chronic Obstructive Pulmonary Disease

- Emphysema
- Chronic Bronchitis

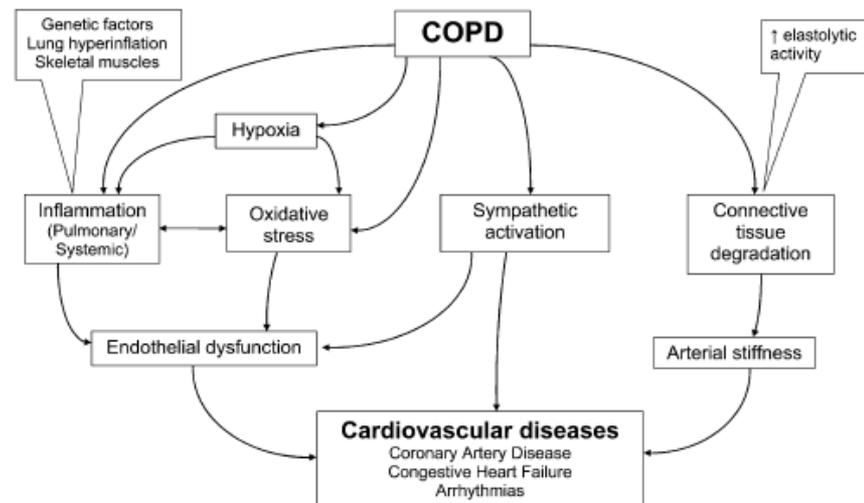


# COPD

## Disrupted and fragmented sleep

- Prolonged sleep latency; decreased efficiency; TST; REM and SWS.
- Coughing and shortness of breath

## OSA Overlap



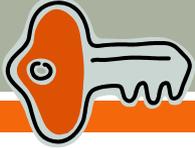
# Asthma

- 7.1 million: Number of children who have asthma
- 9.5%: Percent of children who currently have asthma
- 18.5 million: Number of non-institutionalized adults with asthma
- 14.2 million: Number of visits to physician offices with asthma as the primary diagnosis
- 1.8 million: Number of visits to the ED with asthma as the primary diagnosis

# Asthma and Sleep

- ⌘ Disrupted and fragmented sleep
  - Dyspnea, cough or wheeze
- ⌘ Lowest peak flow during night hours(4 AM)
  - Increased parasympathetic activity; increased airway inflammation, increased levels of proinflammatory leukotriens
- ⌘ Treatment with inhaled corticosteriods may help to improve sleep: Depends on time of day

# Take Away-Bi-directionality



- ✎ Sleep disturbances may contribute to the development of co-morbid conditions
- ✎ Medical conditions can contribute to poor sleep
- ✎ Care of patients with chronic conditions must always include adequate investigation of sleep related issues

## Adults Reporting Selected Sleep Behaviors in 12 States by Characteristics Behavioral Risk Factor Surveillance System, United States, 2009

Age (years)	Unintentionally fell asleep during day at least once in the past month	Nodded off or fell asleep while driving in the past month
18 to <25	43.7%	4.5%
25 to <35	36.1%	7.2%
35 to <45	34.0%	5.7%
45 to <55	35.3%	3.9%
55 to <65	36.5%	3.1%
≥65	44.6%	2.0%
<b>Race/Ethnicity</b>		
White non-Hispanic	33.4%	3.2%
Black non-Hispanic	52.4%	6.5%
Hispanic	41.9%	6.3%
Other non-Hispanic	41.0%	7.2%
<b>Sex</b>		
Male	38.4%	5.8%
Female	37.3%	3.5%

Accessed 8/8/2015 CDC

# Consequences of Sleep Deprivation



# Sleep and the Work Place



The Value of  
Sleep has  
somehow been  
neglected

- ∞ Sleep viewed as “private activity”
- ∞ Expectation that the worker come to work with optimum mental and physical capacity
- ∞ Extreme tiredness is associated with sleep duration prior to shift, shift length, night shift and workload

# Sleep Deprivation Facts

- ✎ Subjective sleep may be stated as higher compared to objective measures
- ✎ OSA associated with CVD, cognitive impairment, increased risk of motor vehicle accidents
- ✎ Insomnia associated with depression, hypertension, daytime functional impairments (increased absenteeism, decreased productivity)
- ✎ Shift Work Disorder contributes to CVD, digestive troubles, cancer, depression

Rogers, A (2008) In Hughes RG (ed.). Patient safety and quality: An evidence-based handbook for nurses. (Prepared with support from the Robert Wood Johnson Foundation). AHRQ Publication No. 08-0043. Rockville, MD: Agency for Healthcare Research and Quality; March 2008.

# The Importance of Adequate Sleep in the Workplace

- ∞ “According to 2004 data from the Bureau of Labor Statistics, almost 15 million Americans work full time on evening shift, night shift, rotating shifts, or other employer arranged irregular schedules” CDC (2013)
- ∞ Types of Shift Work
  - Outside of “normal” work shift hours i.e. 7AM to 6 PM
  - Overtime work (beyond 40 hrs)
  - Extended Shifts (i.e. longer than 8 hours) (Lerman et al., 2012, ACOEM Guidance Statement)

# Performance Benefits of Adequate Sleep

- Improved Productivity
- Improved Learning
- Enhanced Memory
- Improved Judgment
- Enhanced Mood
- Improved Attention and Reaction Times
- Decreased Likelihood of Motor Vehicle Accidents
- Decreased Safety Risks



# Sleep Critical Occupations

- ✎ Pilots
- ✎ Truck Drivers
- ✎ Nurses
- ✎ Physicians
- ✎ Air Traffic Controllers
- ✎ Sleep Technologists
- ✎ EMS
- ✎ Other?

# Practice Implications

- ☞ Question patients regarding their normal working environment
- ☞ Provide suggestions to improve sleep in general
  - If shift worker, provide information specifically related to shift work disorder if appropriate
- ☞ Consider the under-reporting of sleepiness and the impact to public and personal safety

# Creating Sleep Value

- ∞ Promote Sleep Health: An Always event!
- ∞ Participate in health fairs
- ∞ Create community partnerships
- ∞ Align with local corporations HR department
  - Write an article regarding sleep and sleep deprivation
  - Include productivity statistics
  - Provide insight to improvement
  - Offer lunch and learns
  - Demonstration projects
    - Outcome measures
- ∞ Employee Assistance Programs
  - Conduct lunch and learns
  - Educate EAP Executives on the importance of Sleep

# NEJM 2007

BOOK REVIEW

## Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem

N Engl J Med 2007; 356:199-200 | January 11, 2007 | DOI: 10.1056/NEJMbkmrev57946

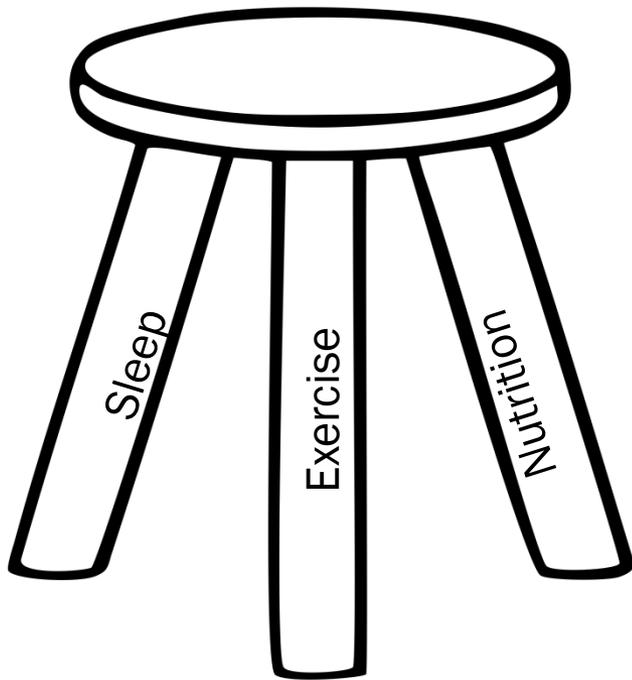
Share:     

Article

This book, coming on the heels of official recognition of sleep medicine by the American Board of Medical Specialties and the Accreditation Council for Graduate Medical Education, is a boon to the field. It will be of great interest to anyone interested in sleep medicine and should be mandatory reading for governmental and academic health-center policymakers. The Institute of Medicine, the

# Summary

Healthy, well  
balanced, life



One leg too long, short  
or broken.....



# Summary

- ☞ The field of Somnology is steeped in research and history
- ☞ Sleep Health impacts individuals, public health and safety
- ☞ Integration of Somnology and Sleep Health is crucial in all areas of medicine
- ☞ Contact and participate in your community
  - HR Departments
  - Industry
  - Lunch and Learns
  - EAP
  - Focus on productivity and loss of work time

