

SLEEPING WELL


A KEY COMPONENT OF THE ESSENTIAL 8



**15th Annual Orange County
Symposium for Cardiovascular
Disease Prevention**



Conflict of Interest

- I was the Chief Medical Officer and Co-Founder of SleepWatch by BodyMatter
- 



LEARNING OBJECTIVES

- Sleep, what is it and how much does a person need?
- Circadian Rhythm ,understanding your body clock
- What happens when we sleep?
- How do we measure sleep?
- What are we measuring
- Mechanism linking poor sleep and cardiovascular disease

Common Sleep Disorders

- Lack of Sleep (insomnia)
- Snoring and Sleep Apnea
- Circadian rhythm disorders
- Movement disorders (restless leg)
- Parasomnias (sleepwalking)
- Too much sleep (narcolepsy)

SLEEP FACTS

- Total Sleep requirement is age dependent
- Adults ages 18 and 64 need seven to nine hours of sleep
- More than one third of adults sleep less than 7 hours
- 80% of Americans report having a problem sleeping at least once a week
- Most people do not know they have the ability to improve sleep
- Insufficient or fragmented sleep can contribute to problems with blood pressure and heighten the risk of heart disease, heart attacks, diabetes, and stroke.



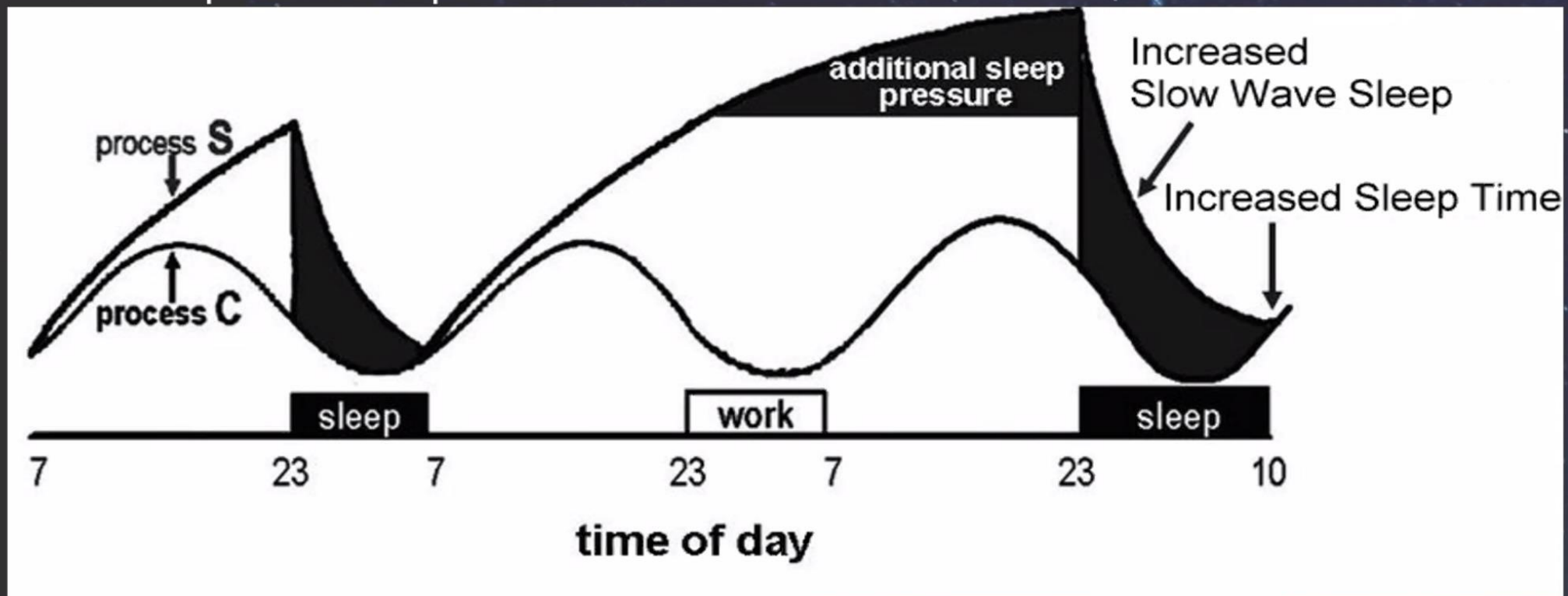
Sleep: A Multi-dimensional Health Behavior

- Naturally Recurring (rhythmic)
- Reduced or Absent Consciousness
- Perceptual Disengagement
- Relative Immobility
- Sleep Posture
- Reversible
- Patterned by Homeostatic and Circadian Factors

(Grandner and Hernandez (Science 2021))

Borbely's 2 Process Model

- Sleep-wake regulation is typically conceptualized as arising from two independent processes:



Stage 1 and 2 (Non-REM) LIGHT/CORE

- 45-55%
- TRANSITION FROM AWAKE TO SLEEP (short time)
- MUSCLES RELAX
- HEART RATE DECREASES
- BODY TEMPERATURE DROPS
- RESPIRATIONS SLOW
- MORE AROUSABLE IN EARLY STAGES

Stage 3 Non- REM DEEP SLEEP

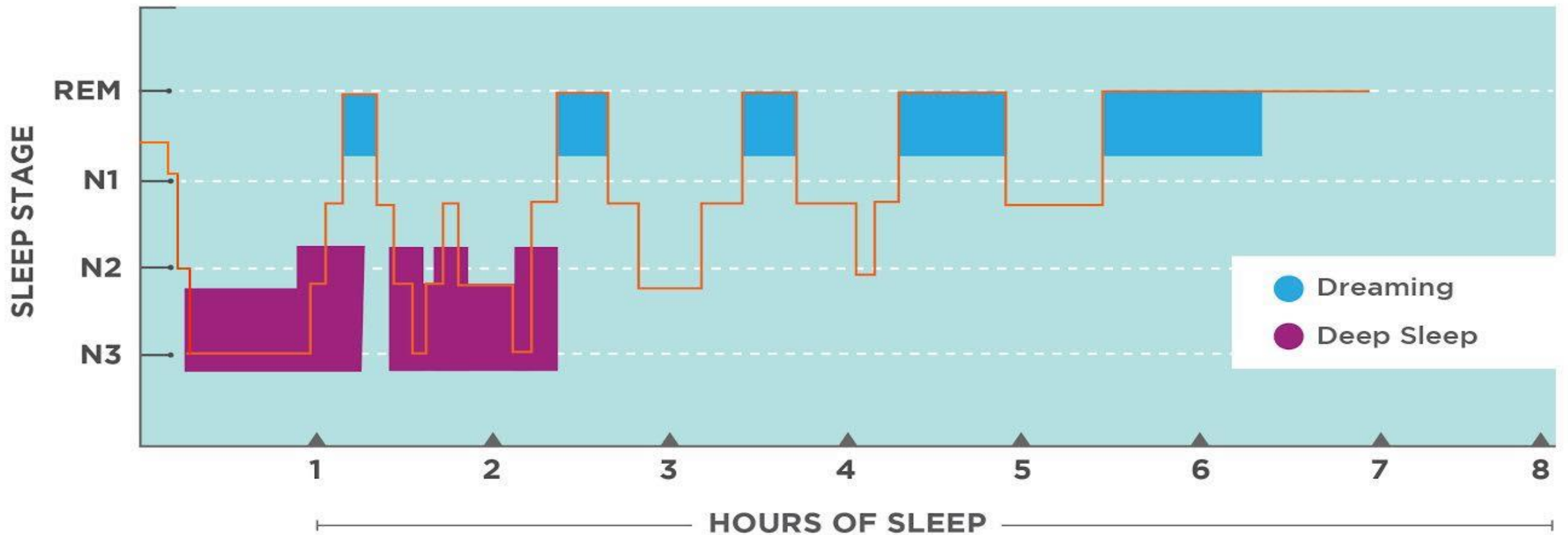
- 13-25%
- Cardiovascular: Blood Pressure decreases
- Brain: Waste products including amyloid are removed
- Immune System: Antibodies and T&B Cells are released into the blood stream
- Muscles and Bones: Are Repaired and Regeneration occurs as Growth Hormone and Prolactin are increased
- Hormonal Changes: Ghrelin ,Leptin, Cortisol, TSH, Insulin

RAPID EYE MOVEMENT (REM) SLEEP

- 20-25%
- BRAIN HIGHLY ACTIVE
- RAPID EYE MOVEMENTS
- MUSCLE PARALYSIS
- INCREASED HEART RATE
- BLOOD PRESSURE RISES
- EMOTIONAL REGULATION & MEMORY CONTROL
- PROCESSING AND INTEGRATING EMOTIONS, MEMORIES AND LEARNING FROM PRIOR DAY

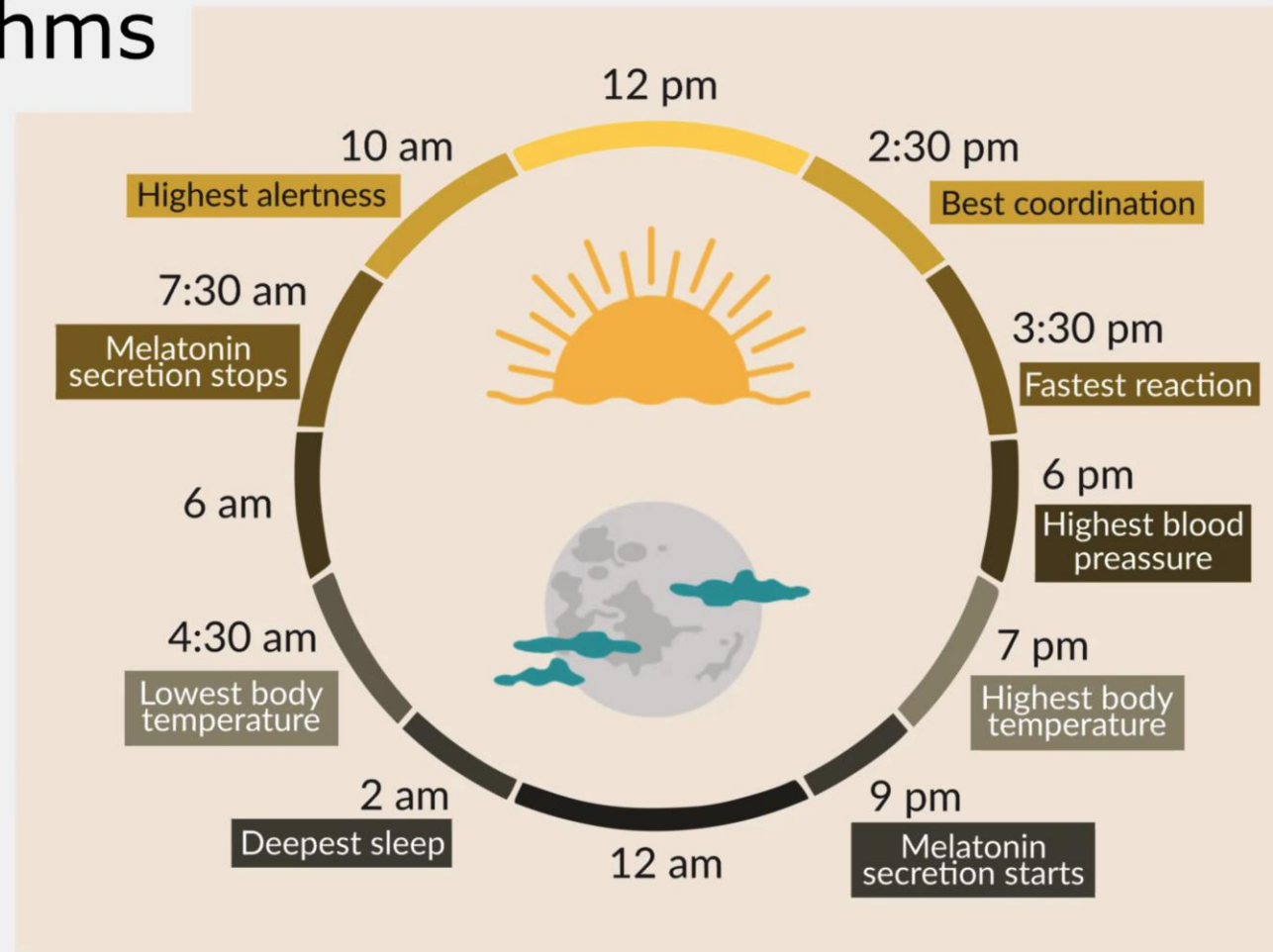
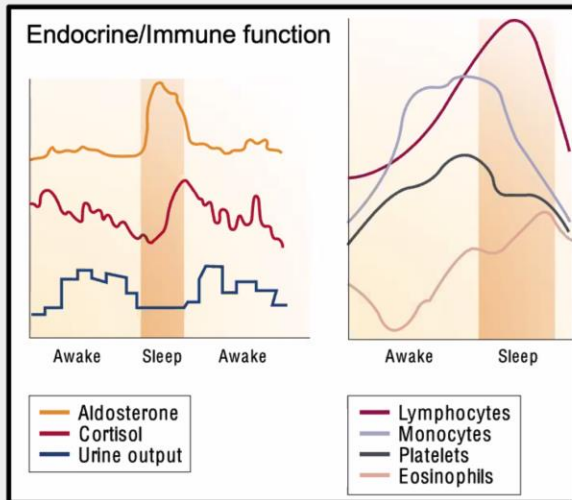
What Happens When We Sleep?

SLEEP STAGES



Circadian Rhythms

Changes in physiology and behavior that follow a roughly 24h pattern. The same cyclical variation is seen from one day to the next.



HISTORY: EVALUATING SLEEP

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2413168/> 2005

- Research Sleep Lab 1925 (circadian rhythm) Nathaniel Kleitman
- Narcolepsy Lab Stanford 1964
- 1st Clinical sleep lab 1970 (Dr. Dement)
- Actigraphy (1990)
- Prospective Diary
- Retrospective Questioning & Data Mining
- Pittsburg Sleep Quality Index (Insomnia 1989)
- Consumer Wearables (Fitbit 2013, Watches, Rings)

WHAT IS BEING MEASURED ?

- Brain Waves
- Eye Movement
- Skeletal Muscle Movement
- Sleep Stages
- **Total Sleep Time/Time in Bed**
- Sleep Rhythm
- **Cardiac Rate and Dipping Ratio**
- Heart Rate Variability
- Blood Oxygen
- Respiratory Rate
- Arousals
- Time to Fall Asleep
- Temperature



Cardiovascular Disease and Sleep

- 1977 A.G. Tilkian Prevalence of Cardiac Arrhythmia (15 patients)
- 1983 C. Guilleminault: Cardiac Conduction Disturbances during sleep 400 patients with sleep apnea
- 1992 E.D. Eaker Myocardial infarction and coronary death among women – psychosocial predictors (20yr follow-up Framingham)
- 2003 Prospective Study of Sleep Duration & CHD in Woman (Nurses' Health study 1986-1996)
- 2007 I. Ben-Dov Blunted Heart Rate Dip During Sleep and Mortality
- 2010 T. Chandola Effect of Short Sleep Duration on CHD is Greatest with Sleep Disturbance (Prospective Study 1985-2004 men and woman)

Cardiovascular Disease and Sleep

- 2013 J.Pepin Hypertension and Sleep Overview of a tight relationship
- 2013 M.Haack Increasing sleep duration to lower beat to beat blood pressure-a pilot study
- 2017 Y. Kubota Heart Rate Variability and Lifetime Risk CVD Atherosclerosis Risk in Communities Study 1987-89 follow-up 2013 Higher HRV ↑ lifetime risk
- 2018 K.Lo Subjective sleep quality, blood pressure and hypertension: a meta-analysis
- 2018 A. Sherwood Waking up to the importance of sleep well for cardiovascular health
- 2021 L.Wang Ideal Cardiovascular Health Metric and Its Change With Lifetime Risk of Cardiovascular Diseases: A Prospective Cohort Study

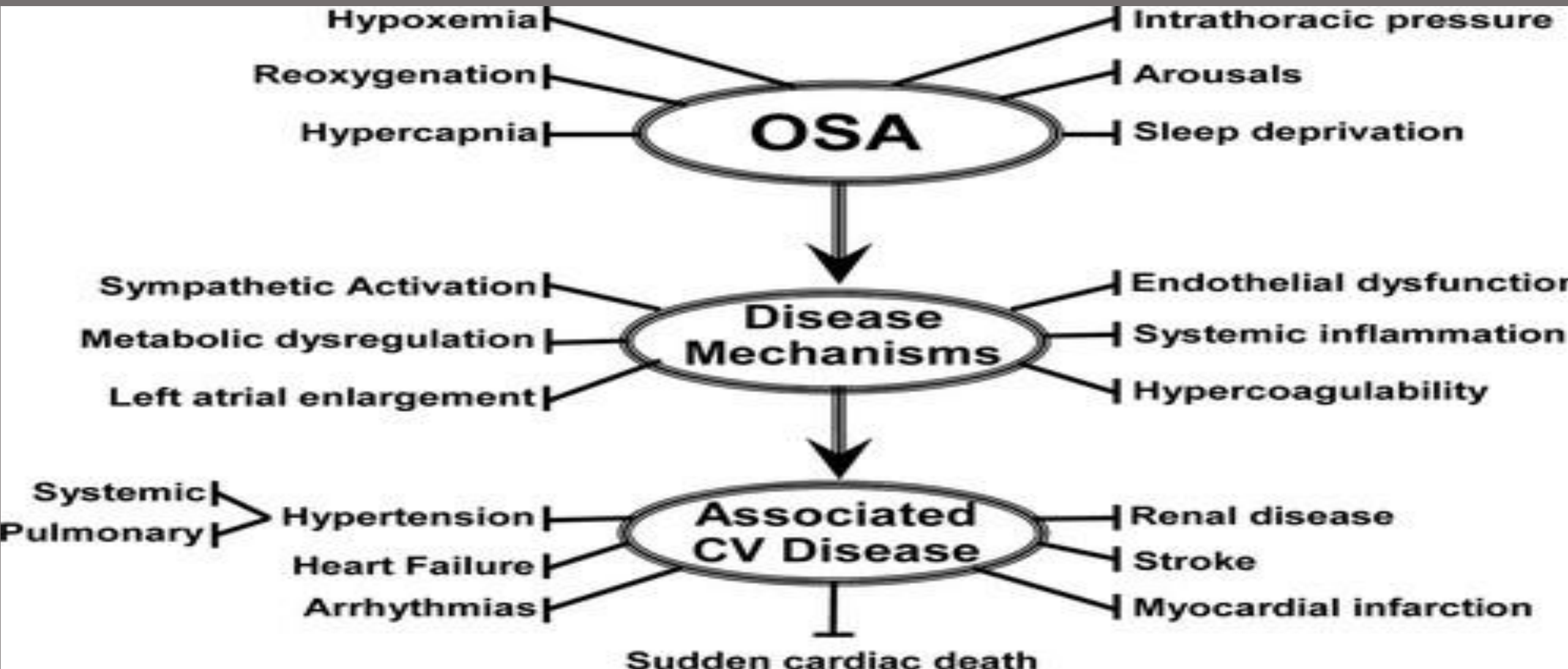
Mechanisms Linking Sleep and Cardiovascular Disease

- Sympathetic nervous system activation (fight or flight) seen OSA
- Inflammatory markers elevated in poor sleep. Chronic inflammation plays a significant role in development and progression of atherosclerosis, hypertension and heart failure
- Endothelial dysfunction occurs with poor sleep leading to impaired dilation and constriction of blood vessels, increased oxidative stress, and reduces nitric oxide availability

Mechanisms –continued

- Metabolic dysregulation occurs with poor sleep leading to alterations in glucose metabolism, insulin resistance, ↑ levels of Cortisol and ↓leptin (appetite control)
- Circadian Rhythm disruption such as shift work or irregular sleep schedules have been associated with adverse cardiovascular outcomes
- In addition, misalignment between our internal body clock and external factors can lead to dysregulation in blood pressure , heart rate variability and other cardiovascular parameters

SLEEP APNEA & CVD A Model (2007)



CVD & ↑BP A WAY FORWARD

- Prioritize sleep
- Fixed wake and sleep time 7-9hr
- Wind down pre-sleep routine
- Dim lights
- Unplug from electronics
- No meals 3 hours before sleep
- ↓ Alcohol
- No Caffeine after 3PM
- Bedroom temp ↓68°F
- Block out light
- Drown out noise
- Light exposure (sun) in AM
- Be physically active during day
- Avoid daily sleep medications
- Restrict Bedroom Activity