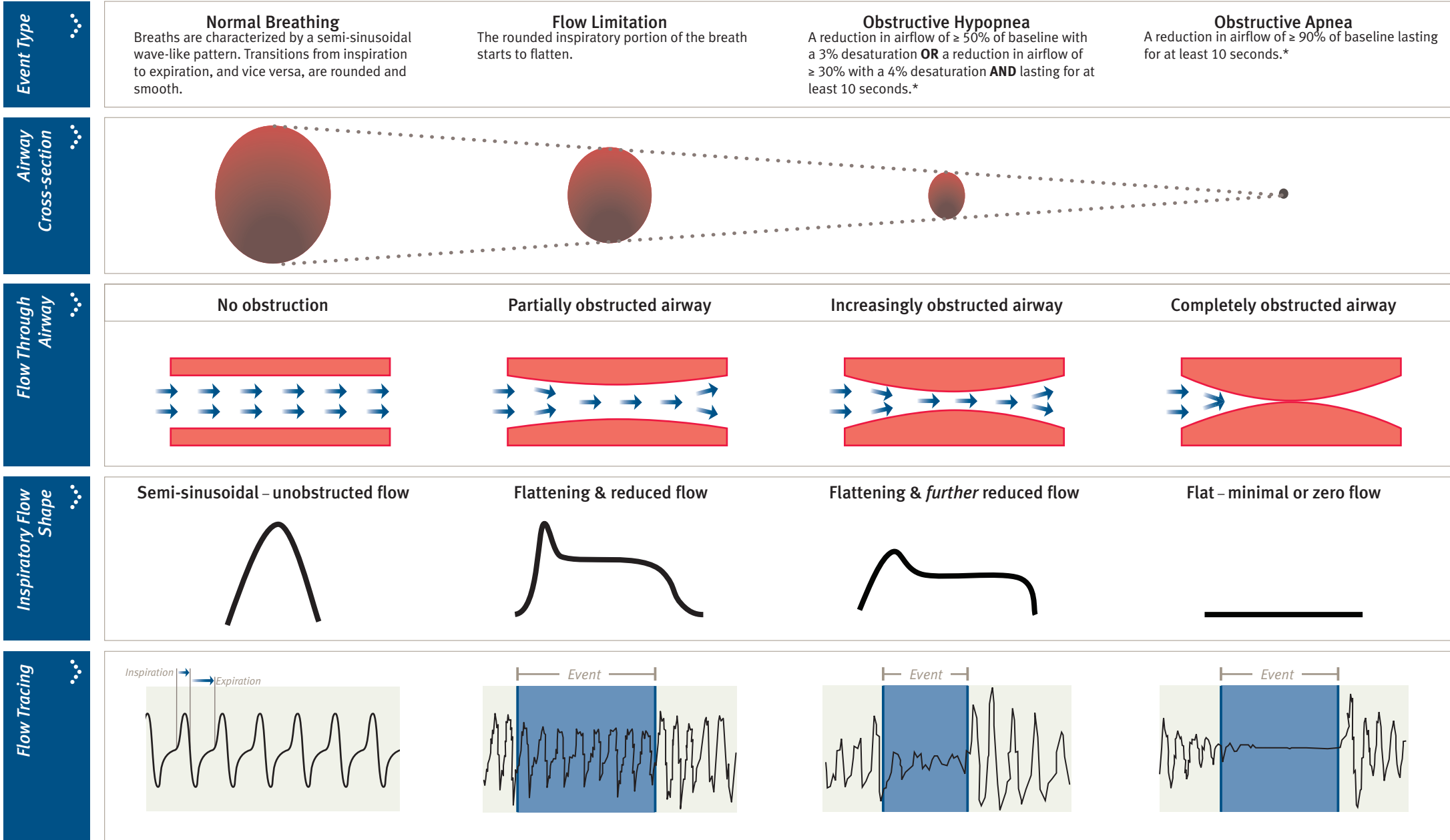


The Fundamentals of Sleep and Obstructive Sleep Apnea



* Iber et al., *The AASM Manual for the scoring of sleep and associated events: Rules, Terminology and Technical Specifications*, 1st ed.: Westchester, Illinois: American Academy of Sleep Medicine, 2007.

Sleep stages:

		%Total Sleep Time	Characteristics	Purpose
NREM (Non-Rapid Eye Movement)	Stages N1 & N2	5-10% 50%	<ul style="list-style-type: none"> • Lightest stages of sleep • Easily woken 	Initial Transition from wake to sleep Transition between sleep stages
	Stage N3	20%	<ul style="list-style-type: none"> • Also known as Slow Wave Sleep (SWS) or deep sleep • Deepest stage of sleep • Very regular breathing pattern and heart rate 	Physical Restoration* Thought to contribute to physical restoration of the body <ul style="list-style-type: none"> • Immune function and repair (e.g. muscle repair after injury or exercise) • Growth – our largest daily surge of growth hormone occurs in Stage N3
REM (Rapid Eye Movement)	Stage R	20-25%	<ul style="list-style-type: none"> • Light stage of sleep • Most dreaming occurs during this stage • Complete skeletal muscle paralysis – to prevent people acting out their dreams (except for the ocular (eye) muscles) • Erratic breathing patterns and heart rate. This activity is thought to occur in line with dream activity 	Memory Consolidation* <ul style="list-style-type: none"> • In adults, the main function of REM sleep is believed to be the creation and maintenance of memories • In infancy, REM is believed to be crucial to the establishment of neural pathways ('learning'). Infants spend 50% of their sleep time (up to 8 hours a day) in REM sleep

** The function of sleep is the greatest mystery in sleep medicine: Schools of thought range from 'it's not necessary' to 'we would die without it'.*

Arousal vs Awake - What is the difference?

An arousal is identified by a disturbance to the EEG (Electroencephalogram – brain waves) that lasts at least 3 seconds, **and is followed by at least 10 seconds of stable sleep**. People are unlikely to be aware of the arousal. Arousals are relevant as they may prevent progression into deeper stages of sleep, thereby affecting sleep quality. An arousal is, therefore, not the same as being awake.

AHI vs RDI - What is the difference?

AHI (Apnea/Hypopnea Index) – most commonly used in Sleep Labs and is recognized by the American Academy of Sleep Medicine (AASM)

Apneas + Hypopneas/hours of sleep.

RDI (Respiratory Disturbance Index)

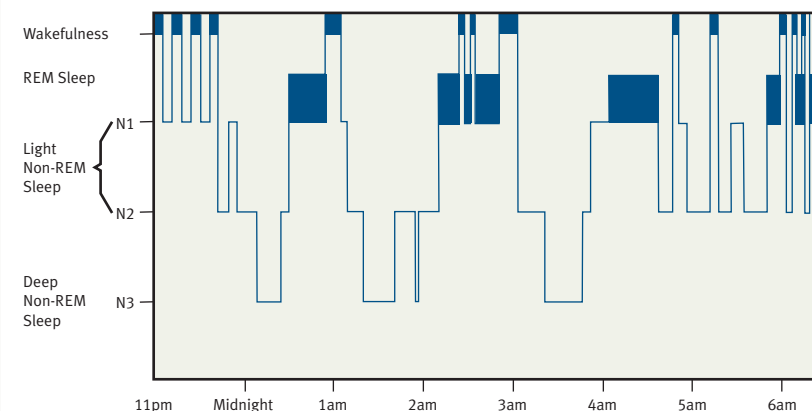
Apneas + Hypopneas + Respiratory Effort-Related Arousals (*RERA)/hours of sleep.

** A RERA is a respiratory event which does not meet the definition of apnea or hypopnea. It is characterized by increasing respiratory effort, leading to an arousal from sleep.*

Severity	Mild	Moderate	Severe
AHI	5-15	16-30	31+
RDI	15-20	21-40	41+

What is a Hypnogram? (Sleep Histogram)

A hypnogram is a picture of how sleep progresses throughout the night. Typically we cycle through all stages four to six times per night. Each cycle lasts around 90 minutes. As the night progresses, our periods of Stage N3 sleep shorten and our REM sleep periods lengthen. We therefore do most of our dreaming later in the night. As you can see, we typically arouse or wake after each cycle of sleep and often many more times throughout the night. As we age, the frequency of these arousals increases significantly.



PSG: Poly (multiple channel) Somno (sleep) Graphy (recording) - The Sleep Study

Channel	Displays what?	Identifies/Distinguishes
Electroencephalogram (EEG)	Brain activity	Sleep stages
Electrooculogram (EOG)	Eye movement	Onset of REM sleep
Electromyogram (EMG – chin)	Muscle activity of chin	Onset of REM sleep Arousal/Wake
Oximetry	Oxygen saturation of the blood	Desaturation
Nasal Flow	Breathing pattern	Apnea Hypopnea Flow limitation
Respiratory Bands	Breathing effort	Obstructive from central events
Electrocardiogram	Heart rate and rhythm	Safety measure
Electromyogram (EMG – leg)	Muscle activity of legs	Leg movements