Effects of Sleep Stages on Oxygen Saturation and Ventilation in COPD

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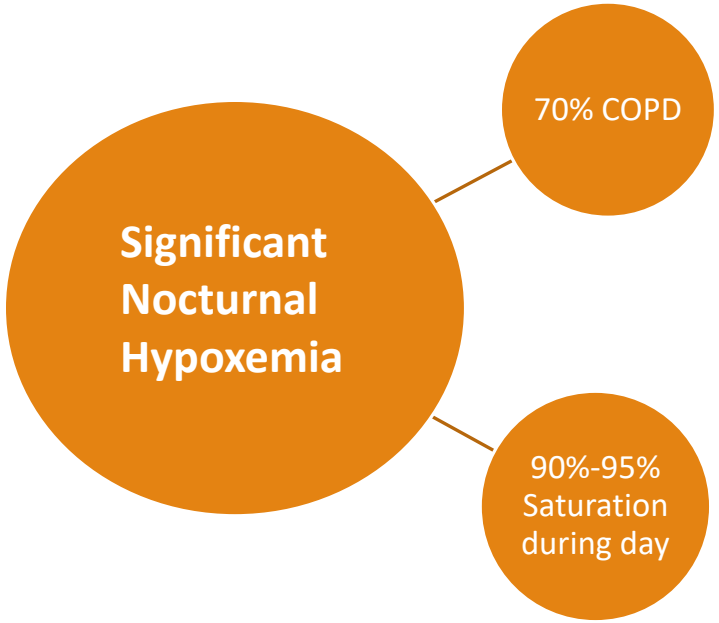
Nocturnal Hypoxemia in COPD patients

Significant nocturnal hypoxemia is reported in up to 70% of COPD patients who have daytime oxygen saturations of 90%-95%



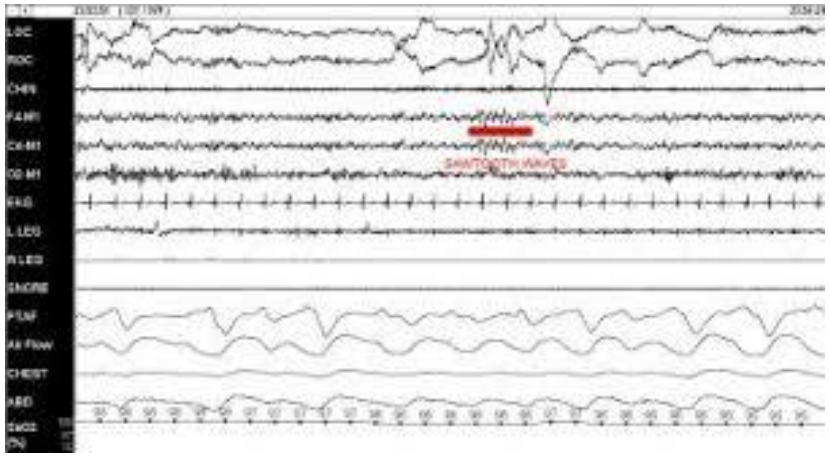
Effect on Minute Ventilation

Minute Ventilation (V_E) can drop **NREM**

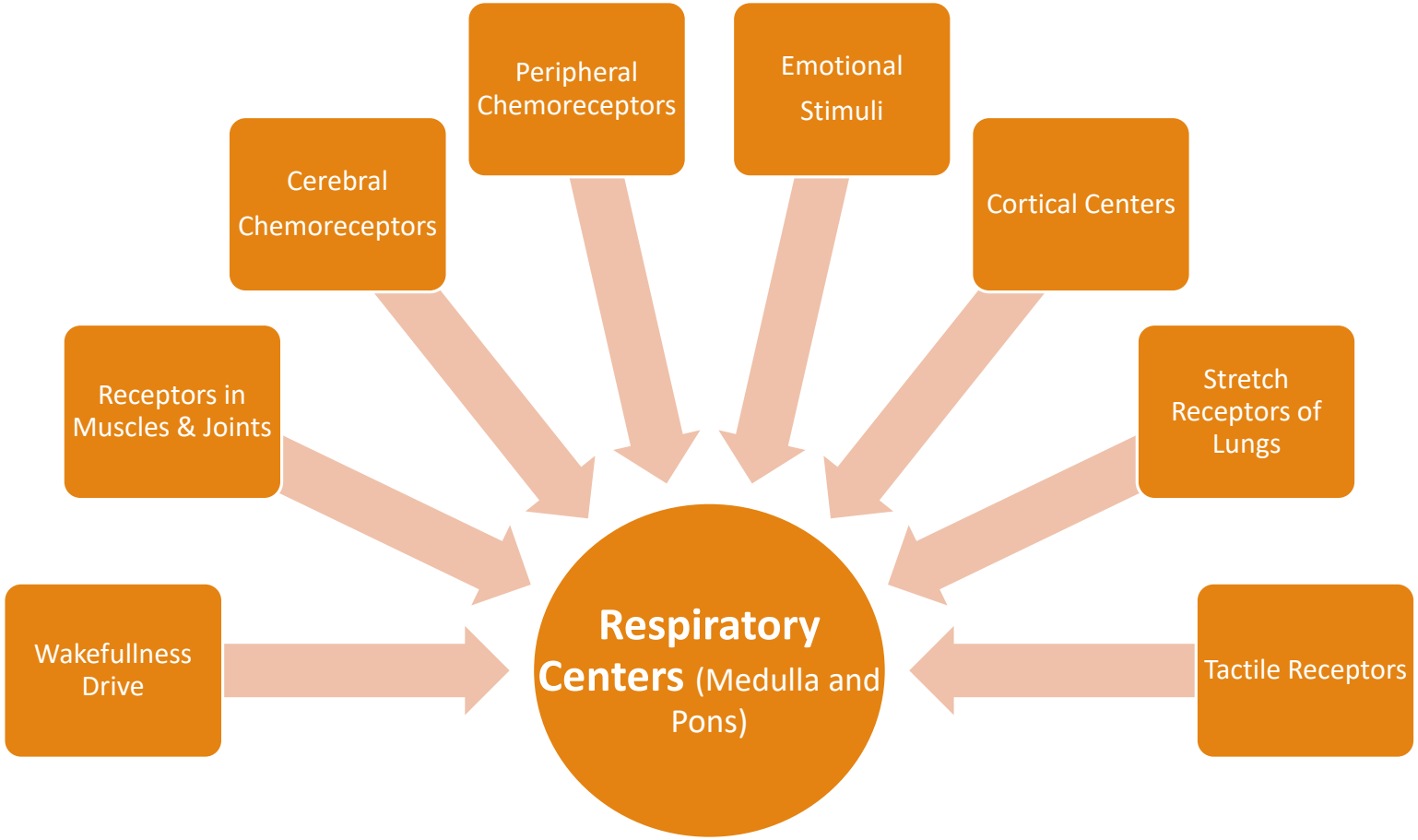
16%

Minute Ventilation (V_E) can drop **REM**

32%



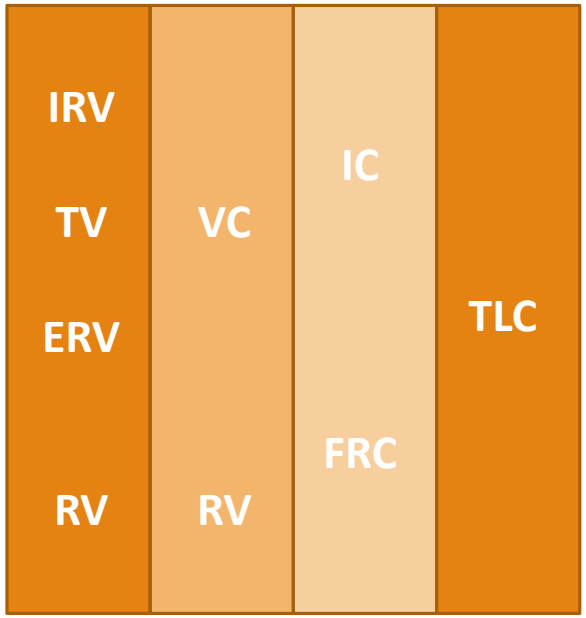
Respiratory Control



Effects of sleep

Sleep effects-

- Airway Resistance
- Thoracopulmonary Compliance
- Lung Volumes

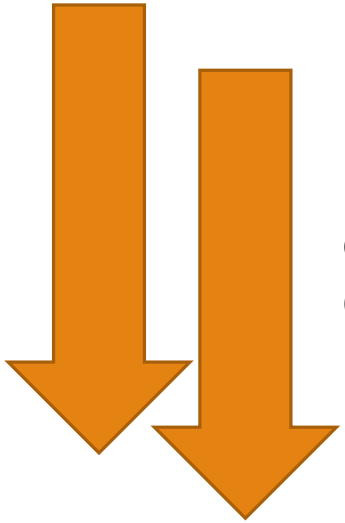


Respiratory Muscle Activity

DECREASES IN NREM SLEEP

NREM

DECREASES FURTHER IN REM SLEEP

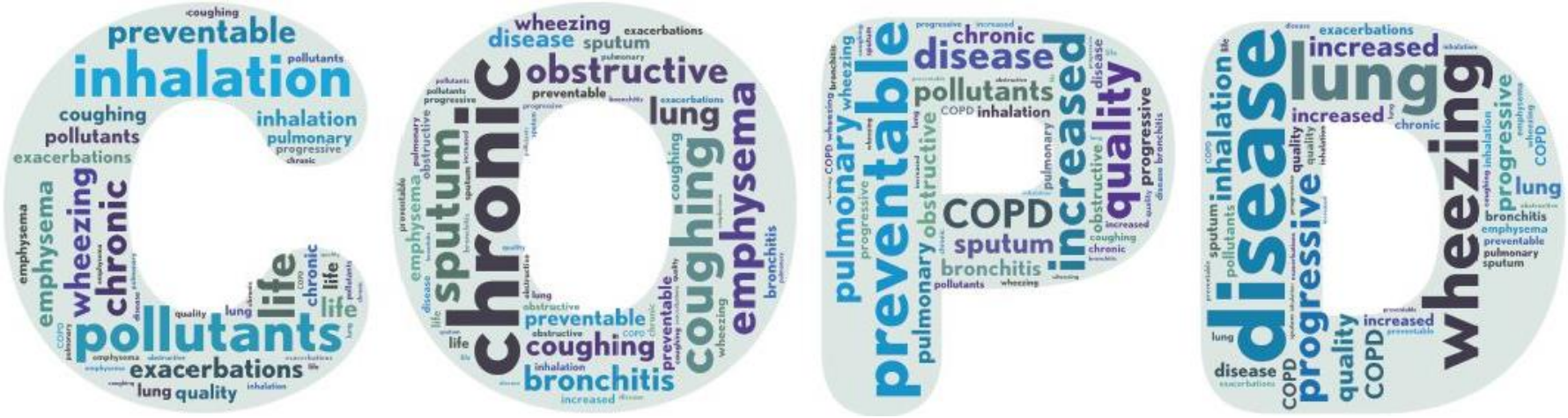


REM (less effect on the diaphragm)

COPD

Defined as:

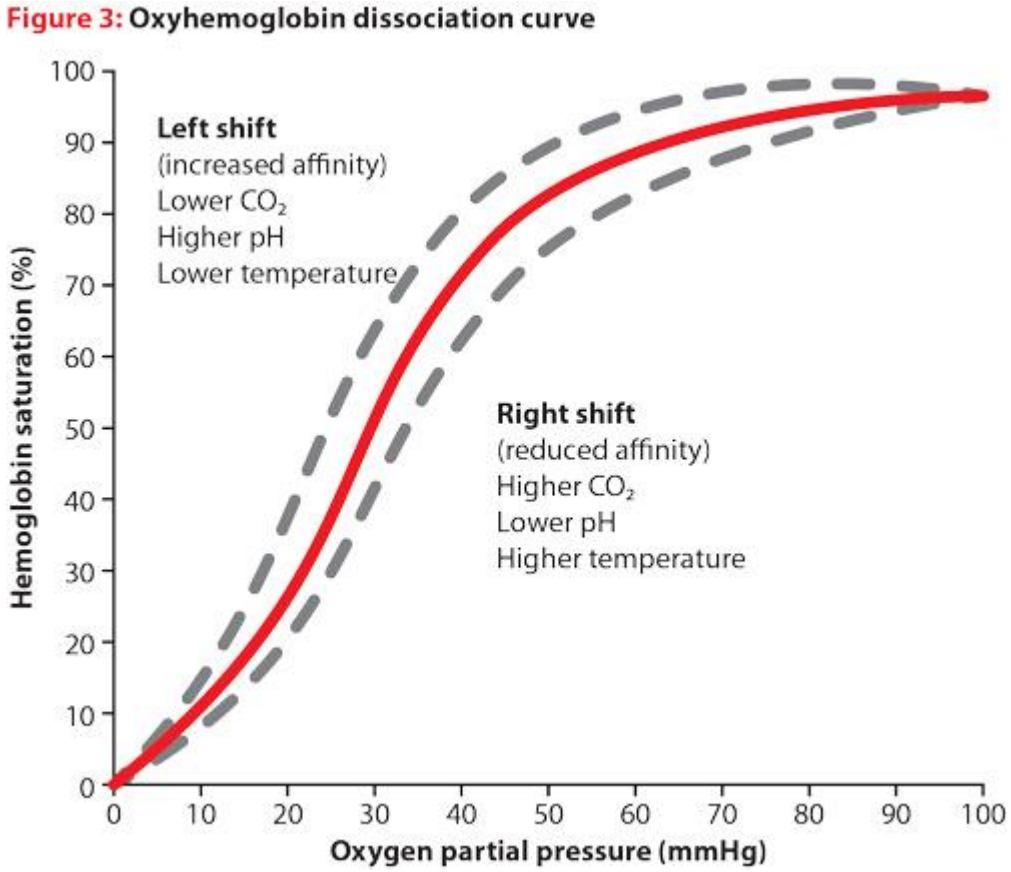
A preventable and treatable disease characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and lungs to noxious particles and gases.



Source http://www.safecare.com/wp-content/blogs.dir/13/files/2017/04/COPD.jpg

COPD

COPD patients with limited oxygen reserves may be operating on the steep portion of the oxyhemoglobin disassociation curve; such that a slight drop in PaO2 causes a large drop in oxygen saturation.

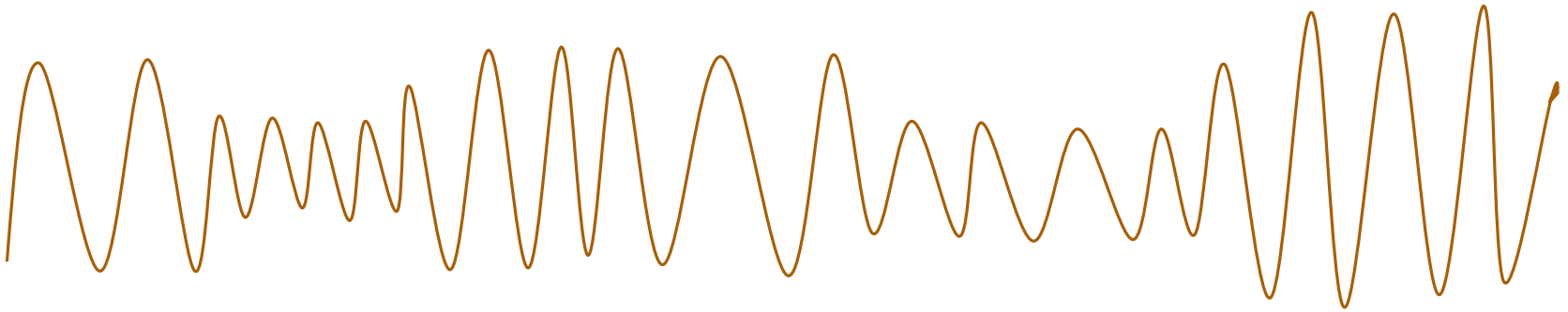


Source: https://www.jems.com/articles/print/volume-42/issue-5/features/the-how-what-and-why-of-ems-pulse-oximetry.html

Sleep Hypoventilation

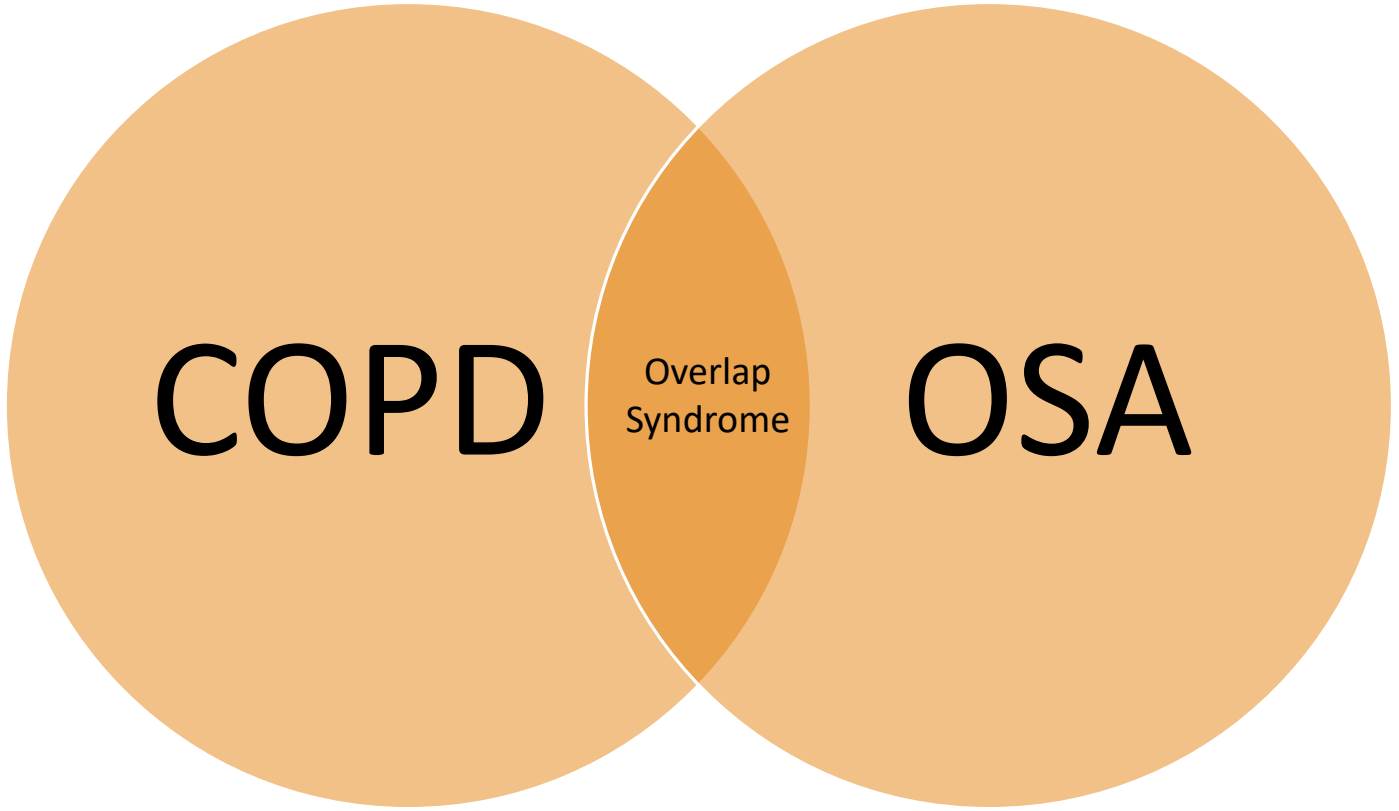
Defined as:

- An increase in $PaCO_2$ to > 55 mmHg for ≥ 10 minutes, **or**
- An increase in the $PaCO_2$ by ≥ 10 mmHg above the awake supine value to a value over 50 mmHg for ≥ 10 minutes



Overlap Syndrome of COPD & OSA

An overlap syndrome consisting of COPD and OSA result in worse morbidity and mortality



References

- Journal of Clinical Sleep Medicine Vol. 11, No. 3, 2015. p. 259-270
- Sleep Disorders in Chronic Obstructive Pulmonary Disease. Etiology, Impact and Management by Budhiraja, et. al