

Hypoxic burden

Hypoxic burden is a clinical term used to quantify the overall severity and duration of low oxygen levels (hypoxemia) in the body during sleep.



Definition

Hypoxic Burden refers to a measure that quantifies the total impact of oxygen deprivation during sleep. Hypoxic burden is the cumulative area under the curve (AUC) of oxygen desaturation events.

It is based on:

- How low the oxygen drops (desaturation depth)
- How long it stays low (desaturation duration)
- All desaturations during sleep

This metric provides a composite measure that reflects both the intensity and the degree of hypoxemia during sleep.

Why it matters

Hypoxic burden is a strong predictor of all-cause and cardiovascular disease-related mortality, sometimes more predictive than the commonly used apnea-hypopnea index (AHI)¹. HB < 20 % min / hr is normal.

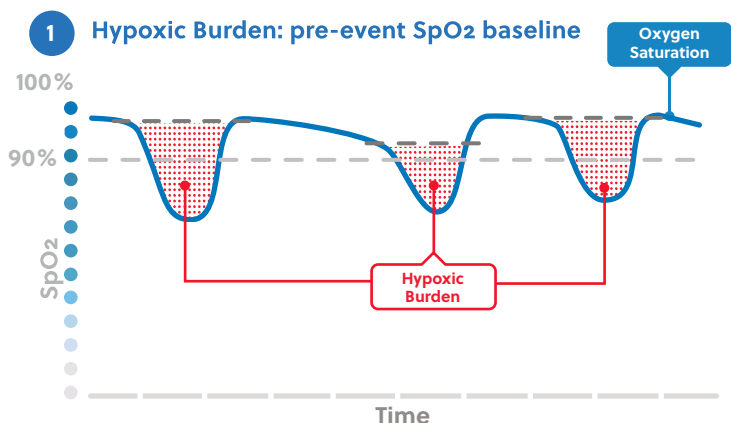
In addition to the AHI, which provides a frequency of events, hypoxic burden allows the clinician to assess the physiological harm from sleep disordered breathing events. HB > 50 % min / hr increases CV mortality¹.

How does the WatchPAT calculate Hypoxic burden?

There are various methods to calculate hypoxic burden, the WatchPAT implements two such methods.

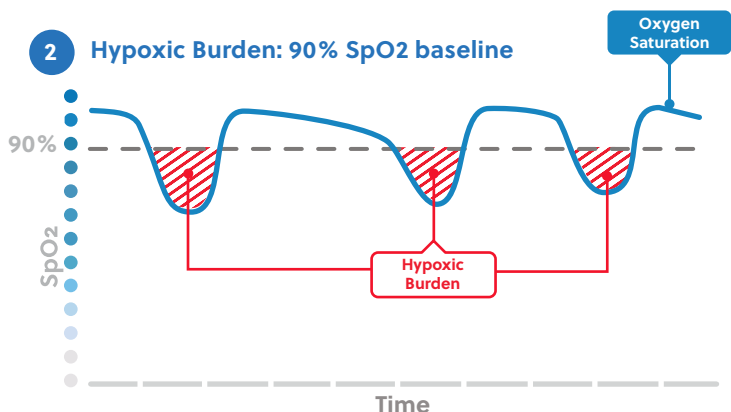
Hypoxic burden is calculated on a second-by-second basis using two methods: (1) a pre-event oxygen saturation as a local threshold and (2) a 90% oxygen saturation threshold.

Example 1: Patient with SpO2 baseline above 90%



Hypoxic Burden	Total [% • min]	Per hour [% • min/hour]
Desaturation area under SpO2 baseline	36*	7.1*

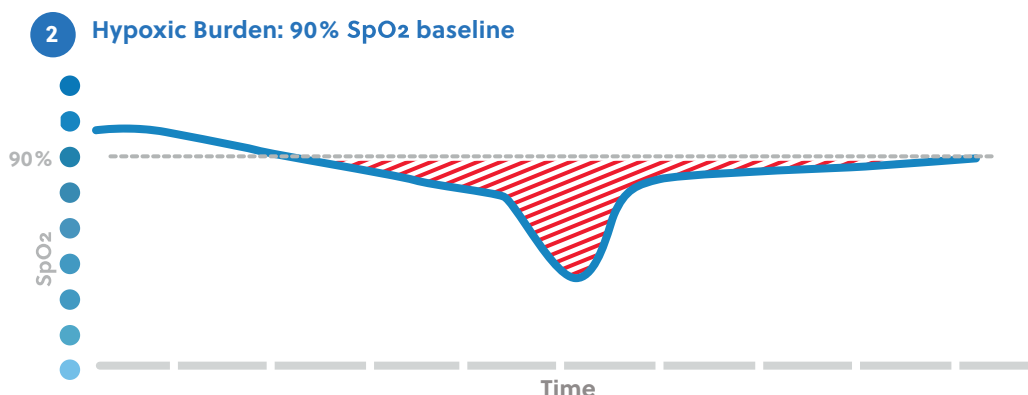
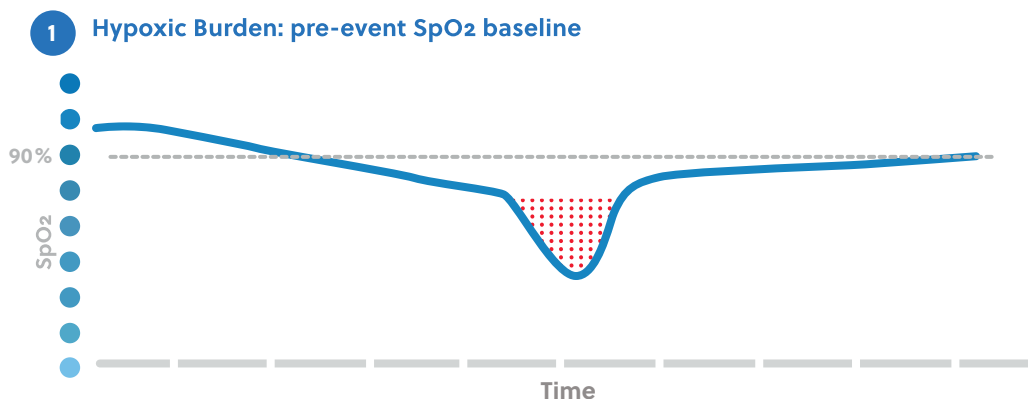
* numbers are for reference only



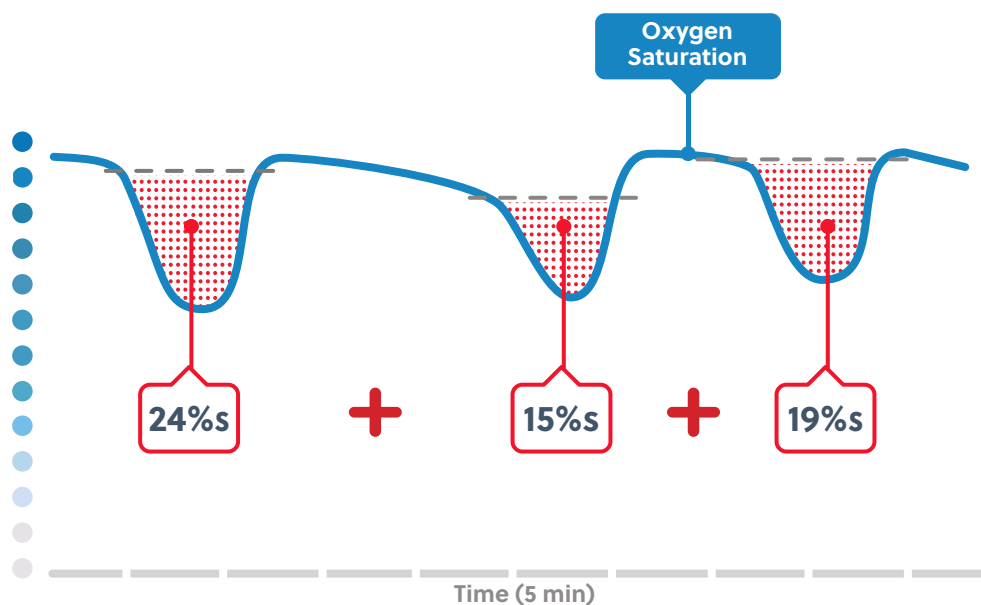
Hypoxic Burden	Total [% • min]	Per hour [% • min/hour]
Area under 90% SpO2	27*	5.3*

* numbers are for reference only

Example 2: COPD Patient when SpO2 baseline drops below 90%



Sleep report explanation: 5 min sleep time example



Hypoxic Burden
(Total) = the
sum of the
areas under
the curve

Hypoxic Burden
(avg. per hour)
= the sum of
the areas under
the curve / total
sleep time

Total [% • min]	Per hour [% • min/hour]
0.97	11.6
$\frac{(24\%s + 15\%s + 19\%s)}{60}$	$\frac{0.97}{(5/60)}$

Reference

1 Azarbarzin A et al. The hypoxic burden of sleep apnea predicts cardiovascular disease-related mortality: the Osteoporotic Fractures in Men Study and the Sleep Heart Health Study. Eur Heart J. 2019.

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