

Understanding Ventilatory Burden

Looking beyond the count reveals the burden on breathing

AHI remains a well-established clinical metric but captures only one dimension of sleep-disordered breathing.[1,2]

Traditional metrics like AHI focus only on the number of apneas and hypopneas, weighing them equally regardless of duration or severity. However, they do not capture how reduced the airflow is or how long events last — nor the cumulative strain these disruptions place on a patient's breathing.[1,2]

Ventilatory burden (VB) summarizes reduction in ventilation associated with respiratory events — focusing on changes in ventilation rather than associated oxygen saturation, providing clinicians with additional insights into breathing patterns alongside the AHI.

What is Ventilatory Burden?

Ventilatory burden quantifies the cumulative reduction in ventilation associated with respiratory events throughout the night. By combining duration, depth and frequency, VB provides a summary of the patient's respiratory burden.

Ventilatory Burden
=
mean event depth x
mean event duration x
event rate

AHI Counts Frequency

- Frequency: apneas + hypopneas per hour of sleep
- Only events are counted, not depth nor duration
- Different respiratory event morphologies can result in the same AHI[1,2]

Ventilatory Burden Estimates Impact

- Depth: how much ventilation falls during events
- Duration: how long the reduction lasts
- Rate: how often events occur[3]

Why it Matters?

Sees what AHI misses

Two people with the same AHI can have very different ventilatory deficits. VB captures the depth and duration behind the event count.[1-3]

Begins with the breathing signal

Respiratory events involve changes in breathing. VB estimates the event-related reduction in ventilation from derived flow signals rather than relying only on downstream effects.[3]

Adds context from research

VB has been shown to better reflect the true physiological burden of sleep apnea and has been shown to be independently predictive of cardiovascular and all-cause mortality.[3]

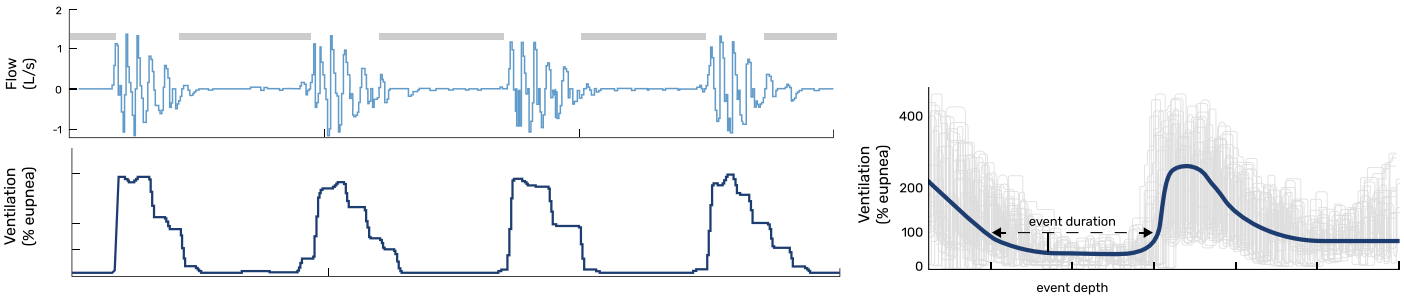

Figure 2: Ventilatory Burden is derived by generating a minute ventilation signal from flow data, then combining event depth, duration, and rate to calculate the total burden (% eupnea min/hour). The average respiratory event, in terms of ventilation, is generated and used to define the average event duration and average event depth. Figure 2 is adapted for marketing purposes from Labarca G, Vena D, Hu W, et al. Am J Respir Crit Care Med. 2023;208:1134–1146. Copyright © 2023 by the American Thoracic Society. This figure is protected by copyright and is reproduced here for reference only.

Evidence in Focus

Across two population-based cohorts comprising more than 4,500 adults, higher ventilatory burden was associated with incident cardiovascular disease and mortality outcomes. In MESA, ventilatory burden explained 78% of the variation in hypoxic burden.[3]

From Airflow to Physiological Insight

Ventilatory Burden relies on patented Nox Flow™ technology, a continuously calibrated estimate of respiratory airflow derived from chest and abdominal RIP belt signals. By capturing the depth, duration, and frequency of reductions in ventilation, VB provides a more complete view of the physiological impact of sleep apnea - helping clinicians gain further insights into breathing patterns beyond the event count.[4]

Volumetric RIP
Rich respiratory movement

→

Nox Flow™
Calibrated respiratory flow

→

Minute ventilation
Ventilation over time

→

Ventilatory Burden
Depth + duration + frequency

→

Clinical insight
More than event count

With Nox solutions, clinicians gain the tools to move beyond counting events — to truly measure their burden.

1. Pevernagie DA, et al. On the rise and fall of the apnea-hypopnea index: A historical review and critical appraisal. J Sleep Res. 2020;29(4):e13066. doi:10.1111/jsr.13066.
2. Malhotra A, et al. Metrics of sleep apnea severity: beyond the apnea-hypopnea index. Sleep. 2021;44(7):zsab030. doi:10.1093/sleep/zsab030.
3. Labarca G, Vena D, Hu W, et al. Sleep apnea physiological burdens and cardiovascular morbidity and mortality. Am J Respir Crit Care Med. 2023;208(7):802-813. doi:10.1164/rccm.202209-18080C.
4. Ventilatory Burden is part of FDA cleared and CE-marked software medical device DeepResp K252330.

Ventilatory burden, Nox Flow and Minute Ventilation are supplementary informational outputs provided for evaluation only and are not intended for clinical decision-making. They do not replace or change the clinical use of established respiratory signals and parameters.

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