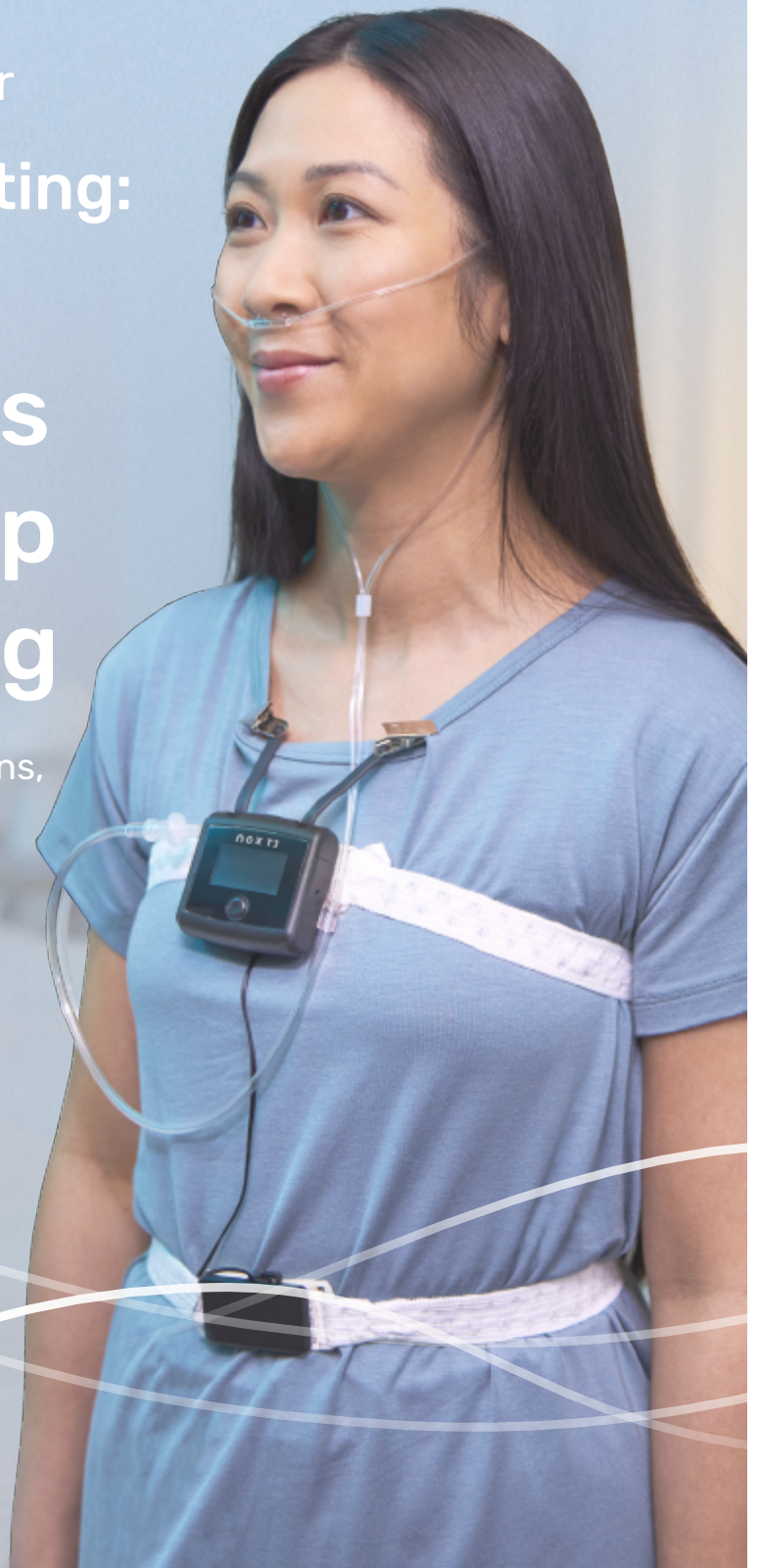




Clinical Application Paper

Inclusive Sleep Testing: Considering Comorbidities in Home Sleep Apnea Testing

The Nox T3s has no contraindications,
supporting diverse patient groups



Introduction

Obstructive sleep apnea (OSA) is a widespread condition that affects individuals across all demographics. However, it rarely exists in isolation—at least 80% of patients diagnosed with OSA also have multiple comorbidities, including cardiovascular, cerebrovascular, pulmonary, and metabolic disorders. Given this high comorbidity burden, effective home sleep apnea testing (HSAT) solutions must be inclusive and capable of assessing diverse patient populations without exclusion criteria.

The Nox T3s HSAT system is designed for ambulatory recording of physiological signals during sleep and offers broad clinical applicability. Unlike some HSAT devices that may **exclude patients with pacemakers, alpha-blocker medications, or certain comorbid conditions**, the **Nox T3 does not impose such limitations**, allowing for greater inclusivity in sleep diagnostics across diverse patient populations.

This paper explores the connection between Sleep Disordered Breathing (SDB) and chronic disease, the importance of using HSAT systems without specified contraindications or exclusion criteria, and how the Nox T3 has been utilized in both clinical and research settings to provide comprehensive sleep apnea diagnostics across diverse patient populations, including those with comorbidities.



Key Takeaways

OSA is highly comorbid with chronic diseases

- At least 80% of patients with OSA also have two or more chronic conditions, increasing the complexity of diagnosis and management.

Traditional HSAT devices may exclude certain patient populations

- Some home sleep testing systems restrict use in patients with pacemakers, certain medications, or comorbid conditions, limiting access to diagnostics.

The Nox T3s is designed for broad clinical use

- With no defined contraindications or exclusion criteria in its intended use, the Nox T3s enables comprehensive sleep testing across diverse patient groups, including those with comorbidities.

Advanced respiratory effort monitoring

- The Nox dual respiratory inductance plethysmography (RIP) belts provide an alternative respiratory flow signal, ensuring reliable event detection even if nasal cannulas become dislodged.

Clinical research consistently relies on the Nox T3s

- The system has been used in studies exploring OSA's role in cardiovascular disease, pulmonary conditions (such as COPD and pulmonary hypertension), and neurological disorders like stroke and traumatic brain injury.



Sleep-disordered breathing (SDB), particularly obstructive sleep apnea (OSA), is among the most prevalent conditions across the globe, affecting patients of all ages, sexes, and ethnicities. But OSA rarely occurs in a silo; at least 80% of patients have multiple, comorbidities across a diverse range of cardiovascular and cerebrovascular diseases, pulmonary, and metabolic disorders.^{1,2}

Significant advances in home sleep apnea testing (HSAT) continue to provide physicians with multiple diagnostic options for their OSA patients. **Given the high comorbidity burden, accuracy is key, underscoring the importance of technology that offers comprehensive analysis of respiratory activity, including airflow and respiratory effort.**

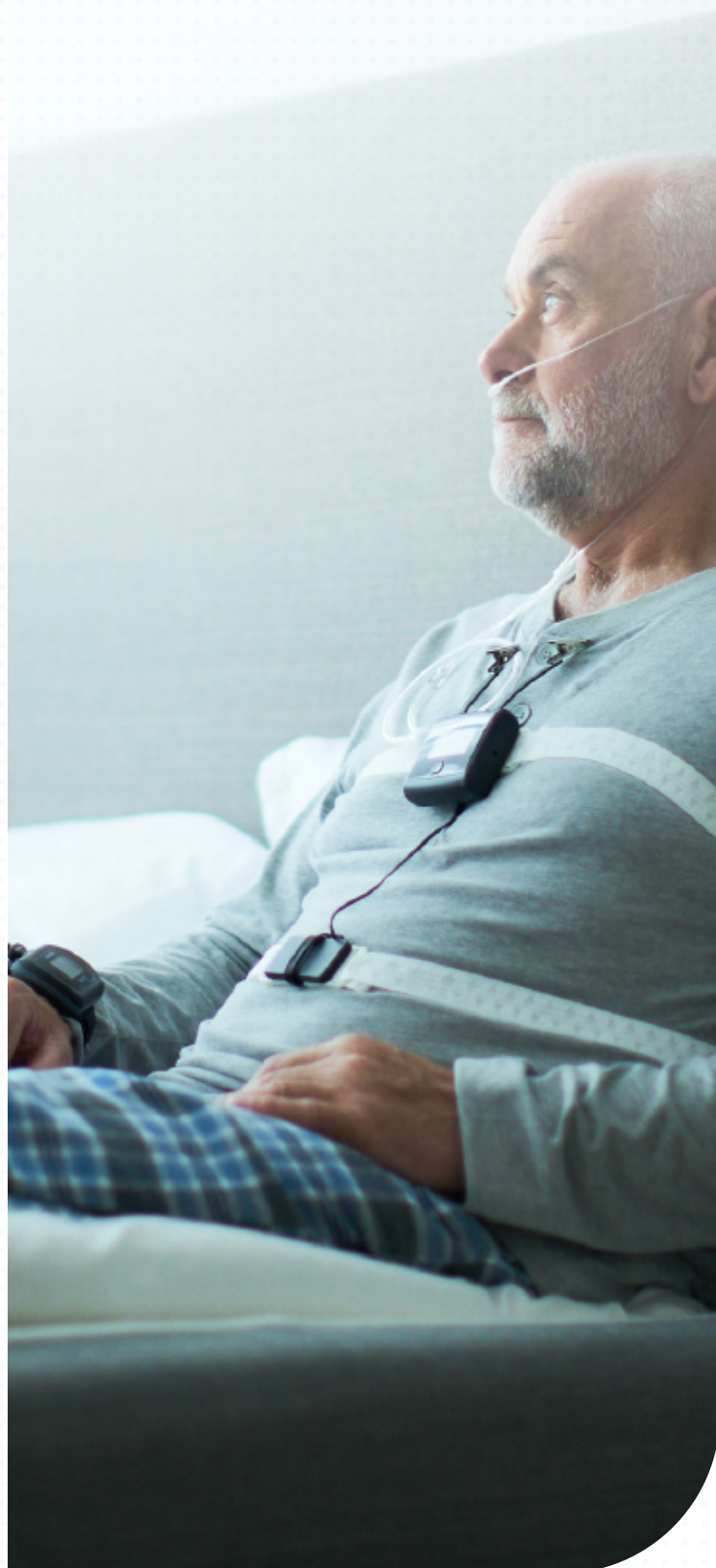
The Nox T3s is designed for ambulatory recording of physiological signals during sleep and offers broad clinical applicability, with no specified contraindications or exclusion criteria in its intended use. Unlike some home sleep testing (HSAT) devices that may exclude patients with pacemakers, alpha-blocker medications, or certain comorbid conditions, the Nox T3s does not impose such limitations, allowing for greater inclusivity in sleep diagnostics across diverse patient populations.

It is critical to consider the evidence supporting the use of these diagnostic devices to test for OSA across complex patient populations. For patients with chronic conditions and OSA, treating OSA can improve outcomes, as it often exacerbates the underlying condition.^{1,2} The American Heart Association recommends screening for OSA in patients with resistant or poorly controlled hypertension, pulmonary hypertension, and recurrent atrial fibrillation.²

The SDB-Chronic Disease Connection

The mechanisms driving the connection between SDB and chronic conditions have not been fully understood. SDB is characterized by recurrent collapse of the pharyngeal airway during sleep, resulting in shallow, restricted breathing (hypopnea) or complete cessation of breathing (apnea).

The burden of comorbidity increases with SDB severity, and overlapping comorbidities are common. Prevalence of OSA is high in various chronic conditions, with rates ranging from an estimated 30% in both coronary artery disease and Type 2 diabetes, to 35% in hypertension, 40% in obesity, 50% in heart failure, and as great as 71% in chronic kidney disease.^{1,21} As such, data shows that 80% of patients with obstructive sleep apnea (OSA) have more than two or more chronic conditions.¹⁻³



Nox T3s: Studied Across a Range of Patients with Comorbidities

Because patients with SDB often present with overlapping health issues that can affect optimal patient care and outcomes, timely diagnosis and careful consideration of the strengths and limitations of available HSAT systems are essential.

The Nox T3s is an advanced Type III HSAT system that uses patented Nox dual respiratory inductance plethysmography (RIP) belts*. The Nox RIP belts are single-use and were developed to ensure accurate respiratory signal detection by continuously capturing and measuring abdominal and thoracic breathing efforts during sleep.

The system also has a nasal cannula that captures changes in pressure to measure respiratory flow.⁴ One important advantage of the Nox RIP belts is that they've been designed to provide an alternative flow signal in cases where a nasal cannula or nasal thermistor becomes dislodged or compromised by oral breathing – a feature that helps avoid invalid test results. Data have also shown that this is a reliable back-up feature for respiratory event scoring.⁵⁻⁷

The Nox RIP belts can be worn comfortably over clothing and remain attached throughout the night. Contacts have been seamlessly integrated into the no-fold, disposable dual belts, which have outperformed both cut-to-fit and semi-disposable belts in a head-to-head study.⁸

Researchers examining co-morbid SDB and chronic diseases have consistently chosen the Nox T3s for their studies across a range of conditions as it meets the criteria for reliability. Data from the Nox T3s can be used by a qualified healthcare professional to score respiratory and other events (according to the AASM Manual) to aid in the diagnosis of sleep disorders (according to the ICSD-3). The most common research areas for co-morbid SDB have been cardiovascular disease (CVD) and cerebrovascular diseases; where SDB has been shown to be an important modifiable risk factor in both men and women for atrial fibrillation,⁹⁻¹¹ dyslipidemia and fatal CVD,¹² heart failure,¹³ and acute coronary syndrome.^{14,15}

The Nox T3s system has also been selected for use in studies examining the role that SDB plays in exacerbating certain pulmonary conditions, most

commonly chronic obstructive pulmonary disease (COPD), where the co-occurrence of the two (known as 'overlap syndrome') has been reported in up to 56% of patients with OSA.^{1,5,16} Other investigations have focused on pulmonary arterial hypertension¹⁷⁻²¹ and pneumonia.^{22,23}

Sleep abnormalities and SDB have likewise been reported in patients with neurological diseases. The Nox T3s system has been used for ambulatory recordings of physiological signals in investigations ranging from those screening for OSA in patients with muscular dystrophy,²⁴ and investigating periodic limb movements in patients with multiple sclerosis²⁵, to the utility of HSAT vs in-hospital polysomnography for patients with moderate-to-severe traumatic brain injury,^{26,27} and stroke.²⁸⁻³¹

Closing the Gap: The Key to Managing Comorbid Conditions

As SDB becomes more broadly identified as a key factor across a range of chronic conditions, and researchers continue to explore the underlying mechanisms driving the connection, it has become increasingly important for clinicians to include a trusted HSAT system in their diagnostic procedure. Even though sleep is a foundational element of care, especially in terms of its role in improving the management of patients with chronic conditions, it is estimated that more than 80% of individuals with OSA remain undiagnosed.³²

HSAT technology continues to evolve, as does the field of sleep diagnostics. Physicians working in this arena are increasingly challenged by difficult clinical presentations and patients with multiple comorbidities, reinforcing the need for evidence-based, accurate, and flexible diagnosis.

The Nox T3s, widely utilized in both clinical practice and research, has no contraindications, supporting use in diverse patient populations, including those with comorbidities. High-quality, informed care relies on accurate, timely diagnosis to ensure the best health outcomes in these patients.



*The Nox T3s recorder is intended for ambulatory recording of physiological signals during sleep. The Nox T3s recorder is intended for patients greater than 2 years of age. The intended environments are hospitals, institutions, sleep centers, sleep clinics, or other test environments, including the patient's home



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Disclaimers

The availability of the Nox T3s may vary between markets. Please contact your local distributor or sales representative for further information.

Caution: This device is restricted to sale by, or on the order of, a licensed medical practitioner, in accordance with applicable laws and regulations in your jurisdiction.

Nox Medical is a global leader in the sleep diagnostic technology space. The company provides sleep specialists with patient-friendly diagnostic devices and robust, reliable data collection. With easy-to-use medical device technology, Nox Medical eliminates common diagnostic pain points by prioritizing patient comfort and reliability of results, allowing providers to better assess, diagnose and treat the entire range of sleep health issues, including sleep apnea, circadian disorders and insomnia.

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