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Selección Vida

OBSTRUCTIVE SLEEP APNOEA SYNDROME:

a scientific perspective for the insurance sector

Yggdrasil: automation and innovation in risk assessment



OBSTRUCTIVE SLEEP APNOEA SYNDROME: A SCIENTIFIC APPROACH FOR THE INSURANCE SECTOR

Obstructive Sleep Apnoea Syndrome (OSAS) is one of the most common yet least diagnosed chronic conditions today.

For decades, it was regarded as a relatively benign condition, associated mainly with snoring and daytime sleepiness. However, scientific research over the last few decades has shown that it is a complex condition with significant cardiovascular, metabolic, neurocognitive and occupational implications.

For the insurance sector, OSAS is of growing interest due to its high prevalence, its link to morbidity and mortality, its impact on healthcare costs and its influence on the risk of workplace and road traffic accidents. Understanding this condition is essential for accurate risk assessment, the design of insurance products and the efficient management of healthcare benefits.

OSA is a respiratory disorder characterised by repeated episodes of partial or complete obstruction of the upper airway during sleep. These interruptions cause a temporary reduction or cessation of airflow to the lungs, even though the person continues to make breathing efforts. Put simply, the patient tries to breathe whilst asleep, but their throat collapses intermittently, preventing air from passing through normally. These interruptions can last from a few seconds to over a minute and may occur dozens or

even hundreds of times in a single night. Each episode generates three fundamental consequences:

- A drop in blood oxygen levels
- Increased respiratory effort
- Micro-awakenings in the brain that fragment sleep

Although most of those affected do not remember these episodes of waking, the quality of their sleep is impaired and it no longer fulfils its restorative functions properly.

THE SCALE OF THE PROBLEM

OSA is a major public health problem. Various epidemiological studies indicate that between 10 per cent and 30 per cent of the adult population suffers from some degree of obstructive sleep apnoea, although the prevalence increases considerably in certain at risk groups. Factors associated with a higher incidence include:

- Obesity
- Advanced age
- Male gender
- High blood pressure
- Diabetes mellitus
- Smoking
- Alcohol consumption

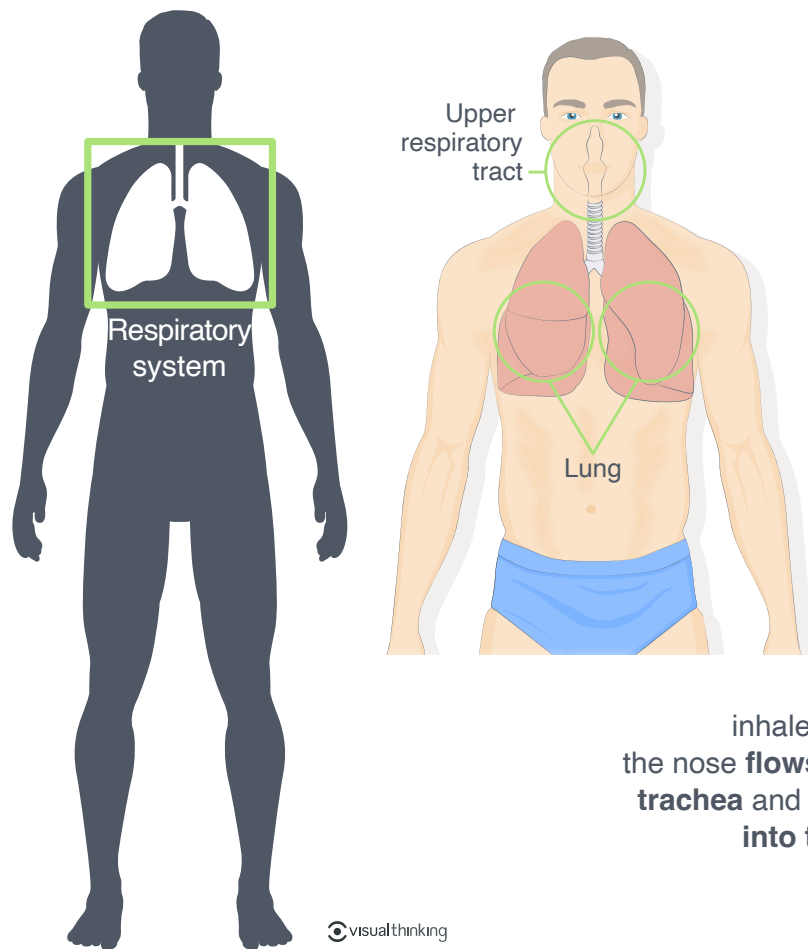
One of the most significant aspects is that a significant proportion of those affected remain undiagnosed. This means that there are thousands of people who continue to be exposed to the harmful effects of the condition for years without receiving treatment.

From an insurance perspective, this high rate of under-detection gives rise to a particularly significant issue: there may be risks associated with OSA that are not reflected in standard medical questionnaires.

HOW DOES APNOEA OCCUR?

To understand OSAS, it is helpful to imagine the upper airway as a flexible tube made up of soft structures in the throat: the tongue, soft palate, tonsils and pharyngeal walls. Whilst awake, the muscles surrounding these structures remain active and keep the airway open. When we sleep, these muscles undergo a physiological relaxation. In certain people, particularly those with excess fatty tissue or anatomical abnormali-

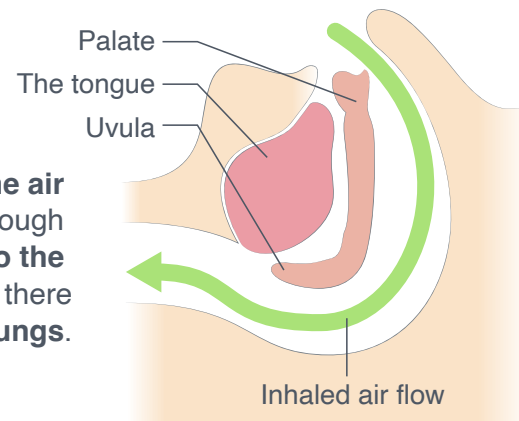
The patient affected experiences **one or more pauses in breathing or has shallow breaths** during sleep.



Causes

Pauses can last from a few seconds to several minutes. They often occur 30 times or more per hour.

Collapse of the upper respiratory tract



The air inhaled through the nose **flows into the trachea** and from there **into the lungs**.

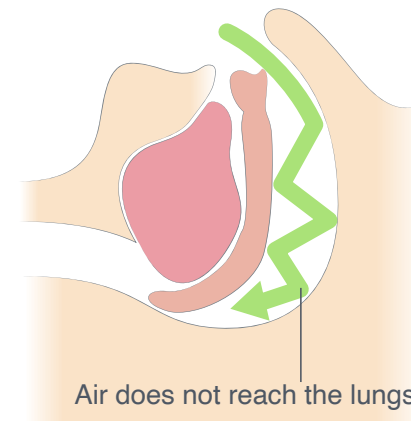
Symptom

If you suffer from sleep apnoea, you usually start snoring very loudly shortly after falling asleep.

- Snoring often gets louder.
- The snoring is interrupted by a long period of silence and breathing stops.
- **The silence is followed by loud snoring and gasping** as the patient tries to breathe.

respiratory tract

Breathing with apnoea



The tongue moves, presses the uvula, and **the air intake is obstructed**.

- Small jaw
- Thick neck
- Chronic nasal obstruction
- Tonsillar hypertrophy
- Palatal abnormalities
- Behavioural factors

Alcohol consumption and certain sedative medicines promote muscle relaxation during the night and increase the likelihood of airway collapse.

CLINICAL MANIFESTATIONS

1. NOCTURNAL SYMPTOMS

The most well-known sign is loud, persistent snoring. However, snoring on its own does not necessarily

indicate the presence of apnoea. Other common symptoms include:

- Breathing pauses observed by the partner
- Feeling of suffocation during the night
- Restless sleep
- Repeated awakenings
- Night-time sweating
- Nocturia (the need to urinate several times during the night)

2. DAYTIME SYMPTOMS

The most characteristic symptom is excessive daytime sleepiness.

Many patients report:

- Constant fatigue
- Difficulty concentrating
- Memory problems
- Irritability
- Poor work performance
- Morning headaches

In the most severe cases, there may be a risk of falling asleep whilst carrying out routine activities, including driving.

3. CARDIOVASCULAR CONSEQUENCES

The link between OSAS and cardiovascular disease is one of the areas of greatest interest to the insurance industry. Each episode of apnoea triggers a cascade of physiological events: a drop in oxygen levels, an increase in carbon dioxide, activation of the sympathetic nervous system, a temporary rise in blood pressure and an increase in heart rate. When these phenomena recur hundreds of times every night, they create a state of chronic biological stress.

Scientific studies have demonstrated an association between OSAS and high blood pressure, ischaemic heart disease, heart failure, atrial fibrillation, stroke and cardiovascular death. For this reason, a person with untreated OSAS may have a considerably higher risk profile than another individual with similar characteristics who does not have this condition.

Furthermore, sleep fragmentation and intermittent oxygen deprivation contribute to insulin resistance, type 2 diabetes, dyslipidaemia and metabolic syndrome. This association is particularly significant because many of these conditions are, at the same time, independent cardiovascular risk factors. Consequently, a cumulative effect occurs that increases the likelihood

ties, this relaxation leads to a narrowing of the airway. If the airway collapses partially, there is a reduction in respiratory flow known as hypopnoea, but if it collapses completely, apnoea occurs.

The brain then detects the lack of oxygen and activates emergency mechanisms that cause a brief awakening. During that moment, muscle tone is restored and breathing returns to normal. The patient then falls back asleep, and the cycle repeats itself over and over again throughout the night. In the most severe cases, this phenomenon can occur dozens of times an hour.

RISK FACTORS

OBESITY

Obesity is the main risk factor for OSAS. The accumulation of fatty tissue around the neck increases

pressure on the airways and makes them more likely to collapse. Furthermore, abdominal obesity restricts respiratory movements and impairs lung ventilation. It is estimated that the majority of patients with moderate or severe OSAS are overweight or obese.

AGE

The risk increases progressively with age due to a loss of muscle tone and structural changes in the airways.

GENDER

Men are affected more frequently than women, particularly during middle age. After the menopause, the difference between the sexes decreases significantly.

CRANIOFACIAL ANATOMY

Certain anatomical features predispose individuals to the development of the condition:

of medical complications and the use of healthcare resources.

4. NEUROCOGNITIVE IMPACT

Sleep is not simply about resting. During sleep, complex processes take place that are linked to memory consolidation, learning and emotional regulation. The constant fragmentation of sleep in patients with OSAS has a negative impact on these functions. The observed consequences include:

- Reduced attention
- Psychomotor sluggishness
- Difficulty in decision-making
- Memory impairments
- Higher incidence of depression and anxiety

From an insurance perspective, these effects can lead to reduced productivity and an increase in sick leave.

RISK OF ACCIDENTS

One of the most widely studied aspects of OSA is its link to road traffic accidents. Daytime sleepiness reduces reaction times, impairs concentration and leads to so-called ‘microsleeps’ – brief, involuntary episodes of loss of alertness. Numerous studies have shown that patients with moderate or severe OSA are at a significantly higher risk of being involved in road traffic accidents. This has direct implications for: motor insurance, accident insurance, employers’ liability insurance and professional indemnity insurance in certain occupations. Professions such as professional drivers, pilots, heavy machinery operators and workers in critical infrastructure require particular attention in this regard..

DIAGNOSIS

The diagnosis of OSAS has evolved significantly in recent years. Traditionally, it was carried out using overnight polysomnography, which is considered the gold standard. This test simultaneously records brain activity, breathing, blood oxygen levels, heart rate and body movements. Nowadays, there are also simplified tests carried out at home, known as respiratory polygraphies.

The main parameter used to measure severity is the Apnoea-Hypopnoea Index (AHI), which indicates the number of respiratory events per hour of sleep. Generally, it is classified as follows:

- Mild: 5–14 events per hour.
- Moderate: 15–29 events per hour.
- Severe: 30 or more events per hour.

This classification has prognostic value and facilitates risk stratification.

RELEVANCE FOR THE INSURANCE SECTOR

From an insurance perspective, OSAS is an excellent example of a condition with a wide-ranging impact. It is not merely a sleep disorder, but a condition capable of influencing multiple dimensions of risk. Patients with OSA result in higher consumption of healthcare resources due to the co-existence of cardiovascular, metabolic and respiratory conditions.

1. LIFE INSURANCE

The association between severe, untreated OSAS and cardiovascular mortality makes this condition a factor that must be taken into account in actuarial models.

2. ACCIDENT INSURANCE

Daytime sleepiness increases the likelihood of accidents both whilst driving and during certain occupational activities.

3. WORK INCAPACITY

Cognitive impairments, fatigue and associated illnesses can affect productivity and lead to longer periods of temporary incapacity.

A particularly interesting aspect is that OSAS is an example of a condition where early detection and treatment yield both clinical and economic benefits. Various studies suggest that patients who are properly treated experience:

- Lower cardiovascular risk
- Fewer road traffic accidents
- Reduced use of healthcare services
- A better quality of life
- Improved work performance.

Consequently, an increasing number of healthcare systems and insurance providers are promoting strategies for the early identification of high-risk patients. From an economic perspective, investment in diagnosis and treatment can be offset by a reduction in future costs associated with medical complications and accidents.



YGGDRASIL: AUTOMATION AND INNOVATION IN RISK ASSESSMENT

Last June, NR made a new risk assessment and pricing tool, Yggdrasil (YG), available to our cedants.

Yggdrasil is based on **decision trees**, a graphical tool that allows a problem to be broken down into different decisions, options and possible outcomes. In our case, this technology enables us **to assess different medical conditions and risk scenarios to determine appropriate premiums** quickly and automatically.

How does it work?

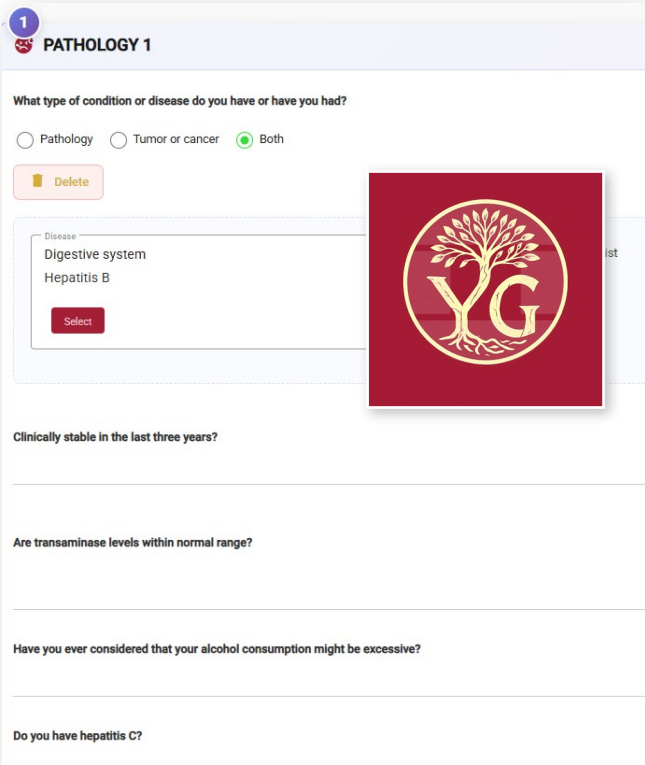
Based on the information provided in the form, six pricing modules are automatically activated, each specialising in a specific area: the first four assess cover for life, disability, accidents and long-term illness, whilst the last two (occupations and sports/leisure activities) assess cover for life, disability, and accidental death and disability.

LifeNR

Automatically generates results based on the main risk variables: gender, age, weight, height, BMI, tobacco and alcohol consumption, blood pressure and cholesterol.

Diabetes

This allows the assessment to be obtained automatically using the following parameters: gender, age, weight, height, BMI, tobacco and alcohol consumption, blood pressure and cholesterol, duration of diabetes, type of diabetes, insulin use and glycated haemoglobin.



Cancer

Runs decision trees for 806 types of tumours, taking into account the Right to be Forgotten Act, and provides the corresponding surcharges.

Medical conditions

Runs specific decision trees for the medical conditions covered by the tool, facilitating an automated risk assessment.

Occupations

Includes a table listing 288 occupations, with the corresponding surcharges.

Sports and hobbies

It features 149 high-risk activities, with their corresponding surcharges.

The result: greater automation, agility and consistency in risk assessment, making our teams' work easier and offering our policyholders a more efficient tool for decision-making.

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Depósito legal:M-344-97



SELECCIÓN VIDA is a publication edited by the Personal Lines Department of **NACIONAL DE REASEGUROS, S.A.** in collaboration with Doctor Pedro Gargantilla. Zurbano, 8 - 28010 Madrid
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