

# Childhood and adolescent insomnia

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## Abstract

*Insomnia is one of the most prevalent sleep disorders, affecting 20-30% of the child and adolescent population at some point, according to diverse studies. The three components of insomnia are: persistent difficulty sleeping, despite an adequate opportunity to do so, and associated with the patient's dysfunction during the day. There is an imbalance in the components that intervene in sleep maturation: circadian, homeostatic, environmental, educational and neuroendocrine. In addition, predisposing, precipitating and perpetuating factors intervene. It produces severe physical, psychological, emotional, cognitive and social repercussions on the patient, affecting the quality of life of the child and his family. The diagnosis is clinical, with a structured clinical history, physical examination and sleep diary. The first choice of treatment is cognitive-behavioral therapy associated with sleep hygiene measures. If it fails, pharmacological treatment can be tried in conjunction with the above, with melatonin being the drug of choice for insomnia in children and adolescents.*

**Key words:** Pediatric insomnia; Childhood; Adolescence; Cognitive-behavioral treatment; Sleep hygiene; Melatonin.

**Palabras clave:** Insomnio pediátrico; Infancia; Adolescencia; Tratamiento cognitivo-conductual; Higiene del sueño; Melatonina.

## Resumen

El insomnio constituye uno de los trastornos del sueño más prevalentes, afectando al 20-30 % de la población infantojuvenil en algún momento, según los diferentes estudios. Los tres componentes del insomnio son: dificultad persistente para dormir, a pesar de una adecuada oportunidad para hacerlo y asociado a una disfunción del paciente durante el día. Existe un desequilibrio en los componentes que intervienen en la maduración del sueño: circadiano, homeostático, ambiental, educativo y neuroendocrino; además, intervienen factores: predisponentes, precipitantes y perpetuantes. Produce graves repercusiones en el paciente: físicas, psicológicas, emocionales, cognitivas y sociales, afectando a la calidad de vida del niño y de su familia. El diagnóstico es clínico, con una estructurada historia clínica, exploración física y agenda de sueño. El tratamiento de primera elección es la terapia cognitivo-conductual asociada a medidas de higiene de sueño. Si fracasa, puede probarse tratamiento farmacológico unido a lo anterior, siendo la melatonina el fármaco de elección en el insomnio del niño y el adolescente.

## OBJECTIVES

- To raise awareness among health professionals about the importance of insomnia, its high prevalence, its consequences and that, despite this, it remains underdiagnosed.
- To know the etiopathogenesis of insomnia, as well as its predisposing, precipitating and perpetuating factors, so as to be able to carry out an adequate diagnosis and treatment.
- To understand that the clinical manifestations of insomnia can affect all aspects of patients' lives: physical, psychological, emotional, cognitive and social, with a significant impact on the quality of life of the child and his family.
- To recognize that the clinical history is the central tool to evaluate pediatric insomnia along with the sleep diary, which allows us to know the patient's sleep-wake pattern.
- To appreciate that the treatment of insomnia in children and adolescents is based, according to current evidence, on cognitive-behavioral therapy associated with sleep hygiene measures.
- To keep in mind that, if cognitive-behavioral therapy fails, the drug of first choice for childhood and adolescent insomnia is melatonin.
- To become familiar with the mechanisms of action, indications and dosage of melatonin in the treatment of childhood and adolescent insomnia.

## Introduction

The symptoms and consequences of insomnia constitute a highly frequent reason for consultation in the pediatrician's Primary Care office, as well as in Sleep Units; although, in general, insomnia, as such, is underdiagnosed. Lack of sleep will affect the child's development in all aspects: physical (obesity), psychological, emotional, cognitive (memory, attention, language acquisition) and social, since sleep influences the maturation of the central nervous system, as well as in the circadian rhythm,

throughout life. The child's insomnia also affects the parents' sleep and, in turn, it may be family problems that affect the child's sleep. When parents come to the pediatrician's office with a sleep complaint, they have generally been dealing with the problem for some time and may have tried a treatment recommended by friends, family, or the Internet. Insomnia can also be a symptom of other specific sleep disorders, such as: restless legs syndrome, phase delay syndrome, etc.

During the first year of life, the most frequent complaint of parents about the infant's sleep is difficulty initiating sleep and/or nocturnal awakenings of the child, followed, at later ages, by various parasomnias and breathing problems during sleep. From the preschool stage onwards, problems are often related to inadequate sleep hygiene, and in adolescence, circadian rhythm disorders (phase delay syndrome) or excessive movements during sleep must also be ruled out.

In recent years, with the COVID-19 pandemic, there has been great stress and traumatic effects on the entire population, with a great impact on the quality and duration of sleep, especially in children and adolescents. This has been related to confinement, the social environment and difficulty developing social habits.

Various studies have shown that, if insomnia is not treated in childhood, it tends to persist, both in adolescence and in adulthood, and can contribute to diseases such as Alzheimer's or Parkinson's. It is essential to carry out the diagnosis and treatment as early as possible, since, as the patient's age increases, it is more difficult to control poor sleeping habits.

Health professionals must know how to identify, guide and treat insomnia, without the need for excessive complementary tests or referrals to specialists.

## Definition and classification of insomnia

**The fundamental components of insomnia are: persistent difficulty sleeping, despite an adequate opportunity to do so, and associated with the patient's dysfunction during the day.**

**Table 1. Diagnostic criteria for chronic insomnia disorder (CID)**

Alternative names: chronic insomnia, primary insomnia, secondary insomnia, comorbid insomnia, sleep onset and maintenance disorder, childhood behavioral insomnia, sleep onset association disorder, and limit-setting sleep disorders

### A-F criteria must be met

- A.** Reports from patients or the patient's parent/caregiver detect one or more of the following:
1. Difficulty initiating sleep
  2. Difficulty maintaining sleep
  3. Earlier than desired wake up time
  4. Resistance to going to bed at an appropriate time
  5. Difficulty sleeping without parent or caregiver intervention
- B.** Reports from patients or the patient's parent/caregiver detect one or more of the following related to difficulty sleeping at night:
1. Fatigue/discomfort
  2. Impaired attention, concentration or memory
  3. Impaired performance with family, work, or social performance
  4. Mood disturbance/irritability
  5. Daytime sleepiness
  6. Behavior problems (e.g., hyperactivity, impulsivity, aggression)
  7. Reduced motivation, energy and initiative
  8. Predisposition for errors/accidents
  9. Concern or dissatisfaction with sleep
- C.** Sleep/wake complaints cannot be explained simply by inadequate opportunity for sleep (i.e., allocation of sufficient time for sleep) or inadequate circumstances (i.e., environment is safe, quiet, and comfortable) for sleep
- D.** Sleep disturbance and associated daytime symptoms occur at least three times a week
- E.** Sleep disturbance and associated daytime symptoms have been present for at least three months
- F.** Sleep disturbance and associated daytime symptoms are not solely due to another current sleep disorder, medical disorder, mental disorder, or medication/substance use

### Notes:

1. Reports of difficulties initiating sleep, difficulties staying asleep, or waking up too early can be seen in all age groups. Resistance to going to bed on time and difficulty sleeping without the intervention of a parent or caregiver is more common in children and older adults who require the supervision of a caregiver, due to a considerable level of functional impairment (e.g.: people with dementia)
2. Some patients with chronic insomnia may have recurrent episodes of sleep/wake difficulties that last several weeks and at a time for several years, however, they do not meet the criterion of three months duration for a single episode. These patients should be assigned a diagnosis of CID, given the intermittent sleep difficulties that persist over time
3. Some patients who use hypnotics regularly may sleep well and not meet the criteria for insomnia disorder when taking them. However, in the absence of such medications, these same patients may meet the criteria. This diagnosis applies to these patients if they have concerns about their inability to sleep without their medications
4. Many comorbid conditions, such as: chronic pain disorders or gastroesophageal reflux disease (GERD), can produce the sleep/wake symptoms discussed here. When these conditions are the sole cause of sleep difficulty, the diagnosis of insomnia should not be made separately. However, in many patients, these conditions are chronic and are not the only cause of sleep difficulties. The clinical presentation they present will have to be assessed. If there is evidence that the symptoms are not solely caused by the medical problem and require separate treatment, the diagnosis of CID will be made

Source: American Academy of Sleep Medicine. ICSD-3. In: *The International classification of sleep disorders - Third edition*. Westchester: American Academy of Sleep Medicine; 2014. American Academy of Sleep Medicine. Text Revision (ICSD-3-TR) Summary of Diagnostic Criteria Changes 2023.

The American Academy of Sleep Medicine (AASM), in its third edition<sup>(1)</sup>, defines insomnia as: “a persistent difficulty in the initiation, duration, maintenance, or quality of sleep that occurs despite adequate opportunity and circumstances to sleep and that leads to some type of alteration in daytime functioning”. The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) also defines insomnia as a persistent disorder.

This difficulty in starting or maintaining quality sleep can manifest itself in the presence of a sleep latency greater than 30 minutes and/or awakenings lasting more than 20 minutes, which can cause significant deterioration in different functioning areas<sup>(2)</sup>.

In childhood insomnia, it is the parents/caregivers who transmit the complaint, influenced by previous expectations and the type of upbringing and, furthermore, the consequences affect the child and the entire family. It is necessary to take into account the child's maturation process, since certain aspects of children's sleep can be considered alterations at one point in their development and normal at another.

The AASM, in its third edition<sup>(1)</sup>, classifies insomnia into three categories:

1. **Chronic insomnia disorder (CID).** Chronic problem initiating sleep and/or complaints of sleep maintenance, associated with a deterioration during the day. This term is reserved for people whose sleep difficulties exceed the minimum thresholds for frequency and duration (at least three times a week and persist for at least three months). Furthermore, it is associated with significant morbidity. The criteria can be seen in table I.
2. **Short-term insomnia disorder.** It is characterized by sleep/wake difficulties, which do not meet the minimum criteria in terms of frequency and duration of CID. It is associated with clinically significant sleep dissatisfaction or impaired wakefulness. The criteria can be seen in table II.
3. **Other insomnia disorders.** They are assigned to the rare cases who do not meet the criteria for short-term insomnia and who have sufficient symptoms of insomnia to require medical attention.

**Table II. Diagnostic criteria for short-term insomnia disorder**

Alternative names: acute insomnia, adjustment insomnia

**A-E criteria must be met**

- A.** Patients report or the patient's parent/caregiver observes one or more of the following:
  1. Difficulty initiating sleep
  2. Difficulty maintaining sleep
  3. Waking up earlier than desired
  4. Resistance to going to bed at an appropriate time
  5. Difficulty sleeping without parent or caregiver intervention
- B.** Reports from patients or the patient's parent/caregiver detect one or more of the following, related to difficulty sleeping at night:
  1. Fatigue/discomfort
  2. Impaired attention, concentration or memory
  3. Social, family, professional or academic development impairment
  4. Mood disturbance/irritability
  5. Daytime sleepiness
  6. Behavior problems (e.g., hyperactivity, impulsivity, aggression)
  7. Reduced motivation/energy/initiative
  8. Predisposition for errors/accidents
  9. Concerns/dissatisfaction with sleep
- C.** Sleep/wake complaints cannot be explained solely by an inadequate opportunity for sleep (insufficient time is allocated for sleep) or inadequate circumstances (the environment is not safe, dark, quiet and comfortable) for sleep
- D.** Sleep disturbance and associated daytime symptoms are present for less than three months
- E.** Sleep/wake difficulty is not better explained by another sleep disorder

**Notes:**

1. Reports of difficulties initiating, maintaining sleep, or waking up very early can be seen in all age groups. Resistance to going to bed at an appropriate time and difficulty sleeping without parental or caregiver intervention is more common in children and older adults who require the supervision of a caregiver, due to a significant functional impairment (e.g.: people with dementia)
2. Patients with short-term insomnia disorder may complain of difficulty sleeping/waking up less than three times a week on average. However, they may have clinically significant concerns about their symptoms and need clinical care
3. Many processes, such as pain, acute pain or other stressors, are very often associated with lack of sleep. When such conditions are the sole cause of sleep difficulty, a separate diagnosis of insomnia should not apply. The main factor in determining short-term insomnia or adjustment insomnia is the degree to which the sleep disturbance becomes an important process for the individual and/or requires independent clinical attention

Source: *The International Classification of Sleep Disorders – Third Edition (ICSD-3)* American Academy of Sleep Medicine, Darien, IL 2014.

These diagnoses apply to patients with and without comorbidities, regardless of whether these are potentially detrimental to sleep.

Recently, in June 2023, the AASM<sup>(2)</sup> has published several changes in criteria in some sleep disorders (ICSD-3-TR) and with respect to chronic insomnia disorder, in criterion F: “sleep disturbance and associated daytime symptoms are not solely due to another current sleep disorder, medical disorder, mental disorder, or medication/substance use”.

Insomnia can be a sleep complaint associated with different medical problems, such as: gastroesophageal reflux, respiratory problem or chronic pain syndrome. If the medical condition is the only cause of insomnia, the diagnosis of insomnia should not be made separately.

Sleep disturbances in acute insomnia may also be due to different causes, such as the initial presentation of autoimmune encephalitis or psychiatric disorders. Another common cause is the use of medications such as: decon-

gestants, selective leukotriene receptor antagonists (montelukast), beta blockers, antidepressants, stimulants, corticosteroids, etc.

For the evaluation and application of specific behavioral interventions in clinical practice, it is most useful to consider the following categories: behavioral insomnia (related to inappropriate associations at the onset of sleep, or to the absence of limits by parents, or also to excessive time in bed), psychophysiological insomnia and transient sleep disturbances, which will be discussed in detail in the clinical manifestations.

## Prevalence

Insomnia symptoms appear in a large proportion of the child and adolescent population, and this prevalence is even higher in children with psychiatric or neurodevelopmental problems.

Insomnia affects 20-30% of the child and adolescent population at some point in their lives<sup>(2-4)</sup>. The global prevalence, logically, varies according to different countries and the methodology used. The increase in prevalence that has been observed in recent years is related to family social habits. Prevalence also varies with age: in the first two years of life, it is highest, around 30%; and after the third year, it remains stable at around 15%, increasing later in adolescence.

The incidence of insomnia increases in children with psychiatric and neurodevelopmental disorders, such as: autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), and also in children with blindness.

In our country, according to a study carried out in the Valencian Community, 27% of children aged 5-12 years show resistance in going to sleep; 11% prolonged sleep latency; 6% frequent awakenings; and 17% had difficulties getting up in the morning<sup>(5)</sup>.

In adolescents, 38.5% have poor subjective sleep quality and 23.1% have sleep latency greater than 30 minutes<sup>(6)</sup>.

## Etiopathogenesis

Childhood insomnia is the consequence of an imbalance in the components that intervene in the maturation of childhood sleep, in addition to predisposing, precipitating and perpetuating factors.

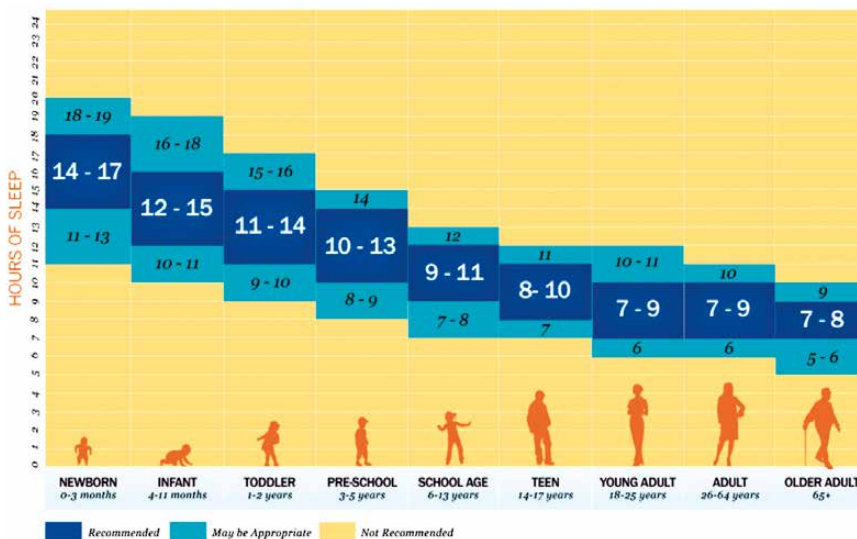
The concept of “sleeping through the night” in an infant does not mean sleeping without interruption, but rather it is a progressive maturation process, which is based on the acquisition of three skills<sup>(7,8)</sup>:

1. A continuous period of time sleeping.
2. Nighttime sleep schedule that matches the rest of the family.
3. Ability to fall asleep autonomously again, after physiological awakenings.

The first thing to determine is, when faced with a child who wakes up at night, whether it is abnormal or not for his or her developmental age. It is normal for a 3-month-old baby to wake up 2 to 3 times a night, and he will begin to sleep through the night around 6 months of age. The infant's nocturnal sleep stabilizes from that age onwards, when the child's sleep/wake cycle goes from being directed by hunger and satiety to being orchestrated by: the circadian rhythm, the social environment and light-darkness changes. Starting at 9 months of age, there is again an increase in the longest uninterrupted night sleep time. Figure 1 shows the hours of sleep needed according to age.

Childhood insomnia is the consequence of the imbalance of the five components that intervene in the maturation of childhood sleep<sup>(8)</sup>:

1. **Circadian component:** ignorance of the physiology and evolution of sleep favors a lack of coordination between the time selected by the parents for the child to fall asleep and the child's personal biological rhythm. This biological rhythm is established after 5-6 months of life, with an individualized circadian time for each baby. This is why it makes little sense to talk about insomnia or problems related to falling asleep or maintaining sleep in a baby under 6 months old.
2. **Homeostatic component:** sleep regulatory mechanism, which establishes that: the more hours of wakefulness prior to sleep (and thus the greater the accumulation of adenosine), the greater the sleep pressure and, therefore, the less difficulty in initiating it.
3. **Environmental component:** presence or absence of light during the day and night. The concentration of melatonin increases during the night (darkness) and adequate concentration at the time of going to bed is reduced or prevented in the presence of light.
4. **Educational component:** sleep is part of the habits of a healthy life. Health education is basic, since establishing sleep routines is associated with better quality of sleep. It is



**Figure 1.** Recommended hours of sleep according to age. Recommendations according to the National Sleep Foundation. Source: Hirshkowitz M. *The National Sleep Foundation's sleep time duration recommendations*. 2015.

important to review the development of the bond within the mother-child “complex adaptive system” during the first years of life, discussed in the ontogeny of sleep, in this issue of the journal.

5. **Neuroendocrine component:** the establishment of the circadian rhythm of cortisol and the baby’s acquisition of the ability to sleep through the night, are closely related. That is, the establishment of the circadian rhythm of cortisol occurs coinciding with the establishment of the circadian wake-sleep rhythm<sup>(9)</sup>. It must be reminded that the consolidation of the microbiota-gut-brain axis, from the uterine stage and during the first 3 years of life, plays a very important role in the development of the central nervous system, as has already been explained in the ontogeny of sleep, in this issue of the journal.

There are also numerous factors that influence childhood insomnia<sup>(8,10,11)</sup>:

- **Predisposing factors:** baseline factors that a child has before insomnia develops, such as: age, sex, genetic predisposition, maternal behavior and stress during pregnancy, type of delivery and care during it, nutrition after birth (the concentration of melatonin in breast milk is minimal at the beginning of the day and increases in the evening feedings), developmental status, temperament or personality, psychological state or anxiety level, and underlying medical or psychiatric conditions.

The mother-child binomial constitutes a *complex adaptation system*, because they are interconnected and complement each other. An infant’s sleep is influenced by the environment he or she experienced during the fetal stage. Maternal stress during the third trimester of preg-

nancy facilitates the permeability of the placenta to corticosteroids, conditioning: an increase in fetal corticosteroids, a delay in the appearance of the diurnal rhythm of cortisol and a hypothalamic-gonadal hyperresponse to stressful situations<sup>(8)</sup>.

- **Precipitating factors:** factors that can trigger insomnia such as: acute events, stress, post-traumatic events, parental psychopathology and poor interaction between parents and children.
- **Perpetuating factors:** factors that maintain insomnia such as: inadequate sleep hygiene, schoolwork or peer pressure, unrealistic parental expectations about the child’s sleep, negative parenting styles and lack of constant discipline.

The most common factors involved in children are inadequate sleep hygiene practices; and for adolescents, bedtime screen use, caffeine consumption, and inappropriate naps. Table III shows different causes/triggers of insomnia depending on age.

Table III. Insomnia, causes and triggers depending on age

| Age                  | Causes  |
|----------------------|---|
| Infants              | <ul style="list-style-type: none"> <li>– Inappropriate sleep onset associations</li> <li>– Food allergies</li> <li>– Gastroesophageal reflux</li> <li>– Colic</li> <li>– Excessive intake of fluids at night</li> <li>– Acute otitis media and other infectious diseases</li> <li>– Chronic diseases</li> </ul>                                 |
| 2-3 years            | <ul style="list-style-type: none"> <li>– Inappropriate sleep onset associations</li> <li>– Fears</li> <li>– Parental separation anxiety</li> <li>– Napping for long periods or at inappropriate hours</li> <li>– Acute infectious diseases</li> <li>– Chronic diseases</li> </ul>   |
| Preschool and school | <ul style="list-style-type: none"> <li>– Absence of limits</li> <li>– Fears</li> <li>– Nightmares</li> <li>– Sleep hygiene problems</li> <li>– Acute infectious diseases</li> <li>– Chronic diseases</li> </ul>   |
| Teenagers            | <ul style="list-style-type: none"> <li>– Sleep hygiene problems</li> <li>– Phase delay</li> <li>– Psychiatric comorbidities: anxiety, depression, ADHD...</li> <li>– Family and school pressure</li> <li>– Sleep-disordered breathing</li> <li>– Movement disorders</li> <li>– Acute infectious diseases</li> <li>– Chronic diseases</li> </ul> |

Modified from: Nunes ML, Bruni O. Insomnia in childhood and adolescence: clinical aspects, diagnosis, and therapeutic approach. *J Pediatr (Rio J)*. 2015; 91: 526-35.

## Clinical manifestations

**Insomnia produces serious clinical manifestations in the patient: psychological, emotional, cognitive, physical and social, affecting the quality of life of the child and their family.**

## Chronic insomnia disorder

The symptoms can be found in table I. Although CID is more common in adults and in females, it can manifest at any time during childhood<sup>(1)</sup>. The onset may be insidious or acute. The course varies and depends on the cause. When this is resolved (limits, negative associations...), sleep improves. Complications are due to sleep loss and include: irritability, drowsiness, cognitive impairment (attention, memory), affected school performance and mood changes. It is accompanied by loss of sleep for caregivers and increased family tension. Some may continue into adulthood.

There is a *natural history of insomnia*, which begins in childhood: with behavioral alterations, lower social

skills, irritability, impulsivity, which then continues with an alteration in the ability to concentrate, with difficulty in learning at school and in different life aspects. If chronic insomnia persists, harmful effects occur on physical health, with cardiovascular, immunological and metabolic alterations, including those of glucose metabolism (diabetes) and endocrine function, with overweight, obesity and impaired growth.

### Short-term insomnia disorder

The symptoms can be seen in table II. Although it is more common in adulthood, it can occur at any age, in isolation, or comorbid with a mental, medical or drug use disorder<sup>(4)</sup>. Sometimes it happens episodically, coinciding with stressors, other times there is no identifiable cause. It can manifest only with problems initiating sleep or maintaining it and, more frequently, with both. It can be accompanied by symptoms during wakefulness similar to CID, such as: fatigue, attention and concentration problems, poor memory, irritability and anxiety due to lack of sleep. If it is due to a stressful event, it may include: anxiety, worry, sadness or depression.

In children, precipitating factors are: having a parent with insomnia, alterations in sleep/wake schedules, family problems, bereavement, moving house or changes in the sleep environment. A constitutional predisposition is suggested. Many experience remission over time and others progress to CID. This diagnosis can be difficult in infants, since it is difficult to link stress factors.

As already mentioned, in clinical practice, for the evaluation and use of behavioral measures, it is more useful to consider the following categories<sup>(14-17)</sup>.

### Behavioral insomnia

It is the most frequent in Primary Care consultations. Resistance to going to bed leads to a delay in the onset of sleep and/or prolonged night awakenings. They often coexist and require parental intervention. It is most common between 1-5 years of age and can persist beyond that. The primary causes are: inappropriate associations with sleep onset, parental difficulty in setting limits, or both.

Some degree of resistance to going to sleep or insomnia in the child is normal, but it is temporary. In order to consider it a disorder, the symptoms must appear at least three times a week, persist for at least three months and determine the impact on the functioning of the child and the family.

In recent years, it has been postulated that the majority of cases of childhood insomnia that were considered behaviorally based, actually have a circadian basis at their beginning and, later, educational-behavioral factors are added. This leads to the fact that, currently, it is considered that the majority of cases of idiopathic childhood insomnia, excluding other causes, will have mixed components: circadian-behavioral.

- **Insomnia due to inappropriate associations at the onset of sleep:** this type of insomnia usually occurs in infants, toddlers, and preschoolers who cannot calm themselves or learn to sleep on their own without specific associations or conditions. They have difficulty falling asleep or staying asleep, or both, due to inappropriate associations with sleep onset. If the conditions of the association are restored, they generally resume sleep relatively quickly. They are likely to have fears, separation anxiety and anxiety about sleeping alone. Generally, there are associations with some form of stimulation (e.g., rocking, being petted, feeding, watching TV, riding in a car), object (bottle), or the presence of parents in the room or even lying next to them.
- **Insomnia due to lack of appropriate limits:** it usually occurs in preschoolers and older children, due to age-appropriate oppositional behaviors, such as resistance at bedtime. Children refuse to go to bed, with protests or demands to do something else to delay their bedtime. Separation anxiety can also result in resistance to bedtime and nighttime awakenings. This occurs when parents are inconsistent with boundaries or discipline in an unpredictable way. As a result, the child's sleep onset is delayed from its appropriate time. Sometimes, the child's resistance to going to bed reflects an

underlying problem (use of medication, medical conditions, restless legs syndrome (RLS), anxiety or lack of coordination between the child's circadian preference and parental expectations)<sup>(11)</sup>.

- **Insomnia related to excessive time in bed:** although it is not a "formal" subtype, it is useful to know it in clinical practice. Parents impose a schedule on the child with time in bed that exceeds their needs, which conditions the child's struggle to go to bed, nighttime awakenings, early morning awakenings, or a mixture of the above.

### Psychophysiological insomnia

It usually occurs in older children and adolescents. They often have a racing mind, with worries and high levels of arousal, with repetitive thoughts when trying to fall asleep, checking the time continuously with negative thoughts about their performance the next day. There is an increase in awakenings and learned associations that prevent sleep. These children usually sleep better during vacations or in a new place, or when they are not trying to sleep<sup>(11-13)</sup>. In this type of insomnia, the following are combined: risk factors (genetic, psychiatric), triggers (stress) and others (poor sleep hygiene).

### Temporary sleep disturbances

It usually occurs in children with previously normal sleep, for example, a period of nocturnal awakenings may be due to stress and be self-limiting, or a sleep disturbance due to travel that produces jet lag. Many diseases can cause temporary sleep disturbances, although they can become chronic if parents respond in an inappropriate way that reinforces nighttime awakenings or use inappropriate sleep habits.

### Insomnia in special circumstances

**It is important to consider the risk of insomnia in adolescents, conditioned by their physiological changes during puberty and the influence of other environmental factors. Likewise, in patients with neurodevelopmental disorders, in which insomnia is more prevalent and severe.**

## Adolescence

Insomnia in adolescents is relatively common, favored by the normal physiological changes in the sleep pattern at this age: the start and end times of sleep are generally delayed in relation to puberty (phase delay)<sup>(17)</sup>. Additionally, sleep-wake patterns are often irregular at this age. These changes often occur simultaneously with other precipitating and perpetuating factors, especially with: environmental influences, including academic and extracurricular demands, peer pressure, earlier wake-up times (start of school), discrepancies between bedtime and waking up time, and also, due to the periods in which adolescents carry out traditional study at school versus online (COVID-19 pandemic), in addition to the prolonged use of electronic devices and screens<sup>(17)</sup>. The grouping of these factors can lead to a greater delay, both in the time of going to bed and in the time of waking up, and result in insufficient sleep<sup>(17)</sup>. Sleep restriction can impair learning, memory, cognitive skills, emotional regulation, and lead adolescents toward risky behaviors, including: smoking, recreational drug use, unprotected sex, driving-related injuries and road safety, violence, psychiatric problems and suicidal tendencies<sup>(17)</sup>. Teenagers are most likely to sleep in on the weekend to compensate for chronic tiredness and fatigue from inadequate sleep during the week. All of the above causes adolescents to have more sleep phase delay and, as a result, an increase in sleep latency, sleep deficit and circadian alteration<sup>(16)</sup>.

A delayed school start time to 8:30 am or later in secondary schools has shown an increase in total sleep time, from 25 to 77 minutes, during weekdays and a reduction of daytime sleepiness. In addition, there is an improvement in academic performance and health, including staying awake in class, class attendance and academic performance, as well as a lower rate of depressed mood, caffeine consumption and fewer car accidents<sup>(11)</sup>.

The use of electronic screens has become ubiquitous in children and adolescents of all ages and it has been shown that excessive exposure to them is associated with sleep problems. Difficulties include: later bedtime, delayed sleep onset, shorter duration of total

sleep time, daytime sleepiness, and poorer sleep quality<sup>(11)</sup>. All of these effects are associated with exposure to blue light from screen devices, which suppresses the secretion of melatonin.

## Children with neurodevelopmental disorders

Insomnia and sleep difficulties are more prevalent in children with ADHD, ASD, eating disorder, intellectual disability (ID), as well as certain syndromes: Smith-Magenis syndrome, Angelman syndrome, Rett syndrome, Williams syndrome, Down syndrome, etc.<sup>(8,11,12)</sup>.

Insomnia in these populations appears to be chronic, with more severe symptoms and occurs more frequently. The prevalence of sleep problems in people with ADHD, ASD and ID is approximately, depending on the series, from 30% to 86%<sup>(11,12)</sup>.

## Diagnosis

**The diagnosis of insomnia is fundamentally clinical and is made with a structured clinical history, a complete physical examination and a sleep diary.**

Tables I and II include the diagnostic criteria for chronic and short-term insomnia disorder, provided by the AATS<sup>(1)</sup>.

The diagnosis is fundamentally clinical and, to make it, three pillars are necessary: a structured clinical history, a complete clinical examination and the sleep diary. Complementary studies are reserved for cases in which there are doubts or possible comorbidities<sup>(8,10-12)</sup>.

**1. General history and structured sleep history.** It should be taken into account that sleep habits and routines are specific to each family and that one parent may consider something normal that is not normal for another. It should be investigated in a friendly way, without blaming, using open, clear and concise questions. It is necessary to include different issues<sup>(8,10,12)</sup>:

- Detailed nighttime and daytime sleep schedules, including start and wake times, whether there are naps, and differences between working days and holidays.

- Whether pre-bedtime routines are performed, whether transitional objects or electronic devices are used. Likewise, if there are associations with sleep, if the child needs some type of behavior or object to fall asleep or the presence of the parents.
- Nighttime environment of the child's room: light, temperature, noise, presence of electronic devices (TV, computer, cell phone).
- Child's behaviors during the night: frequency and duration of awakenings, what parents think the child needs to get back to sleep, what the parent's response is to those awakenings. If the child exhibits unusual behaviors or limb movements, if he snores or has trouble breathing while sleeping.
- The child's behavior during the day: if he is rested, how is his school performance, his relationship with the environment. Assess if there is hyperactivity or daytime sleepiness. If he practices physical exercise and at what time. Exposure to natural light in the mornings. Meal times. Use of screens in the late afternoon.
- How long has the problem lasted? Strategies/medications that the family has used and response obtained.
- Impact of the problem on the child, on family life, on parents and at school.
- Possible association with drugs, medications or stimulants.
- Personal background: type of attachment and educational patterns in the family. Relationship with parents. Maternal stress during pregnancy and today. Establishment of breastfeeding. Psychomotor development. Parental sleep expectations and cultural aspects. Presence of precipitating and perpetuating factors.
- Assess other emotional, psychiatric (anxiety, depression, phobias) or medical problems and their treatments, which may interfere with sleep (e.g., asthma treated with B agonists or montelukast, ADHD treated with methylphenidate or lisdexamfetamine,

| Name:     | Age: |    |    |    |    |    |    |    |    |    | Reason for registration: |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
|-----------|------|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|--|
| Hour      | 20   | 21 | 22 | 23 | 24 | 01 | 02 | 03 | 04 | 05 | 06                       | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | points |  |
| Monday    |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Tuesday   |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Wednesday |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Thursday  |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Friday    |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Saturday  |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Sunday    |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Monday    |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Tuesday   |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Wednesday |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Thursday  |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Friday    |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Saturday  |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Sunday    |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |
| Monday    |      |    |    |    |    |    |    |    |    |    |                          |    |    |    |    |    |    |    |    |    |    |    |    |    |        |  |

Draw ↓ when sleep begins, and ↑ when he gets up. Both if sleep takes place at night and during naps.

Darken the area of the chart that corresponds to the time your child is sleeping.

Leave the area of the chart that corresponds to the awake time blank.

Write an "x" when he performs the abnormal behavior during sleep (crying, movements...).

In the last column, rate the quality of the night from 0 to 5 (0 = very bad night).

**Figure 2.**  
Sleep diary.

gastroesophageal reflux, atopic dermatitis, headaches, chronic pain, iron deficiency, epilepsy...). Presence of other primary sleep disorders (RLS, obstructive sleep apnea syndrome...) or drug use (caffeine, alcohol, nicotine, corticosteroids, antiepileptics, antidepressants...).

- Family history of insomnia or other sleep problems, psychiatric problems, etc.

## 2. Complete physical examination.

Look for signs that suggest a pathology: evaluation of weight-stature and psychomotor development, assessment of the ENT area (snoring, adenoid hypertrophy, malformations), gastrointestinal (reflux...), neurological or behavioral alterations, dermatological alterations (atopy), etc.

3. **Sleep diary or agenda** (Fig. 2): it is an essential tool for diagnosis, since it provides an objective view of the child's sleep patterns. It consists of a daily record of sleep schedules, including the time of going to bed and waking up, both at night

and daytime naps, for a period of time, usually between two and four weeks<sup>(8,10)</sup>. Avoid clinical history bias (parents remember more what happened in the last few nights, as well as the worst nights). It is useful for parents to assume the importance of routines and habits in the problem. In addition to being diagnostic, it is therapeutic, because parents can realize on their own the relationship of certain events with poorer quality of sleep in the child (e.g.: the effect of prolonged or late naps, late onset of sleep or assessment of the number and duration of nocturnal awakenings). It is also useful to see the progression, once therapeutic measures have been established. For the diagnosis of insomnia, it is preferable that the diary be with a free sleep schedule<sup>(8,10)</sup>; that is, the child goes to bed when he is sleepy and wakes up on his own, without interference from school or work schedules.

4. **Complementary tests.** In general, they are not required for the diagnosis of insomnia. They are reserved for cases in which there are diag-

nostic doubts with other neurological or psychiatric processes, or the association of insomnia with other sleep disorders is suspected (obstructive sleep apnea syndrome -OSA-, periodic leg movements, atypical parasomnias, or that require screening for nocturnal epilepsy...), since there is an important comorbidity in sleep disorders.

- **Actigraphy:** it consists of a record of the body movements that the patient makes during the night, using a device similar to a wristwatch. It is a simple and comfortable method, which collects data from the patient in their usual environment and over a period of 5 to 14 days, which has important advantages over polysomnography, which records a single night of sleep. It provides information about sleep and wake patterns, more objectively than the sleep diary. It is used in research and by sleep experts.
- **Polysomnography (PSG):** it consists of a recording throughout the night, to characterize sleep architecture and its pathology. Numerous physiological parameters



**Table IV. BEARS test for screening for sleep disorders in childhood**

The "BEARS" scale is divided into the five main areas of sleep, facilitating the screening of sleep disorders in children from 2 to 18 years old. Each area has a question for each age group

**B** = Problems going to bed (bedtime problems)

**E** = Excessive daytime sleepiness

**A** = Awakenings during the night

**R** = Regularity and duration of sleep

**S** = Snoring

|  | 2-5 years  | 6-12 years  | 13-18 years  |
|--|--|---|--|
| <b>1. Problems going to bed</b>            | – Does your child have any problems going to bed or falling asleep?                        | – Does your child have any problems at bedtime? <b>(P)</b><br>– Do you have any problems at bedtime? <b>(C)</b>   | – Do you have any problems falling asleep at bedtime? <b>(C)</b>   |
| <b>2. Excessive daytime sleepiness</b>     | – Does your child seem tired or sleepy during the day?<br>– Do your child still take naps? | – Does your child have a hard time waking up in the morning, does he seem sleepy during the day, or does he take naps? <b>(P)</b><br>– Do you feel very tired? <b>(C)</b>   | – Are you very sleepy during the day, at school, while driving? <b>(C)</b>   |
| <b>3. Awakenings during the night</b>      | – Does your child wake up a lot during the night?  | – Does your child seem to wake up a lot during the night? - Sleepwalking or nightmares? <b>(P)</b><br>– Do you wake up a lot at night? <b>(C)</b><br>– Do you have trouble falling back asleep when you wake up? <b>(C)</b> | – Do you wake up a lot at night?<br>– Do you have trouble falling back asleep when you wake up? <b>(C)</b>         |
| <b>4. Regularity and duration of sleep</b> | – Does your child go to bed and wake up at about the same time?<br>– What time?            | – What time does your child go to bed and wake up on school days?<br>– And the weekends?<br>– Do you? Do you think you get enough sleep? <b>(P)</b>   | – What time do you go to bed on school days?<br>– And the weekends?<br>– How long do you usually sleep? <b>(C)</b> |
| <b>5. Snoring</b>                          | – Does your child snore a lot at night or have difficulty breathing?                       | – Does your child snore loudly at night or have difficulty breathing? <b>(P)</b>  | – Does your child snore loudly at night? <b>(P)</b>  |

*(P) Questions directed to the parents. (C) Ask the child directly.*

are measured such as: electroencephalogram, electrocardiogram, eye movements, electromyogram, limb movements, thoracic movements and respiratory flow, as well as audio and video recording. It is performed in a sleep laboratory and must be interpreted by a specialist. It is only indicated when there is comorbidity that can be diagnosed by this technique.

- **Night video recording:** if there is data in the medical history that indicates events during the night or nocturnal snoring with possible associated OSA.

**5. Screening tools.** The prevalence of insomnia and other sleep disorders is so high in the child and adolescent population, and its consequences on the child and the family are so important<sup>(4,5,17)</sup>, that it justifies their

active search from Primary Care<sup>(8,10)</sup>. The pediatrician must know and use the screening tools that exist in the periodic health check-ups of children and adolescents.

They are useful as general screening<sup>(8,10)</sup>: the BISQ test (Brief Infant Sleep Questionnaire), for children under 2 years of age, which provides information about schedules, where and how the child sleeps; and for those over 2 years of age, the BEARS test (Bedtime problems, Excessive daytime sleepiness, Awakenings during the night, Regularity and duration of Sleep, Sleep-disordered breathing) is used (Table IV).

If after this screening, the possibility of a sleep disorder is observed, the Bruni (Sleep disturbance Scale for Children) (SDSC) may be useful to guide the diagnosis. It evaluates the last 6 months. Questions 1-5, 10 and

11 guide towards the evaluation of sleep onset and maintenance problems.

All these tests are explained in depth in the tool training topic of this issue of the journal.

## Treatment

The treatment of insomnia should be addressed after an adequate diagnostic process that rules out pathologies that can manifest with symptoms of insomnia, both sleep disorders (such as phase delay syndrome or restless legs syndrome), and diseases that cause disturbed sleep (asthma, dermatitis...). It is essential to avoid therapeutic failure to initially diagnose and treat the causal process<sup>(11)</sup>.

Sleep is influenced by multiple factors and the cause of insomnia is usually multifactorial. Therefore, the treatment must be personalized, appropriate to

the characteristics of the child and the family and addressing the different aspects that, in each patient, may be influencing sleep.

Therapeutic options include non-pharmacological measures and pharmacological treatment<sup>(16)</sup>.

The treatment of insomnia in children and adolescents, according to current evidence, should be based on non-pharmacological measures, reserving drugs for special situations<sup>(8,11,12)</sup>.

### Non-pharmacological treatment of insomnia

There are multiple interventions that can help achieve quality sleep<sup>(16-19)</sup>. The recommendations are to start treatment in each child following the “3-step rule”: sleep hygiene measures, adaptation to the patient’s circadian rhythm and cognitive-behavioral therapy<sup>(20)</sup>.

#### Sleep hygiene

These are the different recommendations on routines and habits that promote quality sleep.

Current evidence cautions against using sleep hygiene recommendations alone as the sole treatment technique; since its use, in isolation, leads to many therapeutic failures. On the other hand, it should always be present in the management of any sleep problem or disorder<sup>(11,12)</sup>.

Sleep hygiene recommendations must be adapted to each age, must be delivered in writing and, in addition, must be explained to the patient or their parents. It is recommended that the doctor focuses especially on those points that the patient is not performing adequately, rather than giving general recommendations that are the same for everyone.

Correct education in sleep hygiene, which leads to a good understanding by the patient of the fundamentals of these measures, is considered in itself a psychological technique for the treatment of insomnia.

Tables V and VI show the main sleep hygiene measures appropriate for different ages, in infants, children and adolescents.

#### Adaptation to the circadian rhythm

Each individual has an endogenous circadian rhythm, marked by neuroendocrine and genetic factors. When the patient tries to follow a sleep schedule that does not fit their own circadian rhythm (in the case of children and adolescents, marked by what their parents consider appropriate), a schedule discrepancy can occur, with: harmful effects on sleep in quantity and quality, increased sleep latency, decreased sleep efficiency and nocturnal awakenings.

The doctor should try to know the patient’s endogenous circadian rhythm,

**Table VI. Sleep hygiene recommendations in older children and adolescents**

- Maintain a stable sleep routine, with stable schedules, and a maximum of one hour difference between getting up every day and on weekends
- Perform relaxing activities before going to bed
- Avoid hunger and heavy dinners
- Avoid exciting substances, such as caffeine, chocolate...
- Spend daily time outdoors
- Perform moderate physical exercise daily, avoiding late exercise
- Maintain a dark and silent night environment, with a comfortable temperature
- Avoid using the bed for activities other than sleeping
- Avoid using the bedroom as punishment
- Avoid screens at least an hour before bed. Keep screens out of the bedroom during nighttime sleep
- Avoid naps, especially if they are long or late or interfere with nighttime sleep

through a free sleep schedule, and adapt to it as much as possible (this matter is explained in depth in the training topic corresponding to circadian rhythm alterations in this issue of the journal). But, in addition, there are numerous environmental chronoregulators that are interesting to know when treating a patient with insomnia:

- Influence of ambient light. It is important that patients are exposed to bright morning light, while nighttime sleep should be in the dark. In the event that due to childhood fears, the child requires a light in the room, this should be orange light and as dim as possible, since night light has proven effects, altering the circadian rhythm<sup>(21)</sup>.
- Exposure to screens. Both due to the exciting effects of exposure to electronic devices, as well as the suppressive effect of melatonin that has been shown to be caused by the blue light of said devices. Prolonged exposure to screens should be avoided and, especially before going to bed so as to improve sleep.

**Table V. Recommendations for parents on sleep hygiene measures in infants and young children**

- Establish a pleasant “presleep” routine
- Acquire habits that highlight the contrast between day and night, using exposure to light during the day
- Use the bed only to sleep. Do not punish the child by sending him to bed
- Find a transitional object (stuffed animal, blanket) to be the child’s companion in the crib
- The environment in the bedroom should be quiet and dark
- Avoid using screens before the age of 2 and never use them in the hours before going to bed
- The daily wake-up time and bedtime should be approximately the same every day
- The child can learn to fall asleep alone, without help. If he has tantrums, you have to be firm and always act in the same way, establishing clear limits with affection and calmness. Parents must convey the message that this is not a punishment or a dispute between parents and child
- Until the age of 5, it is normal for the child to need to take a nap. Avoid very long or late naps
- Do not lose your temper when sending your child to sleep. The message we want to convey is: “you are capable of enjoying sleeping alone”. If the parents get angry, the child will become even more agitated

- Physical exercise. It is a beneficial chronoregulator, and there is evidence that regular physical activity improves sleep quality in general. But intense physical activity in the late afternoon hours should be avoided, since, if it is too late, exercise can delay the secretion of melatonin and make it difficult to fall asleep<sup>(22)</sup>.
- Food: composition and schedules. There is increasing evidence of the influence of the type and schedule of feeding on the chronoregulation of the individual. Regular feeding schedules should be recommended, with breakfasts rich in tryptophan.

### Cognitive behavioral therapy

Cognitive-behavioral therapy is currently the first-line treatment, indisputable in the treatment of insomnia in adults of any age<sup>(23)</sup>, emerging in the same way in childhood and adolescent insomnia, together with education and sleep hygiene measures.

Its objectives are: to eliminate routines that are harmful to sleep, regulate the patient's sleep-wake rhythms, and modify thoughts or worries that contribute to or perpetuate insomnia. This therapy is based on the idea that thoughts (cognitions) influence emotions and experiences, generating various behaviors (actions) that will be reinforced or limited depending on the achievement of certain consequences.

Interventions with multiple components are recommended: sleep hygiene education, behavioral techniques such as stimulus control and sleep restriction, relaxation techniques, cognitive therapies, etc.<sup>(16)</sup>.

Cognitive behavioral therapy has been shown to be effective, well accepted by patients and with lasting effects, with studies showing benefits even after 2 years. It has no notable side effects, except with some specific techniques in which the patient must be warned that drowsiness may increase, especially in the early phases of treatment.

Some of the techniques that have proven to be effective in the intervention of patients with insomnia are presented. They must be adapted to the individual needs of patients<sup>(16,19)</sup>. Likewise, it is advisable to individualize the techniques to be used in each

| Disorder tolerance (1)   | Mother |    | Father |    |
|--|--------|----|--------|----|
|  | Yes    | No | Yes    | No |
| 1. The behavior is so severe and intense that it is impossible for the parent to ignore it | Yes    | No | Yes    | No |
| 2. It is difficult for the parent to listen to him scream/cry for a long time              | Yes    | No | Yes    | No |
| 3. The parent finds it very difficult to get him back into bed                             | Yes    | No | Yes    | No |
| Schedule tolerance (2)   | Mother |    | Father |    |
| 4. Is anyone in the family willing to stay up late to complete the treatment program?      | Yes    | No | Yes    | No |
| 5. Is anyone in the family willing to get up early to do the treatment program?            | Yes    | No | Yes    | No |
| Attitude difficulties (3)  | Mother |    | Father |    |
| 6. Are you emotionally unable to deal directly?  | Yes    | No | Yes    | No |
| 7. Do you feel guilty when you force your child to go back to bed?                         | Yes    | No | Yes    | No |
| 8. Do you think you are mistreating your child when you try to change the situation?       | Yes    | No | Yes    | No |

(1) A positive response contraindicates input extinction.  
 (2) A negative response, assess: gradual extinction versus another intervention.  
 (3) A positive response: prior intervention in the family.  
 Source: Del Rosso L, Hoque R. Eczema: A diagnostic consideration for persistent nocturnal arousals. *J Clin Sleep Med*. 2012; 15: 459-60.

case and consider family tolerance to the different interventions (Table VII).

### Stimulus control technique

Stimulus control describes the situation in which there is a high probability that a particular response will occur in the presence of a previous stimulus<sup>(18)</sup>. In the field of insomnia, this strategy focuses on modifying the associations between behaviors that take place in the bedroom and the bed, with the aim of strengthening the connection between these places and sleep<sup>(10)</sup>. The aim is to create a stronger association between bed and sleep, avoiding activities that could associate bed with wakefulness or activity. Therefore, the bedroom and bed should be reserved exclusively for sleep, avoiding stimulating activities there, such as using electronic devices, watching television or reading exciting books. Stimulus control seeks to unlearn the erroneous association between bed and waking activities. In addition, the application of this technique will also mean that the patient must get out of

bed during the night, if they cannot fall asleep in a short period of time, generally around 15-20 minutes. During this period of time out of bed, it is suggested to do calm and relaxing activities.

### Extinguishing techniques

In the field of insomnia, they are used to intervene and modify conflictive sleep patterns, when there is reinforcement towards an unwanted behavior (for example, the child shows disruptive behaviors instead of sleeping and the father goes to his room and lies in bed with the child). The aim is to eliminate the expected reinforcement after the emission of a behavior that had previously been reinforced and achieve a consistent decrease in the unwanted behavior. In clinical practice, this technique has been used for child insomnia, when a problem related to the existence of inappropriate associations with the onset of sleep has been identified, such as the child requiring the presence of the father with him to sleep. It can be applied in the form of

“**pure extinction**”, in which the parent is asked to leave the child sleepy, but awake in his crib/bed and not respond to his complaints, ensuring the child’s safety, or with variants, such as “**gradual extinction**”, when the father can respond to the child’s demands, but in a progressively more spaced manner, or “**paternal fading**”, when the father, night after night, decreases his interaction with the child during the onset of sleep (initially he can be in your bed, but without touching you, then sitting on the edge of the bed, sitting in a chair outside the bed, standing in the room, next to the door...).

The application of these extinction techniques usually produces a series of effects, about which it is necessary to notify the family in advance. These are the “extinction burst” (increase in the intensity and frequency of the behavior in the first moments of application), “extinction-induced aggression” (increase in aggressive or emotional behaviors when the technique is implemented) and “spontaneous recovery” (the behavior can reappear after the passage of time)<sup>(18)</sup>.

To apply this procedure, some rules must be followed<sup>(18)</sup>:

- Identify the reinforcers that maintain the behavior to be extinguished (if this step is not possible, its use is discouraged).
- Apply reinforcement of some alternative behavior or behaviors and, if possible, incompatible with the one that is intended to be eliminated.
- Being able to control the presence of reinforcers.
- It can be applied continuously, since its intermittent application can worsen the problem. The professional must assess the family’s capacity to be able to apply this type of techniques.
- Verbally specify and clarify the conditions of extinction.
- To inform the people involved in the program of the: possible initial increase in behavior, possible aggressive responses induced by frustration and spontaneous recovery; and provide instructions on how to act.
- Do not use extinction as the only technique if you want an immediate cessation of the behavior or if it is dangerous.

### *Sleep restriction technique*

It involves restricting time in bed to the amount of time it is estimated that the patient is actually sleeping. The process begins with an assessment of how much time the patient sleeps during the night, and a more restrictive sleep schedule is designed where, initially, time in bed is reduced. This way, the patient will spend less time awake in bed. This approach generates a kind of “interest in rest”, since, by spending less time in bed, you tend to fall asleep more quickly and experience deeper sleep. As the quality of sleep increases and nighttime awakenings are reduced, the time in bed is gradually increased, so that when a sleep efficiency (time sleeping/time in bed) of 85% is achieved, you can gradually increase the time you are allowed to stay in bed<sup>(16)</sup>. The aim is to find a balance between time in bed and efficient rest. For example, if a person spends nine hours in bed, but only sleeps six hours, sleep restriction allows the patient to spend only six hours in bed initially and, as sleep improves, that time is increased gradually. By delimiting time in bed and reinforcing the association between bed and sleep, patients may perceive a substantial improvement in sleep quality.

Variants of this technique include “**delaying bedtime**”, a technique used, above all, in cases where prolonged sleep latency is observed. Parents are instructed to put their child to bed later than usual, at the actual time the child usually falls asleep<sup>(19)</sup>. Actually, the goal and basis of this technique are similar to sleep restriction.

### *Relaxation techniques*

Relaxation techniques, in the context of cognitive behavioral therapy (CBT) for insomnia, aim to reduce psychophysiological arousal and relieve tension and stress that can interfere with the ability to fall asleep and stay asleep. Stress is a biological response to situations *perceived* as threatening and in which the body feels that it does not have sufficient resources to cope. If this response is repeated very frequently or is disproportionate to the situations that trigger it, it can affect the neurophysiological, neuroendocrine and neuroimmune systems. Relaxation helps to calm the mind and body before going to bed,

as a “deactivation”, promoting a favorable environment for sleep<sup>(18)</sup>.

This will be key for those who experience anxious or worrying thoughts related to sleep, since psychophysiological activation can boycott the transition to sleep. These relaxation techniques will generally be applied before going to bed or when, due to waking up during the night, there is difficulty returning to sleep.

There are various relaxation techniques used in CBT for insomnia:

- Progressive muscle relaxation: will involve consciously tensing and relaxing the different muscle groups in the body, which will promote the release of accumulated tension.
- Meditation: will focus on mindfulness and mental relaxation and deep breathing techniques will focus on breathing slowly and deeply to calm the nervous system.
- Deep breathing techniques: contribute to relaxation and stress control.

### *Cognitive restructuring techniques*

Techniques aimed at identifying inappropriate thoughts (cognitions) of the patient, which are affecting their emotions and producing inappropriate behaviors, with the aim of modifying them or replacing them with more suitable ones.

In the context of CBT for insomnia, cognitive restructuring will focus on identifying and changing negative or anxious thought patterns related to sleep. Professionals will help patients address erroneous beliefs about sleep and develop more positive and realistic thoughts related to rest. This technique involves changing dysfunctional thought patterns to reduce anxiety and worry related to insomnia. People who suffer from insomnia often have negative thoughts about their ability to fall asleep, stay asleep, or the consequences of lack of sleep on their daily lives. These thoughts can cause anxiety and worry, as well as making it difficult to fall asleep. Negative beliefs and thoughts are problematic, since they lead to excessive or unrealistic negative emotions such as: anxiety, guilt, anger, sadness, etc.<sup>(10)</sup>. Cognitive restructuring involves several steps<sup>(18)</sup>:

- Recognition of dysfunctional thoughts: The first step is to identify

and record the negative and anxious thoughts that arise in relation to sleep. This may include statements such as: “I will never be able to sleep” or “I will fail the exam if I can’t sleep”.

- Evaluation of thoughts: once dysfunctional thoughts have been identified, it will be assessed whether they are realistic and whether there is solid evidence to support these beliefs. In numerous situations, it is discovered that these thoughts are unrealistic (“Have you ever failed a test because of not sleeping?”).
- Alternative thought formulation: replace negative thoughts with more balanced and realistic thoughts.
- Train new thoughts: patients practice and consolidate new alternative thoughts. This can be done through repetition and self-affirmation.

Cognitive restructuring techniques can only be used in older children, with some revisions suggesting the threshold at the age of 7 years<sup>(16)</sup>, and subject to the child’s maturation. They require the intervention of psychologists or professionals trained in the application of these techniques.

### Pharmacotherapy

It should never be the initial treatment for a child or adolescent’s sleep problem, but it may be necessary when cognitive-behavioral treatment is not sufficient. In the latter cases, it will always be used in association with non-pharmacological measures. Drug treatment alone should not be used for insomnia<sup>(24,25)</sup>.

Most children with insomnia will need a non-pharmacological therapeutic approach, based on educational and behavioral techniques. If the doctor considers using medication, it should always be after an adequate evaluation and risk-benefit assessment. The use of drugs will be considered only in the event of failure of other measures, except in some very selected cases in which, due to their severe involvement, the pediatrician proposes the joint initiation of non-pharmacological and pharmacological measures<sup>(26)</sup>. The use of medications for insomnia will be for the shortest periods of time possible

(most guidelines propose 4 weeks) and at the lowest effective dose.

The pharmaceutical industry, given the high prevalence of sleep disorders in the population, offers a multitude of products, many of them under the guise of dietary supplements, and patients or their families may require them, under the illusion of a quick effect and “giving him something” for sleep. However, the pediatrician must clearly explain that most sleep medications, without a prior diagnostic approach and without a structured treatment plan, will most likely lead to therapeutic failure or may even worsen the problem. (e.g., using antihistamines in a child with OSA). It is important, before starting treatment, to set specific and realistic goals for sleep improvement (e.g., shorten sleep latency...) to avoid frustration<sup>(11)</sup>. In addition, it can serve to mark the end of pharmacological treatment. Similarly, also before starting treatment, the patient’s comorbidities, both physical, psychiatric and other sleep disorders, must be assessed and a therapeutic approach taken, considering all of them. It is recommended that parents know the bases of sleep regulation and its conditions, and the importance of sleep hygiene measures, which should continue during and after drug treatment<sup>(26)</sup>.

Melatonin is the first choice medication for childhood insomnia, although there are multiple drugs with hypnotic effects<sup>(8,12,25)</sup>.

Most insomnia drugs have been approved for short treatments, up to 4 weeks. The side effects described differ depending on the drug, but, in general, they include: daytime drowsiness, fatigue, episodes of nocturnal confusion, rebound effect, tolerance and dependence<sup>(24,26)</sup>.

Relative contraindications have been established for starting pharmacological treatment in childhood and adolescent insomnia<sup>(11)</sup>: acute insomnia due to specific events, alcohol or drug abuse in adolescents and impossibility of adequate follow-up.

### Melatonin

Melatonin is a neurohormone whose main function is the regulation of the sleep-wake cycle. It is produced in the pineal gland, in response to the absence of light captured by the suprachias-

matic nucleus, increasing production in dark conditions, and being suppressed in the presence of light. Its secretion is one of the biological processes that follows a circadian rhythm. It acts through MT1 and/or MT2 receptors.

Exogenous melatonin has a double function: on the one hand, a hypnotic effect, inducing the onset of sleep; and on the other hand, chronoregulatory effect<sup>(24)</sup>. Each of these actions is achieved through a different administration pattern and at a different dose. The greatest effectiveness is described in the shortening of sleep latency, in early insomnia and in phase delay syndrome.

Melatonin is used for both insomnia in adults and children. In childhood, it is the recommended product of first choice, due to its safety. However, in adults, its effectiveness is sometimes questioned, and it is directly discouraged by some European guidelines, although with a weak recommendation<sup>(23)</sup>. Melatonin has demonstrated efficacy in children and adolescents with phase delay and insomnia at onset, demonstrated, above all, in children with ASD and ADHD<sup>(27,28)</sup>.

There are multiple preparations on the market based on melatonin, most of them regulated, both by the FDA (United States Food and Drug Administration) and by the AEMPS (Spanish Agency for Medicines and Health Products), as a food supplement. In recent years, sales of melatonin have skyrocketed, going from sales of \$285 million in 2016 to \$821 million in 2020 in the US, as Lelak et al. warned in 2022. The high prevalence of problems of sleep in childhood, together with the wide availability on the market of multiple forms of melatonin, and the feeling of security of parents and professionals that they are not using a drug with the side effects of traditional hypnotics, are the explanations most accepted reasons for the large increase in melatonin use in children throughout the Western world.

The different commercial presentations of melatonin, available in: drops, oral sprays, tablets, gummies..., do not have strict regulation as they are not considered drugs, and great variability has been demonstrated in the melatonin content of these compounds: a Canadian study demonstrated variability in the melatonin content of different com-

pounds from -83 to +478 compared to labeling, with variability of up to 465% even between batches of the same product. Additionally, serotonin contamination was demonstrated in up to 26% of supplements (Erland et al, in 2017).

There are *two main types of melatonin formulations*: immediate action and delayed action<sup>(24,26)</sup>:

- Immediate action melatonin: with onset of action in approximately 30 minutes. It can be used both as a sleep inducer and as a chronoregulator, at different doses for each purpose.
- Long-acting melatonin: with a coating that allows prolonged release of melatonin over several hours. It has been approved by the European Medicines Agency for use in children and adolescents with ASD and Smith-Magenis syndrome. It can be used in maintenance insomnia, with some evidence of its effectiveness and safety, increasing total sleep time and reducing nocturnal awakenings.

In addition, formulations of melatonin associated with tryptophan are available. This is an essential amino acid, from which melatonin is synthesized and, with its addition, a possible greater clinical effectiveness has been postulated by the pharmaceutical industry.

#### *Dosage and administration schedule*

The dosage of melatonin depends on the effect sought and the type of sleep problem:

- As a hypnotic, in early insomnia, the dose should be titrated starting with the smallest: in preschoolers 1-2 mg, schoolchildren 2-3 mg, and in adolescents up to 5 mg, administered 30-60 minutes before bedtime. In children with ASD, it is used at higher doses, up to 10 mg<sup>(26)</sup>.
- As chronoregulator, in phase delay, should be used at a smaller dose (0.3-0.5 mg) administered according to the DLMO (Dim Light Melatonin Onset)<sup>(24)</sup>. In this way, it advances the endogenous production of melatonin and advances the circadian rhythm, mitigating phase delay. Ideally, DLMO should be determined by measuring salivary melatonin. In practice, it should be administered about 3-6 hours before

the actual sleep onset time, or about 2 hours before the desired sleep onset time<sup>(24,26)</sup>.

#### *Side effects of melatonin*

Various studies have confirmed the safety of melatonin at the recommended doses and guidelines, with follow-ups of up to 4 years. No effects on growth or puberty, nor a rebound effect, have been described. Morning drowsiness and drunken sleep have been described in adolescents<sup>(29)</sup>.

Its use together with certain drugs that act on CYP1A2 (cytochrome P450 1A2): tricyclic antidepressants, fluvoxamine, cimetidine, ciprofloxacin, oral contraceptives, carbamazepine, omeprazole or alcohol, can modify the metabolism of melatonin and decrease or increase its concentration<sup>(26)</sup>.

Accidental ingestions of melatonin in children have increased in recent years, accounting for 5% of all accidental pediatric drug ingestions recorded in the US<sup>(26)</sup>.

#### *Other medications for insomnia*

The Spanish consensus on the treatment of insomnia and the use of melatonin<sup>(8,24)</sup> considers that the Primary Care pediatrician could consider its use as a second-line medication, in the case of failure with melatonin and oral antihistamines, and in specific cases. In addition, the benefits of oral iron treatment may be considered, since iron deficiency has been related to various sleep disturbances. Iron supplements are currently indicated for insomnia, along with restless legs syndrome and restless sleep syndrome<sup>(30)</sup>.

#### *Antihistamines*

They have been widely used to improve sleep in children, due to the feeling of security in their use by parents and doctors, the extensive management experience for multiple childhood pathologies, good tolerance, pediatric presentations and low cost.

They have a sedative effect due to their anti-H1 action, especially the first generation (diphenhydramine, hydroxyzine, chlorpheniramine, doxylamine). The second and third generation have less sedative effect. They have a rapid onset of action. They minimally alter the architecture of sleep. They have

controversial efficacy on childhood insomnia, with some studies demonstrating a decrease in sleep latency and nocturnal awakenings, which do not coincide with the results of others<sup>(26)</sup>. They are not indicated in the insomnia guidelines in adults<sup>(23)</sup>.

Its use can be considered in specific situations, especially in children with atopic dermatitis, but long-term treatment is not recommended. One of their main problems in clinical management is that they quickly generate tolerance with continued use. Although they are usually well tolerated, they can present side effects: dry mouth, urinary retention, constipation, confusion and blurred vision.

#### *Other hypnotic drugs*

There are many drugs with a hypnotic effect, most with restricted use in childhood. They should not be used in the management of insomnia in children and adolescents from Primary Care. The main ones are listed in table VIII.

The main groups include:

- Benzodiazepines.
- Other non-benzodiazepine GABA receptor agonists (zolpidem, zopiclone).
- Melatonin receptor agonists (ramelteon, tasimelteon).
- Sedative antidepressants (e.g., mirtazapine).
- Antagonists of orexin.
- Antipsychotics.

#### *Phytotherapy*

Many plant species have been attributed beneficial effects on sleep in popular tradition. Some of them are: valerian, lemon balm, passionflower, lavender, medicinal cannabis..., which are supposed to have relaxing, hypnotic and sedative properties. The European Medicines Agency (EMA) and the Committee for Herbal Medicinal Products (HMPC) highlight that its use is based on "traditional use", without scientific evidence of its effectiveness. There are no studies that support its effects or safety in children and adolescents, nor dosage data or possible contaminants<sup>(8)</sup>. Its use in children under 12 years of age has not been established, due to lack of adequate data.

Table VIII. Off-label hypnotic drugs in Pediatrics

|   |   |
|---|---|
| <b>Melatonin receptor agonists</b><br>– Ramelteon   | MT1 and MT2 receptor agonist. Its use in children is not approved, being anecdotal  |
| <b>Alpha-agonists</b><br>– Clonidine<br>– Guanfacine  | They inhibit the release of norepinephrine. Indicated for insomnia in children with Tourette syndrome and attention deficit hyperactivity disorder<br>Side effects: dizziness and hypotension   |
| <b>Antidepressants</b><br>– Tricyclics: amitriptyline, doxepin...<br>– Atypical: mirtazapine, trazodone<br>– SSRI: fluvoxamine, citalopram... | Some antidepressants with histamine H1 receptor antagonist action have been used in insomnia due to their sedative effect<br>Its use in children has not been established. They can be considered in children with psychiatric comorbidity such as mood disorders, or in the case of amitriptyline, as prophylaxis in children with chronic migraine<br>Anticholinergic side effects: dry mouth, urinary retention. If they are from the tricyclic group, risk of cardiac arrhythmias and poisoning |
| <b>Benzodiazepines</b>  | Hypnotic and anxiolytic effect. GABA receptor agonists<br>They are not indicated in childhood insomnia, although due to their anxiolytic effect they may influence some patients with psychiatric comorbidity   |
| <b>Non-benzodiazepine GABA agonists</b><br>– Zolpidem<br>– Zopiclone  | Indication for adult insomnia<br>Two clinical trials in children with zolpidem and zopiclone do not show improvement in sleep in children   |
| <b>Plants with sedative effects</b><br>Lavender, passionflower, lemon balm and valerian oil   | Questionable effectiveness. Anxiolytic and sleep facilitating effect  |

## Role of the Primary Care pediatrician

The Primary Care pediatrician must be the reference professional for diagnostic guidance and initial treatment of children and adolescents with symptoms of insomnia. He must be sensitized to the problems posed by sleep disturbances and carry out systematic screening for sleep problems associated with the rest of the prevention and health promotion measures, both in periodic health checks and opportunistically. Likewise, he must be trained to take a correct history in the event of a sleep complaint and request and interpret a sleep agenda or diary. Childhood insomnia must be diagnosed and guided by the Primary Care pediatrician, who will initiate the most appropriate treatment in each case. If the process does not improve, is associated with comorbidity with other sleep disorders or has serious consequences for the child, referral to a sleep unit will be made.

## Conflict of interest

There is no conflict of interest in the preparation of the manuscript. Declaration of interests: none.

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## Clinical case

A 14-year-old female visits her primary care pediatrician reporting that she has difficulty falling asleep and, in addition, has awakenings during the night, which makes her tired during the day. At times, she is very irritable and sad, having trouble concentrating and studying. She was always a good student. She started having sleep problems two years ago, since the COVID-19 pandemic. She has taken herbal tea that was given to her at home, but she does not notice any improvement and the entire condition has worsened in the last 7 months.

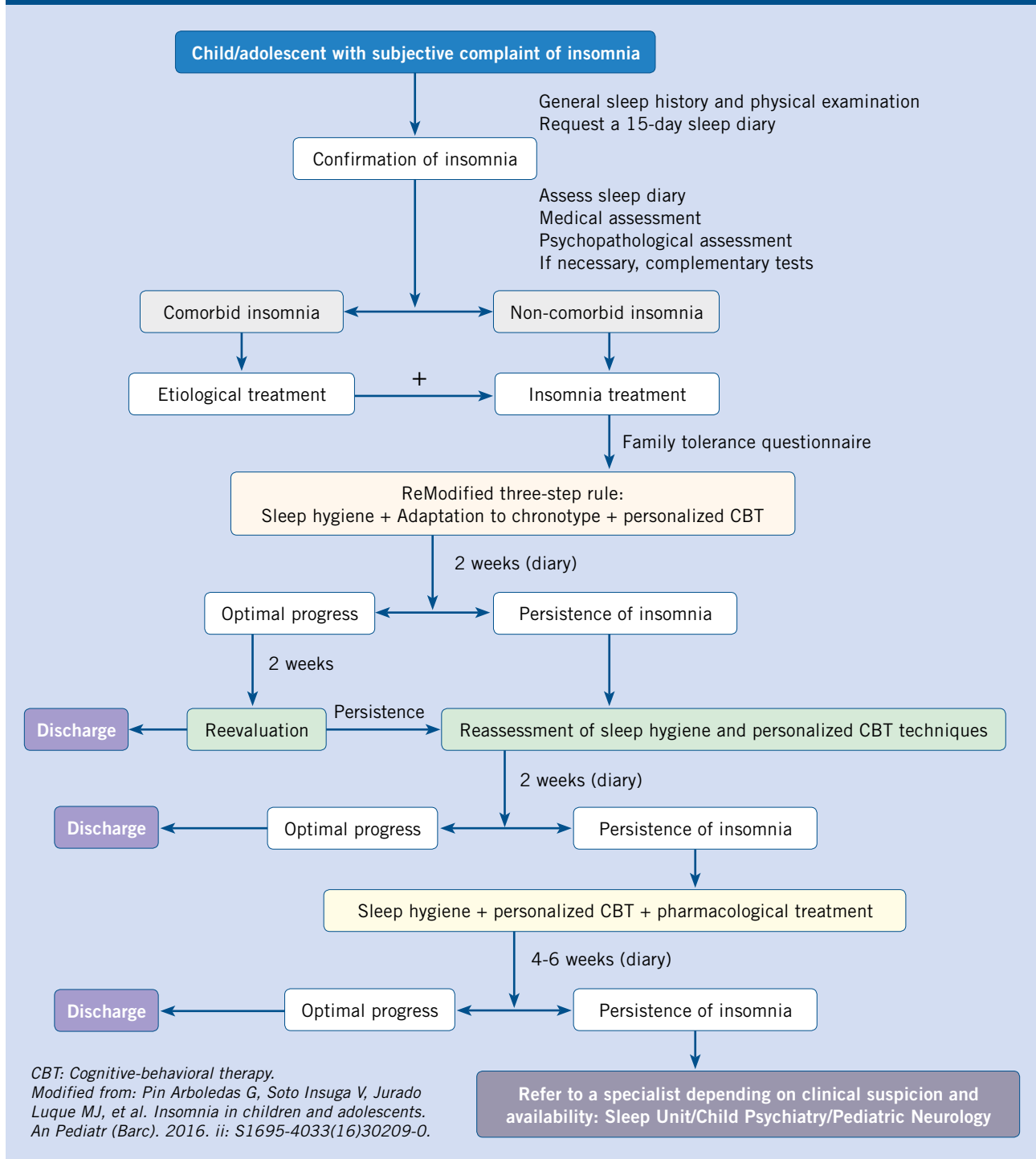
Physical examination: she is in good general condition, adequate weight-height development, normal cardiopulmonary as well as the rest of the full examination.

Neuropsychological assessment: she feels somewhat tired, very worried about her studies, and sometimes notices pressure in her chest. She thinks that she is going to fail and sometimes she feels very weak and worthless. She reports good atmosphere at school, she has close friends. At home she gets along well with her parents, but the sometimes argue, because they do not let her sleep when she is tired, because she is late going to sleep at night or because she spends a lot of time on the computer. She does not smoke or take drugs.

Uneventful family history. Personal background: Uneventful.



## Diagnostic-therapeutic approach algorithm for child and adolescent insomnia



### Accreditation quiz

The Accreditation Questionnaires for FC topics can be done at "On line" through the web: [www.sepeap.org](http://www.sepeap.org) and [www.pediatrintegral.es](http://www.pediatrintegral.es).

To obtain the single continuous training accreditation from the accreditation system for health professionals for the entire national health system, 85% of the questions must be answered correctly. The accreditation questionnaires on the different issues in the journal may be carried out during the period stated in the online questionnaire.



# Accreditation quiz

Subsequently, the following accreditation quiz of *Pediatría Integral* collects questions on this topic, which must be answered online through the website: [www.sepeap.org](http://www.sepeap.org).

In order to obtain certification by the Spanish “formación continuada” national health system for health professionals, 85% of the questions must be answered correctly. The accreditation quizzes of the different numbers of the journal may be submitted during the period indicated in the “on-line” quiz.

## Childhood and adolescent insomnia

25. Which of the following actions do you consider **PRESCINDIBLE** for the diagnosis of insomnia?
- Sleep diary.
  - Polysomnography.
  - Physical examination.
  - Sleep history.
  - General pediatric history.
26. Which of the following is the **INITIAL** treatment of choice in childhood insomnia?
- Benzodiazepines.
  - Sleep hygiene.
  - Melatonin.
  - Cognitive-behavioral therapy associated with sleep hygiene.
  - Valerian or other natural products.
27. Which of the following sleep hygiene measures would you **NOT** recommend to a teenager with insomnia?
- Avoid screens before bed.
  - Do not consume exciting substances or drinks, especially beyond afternoon.
  - Physical exercise before sleeping.
  - Avoid using the bed for activities other than sleep.
  - Avoid long and late naps.
28. Which of the following cognitive behavioral therapy techniques for insomnia would you **NOT** use on a 5-year-old child?
- Sleep restriction technique.
  - Cognitive techniques.
  - Bedtime delay technique.
  - Stimulus control technique.
  - Muscle relaxation techniques.
29. When faced with a patient with symptoms of insomnia, which of the following sleep disorders do you think he/she is **NOT** likely to suffer from?
- Phase delay syndrome.
  - Restless Leg Syndrome.
  - Narcolepsy.
  - Idiopathic insomnia.
  - Inappropriate associations with sleep onset.
30. Given the condition that this patient tells us, which of the following statements is **CORRECT**?
- The patient has a sleep problem, she must be reassured by explaining the sleep hygiene measures, to be patient, and that with this she will improve.
  - Since it takes time and she is very affected, treatment with melatonin must be started.
  - The patient, most likely has anxiety-depression and this is the cause of her sleep problems, so she must be referred to Mental Health.
  - The patient has phase delay disorder, which is very common in adolescence.
  - The patient has a chronic insomnia disorder and the pediatrician can and should help her with treatment.
31. What can we do to make an appropriate diagnosis in this patient? Mark the **CORRECT** answer:
- It is necessary and essential to carry out a polysomnography for the correct diagnosis of insomnia.
  - The diagnosis is clinical, based on: a structured clinical history, a complete clinical examination and the sleep diary.
  - For the diagnosis of insomnia, it is preferable that the sleep diary be with a free sleep schedule.
  - b and c are correct.
  - None of the above are correct.
32. Which of the following techniques and strategies are **INDICATED** to perform the treatment in this case?
- Inform the patient and family of the diagnosis, how the treatment will be carried out according to the three-step rule and the objectives to be achieved.
  - Stimulus control and relaxation techniques to reduce recurring thoughts that increase anxiety.
  - Cognitive restructuring techniques to correct false beliefs about sleep.
  - Promote self-esteem and prevention of relapses.
  - All of the above are appropriate to be used in this patient.