Sleep disorders in infants and children

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Abstract: Sleep disorders in infants and children are common and often behavioural in origin. Problems include difficulties going to sleep and/or maintaining sleep. History taking should focus on the bedtime routine, consistency of caregiver approach to settling, sleep cues and exclusion of medical problems including atopy and obstructive sleep apnoea. Management includes ascertaining parent goals, ensuring these are realistic and then offering parents a choice of evidence-based strategies, tailored to family need and capacity. Sleep diaries and parent education materials from evidence-based web sites complement the consultation.

Key words: behavioural management; children; infant; night waking; sleep.

By 3 years of age, the average child will have spent more time asleep than awake. Sleep problems are common in children, with at least 30% of parents of healthy children complaining at some stage that their child’s sleep pattern is a concern.1 Insufficient sleep is linked to behavioural and learning problems, maternal depression, poor parental functioning and in some studies, obesity.1–3 In order to treat paediatric sleep problems, it is important to appreciate normal sleep patterns across ages, and be familiar with evidence-based management strategies.

Normal Sleep Patterns

The circadian rhythm is an endogenously generated rhythm with the circadian pacemaker located in the suprachiasmatic nuclei in the anterior hypothalamus. The main input is light from the retina and output pathways include the sleep/wake cycle, body temperature and production of melatonin. At around 3 months of age, the circadian system becomes mature, with melatonin able to be detected in the urine of infants. At birth there are two distinct sleep states called active sleep (precursor of rapid eye movement (REM) sleep) and quiet sleep (precursor of non-rapid eye movement (NREM) sleep).4 With neumaturation the electroencephalogram pattern can be differentiated into NREM (NREM 1 light sleep through to NREM 4 deep sleep) and REM sleep by 6 months. From this age or even earlier, a healthy full-term infant is able to maintain 8 h of sleep.5 Most health professionals offer behavioural management strategies to infants aged 6 months and older.

Sleep requirements vary with increasing age, with a European study producing sleep centiles by following a group of nearly 500 healthy children aged 1 month to 16 years of age.6 They found that the total sleep duration remained relatively steady across the first year of life, with a mean of around 14 h per 24 h. In toddlers, the total sleep duration is around 12–13 h, and in pre-schoolers 11–12 h. The majority of children stop regular naps by 5 years, providing they receive sufficient good quality sleep overnight. In school-aged children, total sleep time is between 9 and 11 h.

Assessing Sleep Problems

When assessing children clinically, it is important to take note of parents’ concerns and expectations and a detailed sleep history. Questions should look at the bedtime routine; frequency and characteristics of nighttime wakings; sleep environment; differences between weekends and weekdays; and different caregivers. For infants, explore where they sleep day and night, how the infant is settled and whether this differs by parent. The presence of snoring and daytime functioning should be included. To aid in taking a sleep history, the ‘Bears’ mnemonic can be very useful to trigger sleep-related questions (B = Bedtime regularity, E = Excessive daytime sleepiness, A = night time Awakenings, R = routine and duration of sleep, S = Snoring).7 A family and psychosocial history is important, along with

Key Points

• At least 30% of parents report their infant or child’s sleep to be a problem in the early years of life.
• From 6 months of age, behavioural sleep strategies have been shown to be effective in improving sleep and other outcomes including child behaviour and parent mental health.
• Clinicians can now access a number of web sites to provide good quality parent and child education materials around medical and behavioural sleep problems and their management.

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a physical examination to exclude medical problems that may be contributing to night-time wakings. These include obstructive sleep apnoea, nocturnal seizures, eczema, asthma, and chronic otitis media. Finally, ascertain the parents’ goals for their child’s sleep and ensure they are realistic. The use of a sleep diary (http://www.rch.org.au/emplibrary/genmed/sleepcrydiary.pdf) may also aid in history taking and help parents evaluate sleep patterns, consistency of routines and response to management.

**Infant Sleep**

Typically, infant sleep problems include difficulty getting to sleep and/or maintaining sleep. Exactly when infant sleep patterns become ‘a problem’ is controversial and depends on family and cultural expectations.

Most infant sleep problems stem from an inability to self-settle, leaving the parent to rock, feed or even drive their infant to sleep.\(^7\) The way an infant falls asleep at the start of the night is the way they expect to return to sleep after waking overnight. Thus, if the last action an infant remembers when falling asleep is being rocked or fed, then he will want to be rocked or fed back to sleep when he wakes naturally overnight. These actions become the infant’s cues or sleep associations to return to sleep and form a habit that can exhaust parents.

**Management of infant sleep problems**

Management consists of explaining:

- Normal infant sleep patterns and sleep cycles
- The role of parent-led cues in settling the infant to sleep
- Ensuring the infant has a consistent bedtime routine
- Strategies to allow the infant to self-settle rather than relying on an adult

Behavioural management strategies (Table 1) are suitable for infants aged 6 months and older and include: graduated extinction (also known as controlled crying or controlled comforting), adult fading (aka camping out) and parental presence. Each is effective and should be explained to parents who then decide which strategy they want to pursue.

Write down for the family the strategy they want to pursue and ask them to complete a sleep diary before review.

**Do behavioural strategies cause harm?**

Strategies such as controlled comforting are associated with infant crying. However, there is no evidence that behavioural strategies cause harm in the medium or even longer term. Follow-up of over 400 children from two randomised controlled trials suggests that such strategies can reduce maternal depression 2 years on and have no impact – adverse or otherwise – on child behaviour, parent–child relationships or parenting styles.\(^11,12\)

**Sleep Problems in Older Children**

**Frequent night-time feeding**

Excessive night-time feeding can lead to frequent wakings by both sleep associations, and a learned hunger with the consumption of large volumes of fluid. Hunger sensations can become conditioned to trigger wakings and also interfere with return to sleep. Most healthy full-term babies can go without a night feed by 6 months. Toddlers may consume large volumes of milk overnight with the development of iron deficiency, which may exacerbate sleep problems and irritable behaviour during the day. Strategies to eliminate night-time feeding involve identifying the parental concern for continuing over-night feedings and reducing the frequency and volume of feedings over a period of time. Allowing the child to develop other ways to settle to sleep at the beginning of the night, increasing the interval between breast feeds/bottles and substituting water for milk/juices in the older child are techniques that can be used.

**Bedtime struggles**

With increasing mastery of motor and verbal skills, bedtime struggles often ensue. All caregivers must implement a consistent approach and predictable bedtime routine. Inconsistent limit setting may be due to a lack of awareness or inadequate knowledge, or there may be underlying psychosocial factors, which should be excluded before embarking on a behavioural programme. Parents should be assisted with techniques to enable them to be consistent which results in a change in the child’s behaviour.

Night-time fears and anxieties may present in the young child as bedtime struggles or refusal to sleep by themselves overnight. The majority of fears and anxieties are short lived and benign, and parents should reassure the child about these fears rather than reinforce them. Occasionally, bedtime problems are due to an anxiety disorder (separation anxiety) and management depends on the age of the child but may include combinations of the following supportive strategies: camper beds; transitional
objects; muscle relaxation or visual imagery; positive self statement; a ‘worry box’ to put worry thoughts in for the night; and sticker charts to reward brave behaviour, for example, staying in room.

Snoring

Obstructive sleep apnoea (OSA) occurs when there are repeated partial or complete obstructions to the upper airway interfering with ventilation and causing sleep disruption. Parents, whose children snore for at least three nights a week, should be asked if they have witnessed choking or gasping episodes, mouth breathing, laboured breathing, and daytime symptoms of tiredness.13 OSA peak incidence is between 2 and 6 years of age and in the majority of children is due to adenotonsillar hypertrophy. Increased risk of OSA occurs with craniofacial syndromes, neuromuscular weakness and hypotonia, and obesity.

Sleep walking and night terrors

These nocturnal events are common and often extremely distressing and disruptive to parents. Sleep walking and night terrors typically occur in the first third of the night and are due to a partial arousal from NREM 3/4 or deep sleep. During sleep walking, younger children tend to gravitate towards a light source or parent, with older children tending to be involved in semi-complex activities. Night terrors are much more dramatic events with marked sympathetic activation and agitation. Characteristics of night terrors and differential diagnosis are described in Table 2. These events are far more likely during an acute illness or sleep deprivation. Nocturnal seizures should be considered as part of the differential if these events are at an unusual time or frequency during the night. The majority of children can be treated with parental education and strategies to increase sleep duration.14

Multiple Choice Questions

1. Which of the following is true of normal sleep?
   a. The circadian rhythm matures at around 2 months of age.
   b. A healthy term infant is able to sleep for 8 h without feeding by 6 months or earlier.
   c. The majority of children stop regular naps by 3 years.
   d. In toddlers, the total sleep duration is around 11 h.
   e. Insufficient sleep is not associated with obesity.

   Answer: The letters a, c and d are untrue as the circadian rhythm matures at around 3 months of age, many children nap until 5 years of age and toddler sleep duration is typically 12–13 h/24 h. The letter b is true, with the median age of sleeping for 8 h without a feed found to be closer to 3 months in a sample of healthy, New Zealand infants.3 The letter e is untrue as shorter sleep duration has been found to be associated in some studies with obesity and possible mechanisms include changes in the appetite regulating hormones leptin and ghrelin, decreased physical activity (due to tiredness) and increased caloric intake.

2. Which of the following is true?
   a. Graduated extinction involves parents leaving their infant to settle for the whole night.
   b. Behavioural sleep strategies have been shown to cause long-term harm.
   c. Adult fading requires a parent to go in and out of an infant’s room while settling them.
   d. Behavioural sleep strategies are suitable for infants aged 4 months and older.
   e. Parent-led cues for infant sleep can lead to later problems with infant self-settling.

   Answer: The letter a is untrue as leaving an infant to settle for the whole night is known as ‘extinction’, and while effective, is generally not favoured by parents or sleep clinicians. The letter b is untrue as follow-up of randomised controlled trials of infant sleep interventions has found no evidence of long-term harm at child age 2 or 6 years. The letter c is untrue as adults need to remain in the infant’s room until the infant fall asleep. The letter d is untrue as strategies are typically recommended for infants aged 6 months and older when the vast majority of infants can forgo feeding for 8 h. The letter e is true as parent-led cues such as rocking or feeding an infant to sleep lead to learned sleep associations that an infant then depends upon to fall asleep at the start of the night and overnight.

3. Which of the following is true of sleep in older children?
   a. OSA peak incidence is between 6 and 10 years of age.
   b. Night terrors typically occur in the last third of the night.
   c. Eliminating night feeds is best done rapidly over a few nights.
   d. Nocturnal seizures can occur anytime throughout the night.
   e. When having a night terror, children are easy to rouse.

Table 2 Characteristics of night terrors and differential diagnosis

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Night terrors</th>
<th>Nightmares</th>
<th>Epilepsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep stage</td>
<td>NREM 3/4</td>
<td>REM</td>
<td>NREM2 but can occur all stages</td>
</tr>
<tr>
<td>Time of night</td>
<td>First third</td>
<td>Last half</td>
<td>Anytime</td>
</tr>
<tr>
<td>Wakefulness</td>
<td>Unrrousable</td>
<td>Easily aroused</td>
<td>Usually unrrousable</td>
</tr>
<tr>
<td>Amnesia</td>
<td>Yes</td>
<td>No</td>
<td>Yes or may have some recall</td>
</tr>
<tr>
<td>Return to sleep</td>
<td>Easy</td>
<td>Difficult</td>
<td>Easy</td>
</tr>
<tr>
<td>Family history</td>
<td>Yes</td>
<td>No</td>
<td>Possibly</td>
</tr>
</tbody>
</table>

NREM, non-rapid eye movement; REM, rapid eye movement.
The letters a, b and c are untrue as OSA incidence peaks between 2 and 6 years of age; night terrors typically occur during the first third of the night when children transition from ‘deep’ NREM sleep to lighter sleep; and eliminating feeds is best done over a more prolonged period as rapid weaning is typically met by much protest from the child. The letter d is true and the letter e is untrue as children are difficult to rouse from a night terror. If parents succeed in arousing their child, then the night waking is typically prolonged.

Useful Resources

http://www.purplecrying – evidence-based web site focusing on younger infant crying, sleep and settling strategies.
http://www.sleepforkids.org/ launched by National Sleep Foundation aimed to provide information to children aged 7–12 years http://www.sleephealthfoundation.org.au/brochures.html – parent information brochures on childhood sleep disorders
http://www.sleep.org.au/information/health-professionals-information – Australasian Sleep Association web site with handouts on OSA and other child sleep disorders

References