

Adolescent sleep

AYPH Research Update No.10 July 2012

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WELCOME

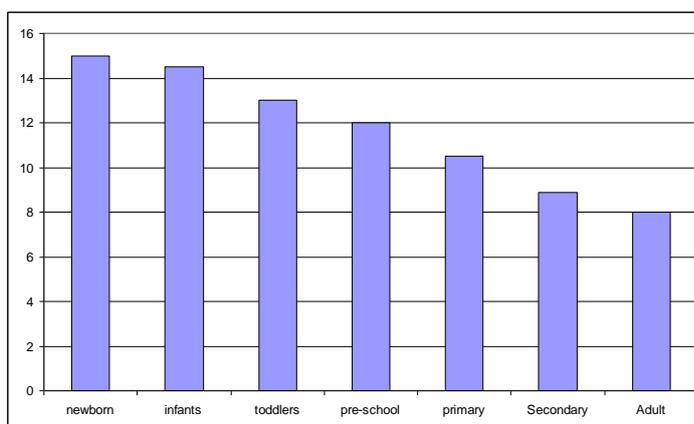
AYPH's latest Research Update focuses on the neglected but important topic of adolescent sleep and sleep disorders. We produce these regular updates to provide an overview for our members of current research, and to highlight recent developments concerning adolescent health. Topics covered by earlier updates include Long-term Conditions, Accidents and Injuries, Health Inequalities, Disability, Physical Activity, Alcohol & Substance Use, Teenage Pregnancy & Sexual Health, and Mental Health & Emotional Wellbeing. Other member benefits include a monthly newsletter, additional resources in the members' only area of our website, free copies of our flagship publication - *Key Data on Adolescence* - and discounts for our annual conference and other events. Join AYPH by visiting our website at www.ayph.org.uk.

This paper is not based on a formal review of the literature, but presents an overview of the issues, and a useful selection of key, up-to-date findings on adolescent sleep, the links with health outcomes, and sleep disturbances. A list of resources and links is provided for follow-up information.

WHAT DO WE KNOW ABOUT ADOLESCENT SLEEP AND WHY IS IT IMPORTANT?

The importance of sleep for general health and wellbeing is beginning to be widely acknowledged. However, it still remains a neglected topic in adolescent health research, partly because there are widespread misunderstandings about adolescents' needs for sleep. In fact, the sleep needs of teenagers are not very dissimilar to those of primary school aged children. They remain higher than adult needs across the second decade of life; probably because sleep plays

Figure 1: Sleep needs across development



Source: National Sleep Foundation ¹

a big part in creating the environment for healthy brain development, and as research tells us, adolescent brains are still changing and refining across this age period.

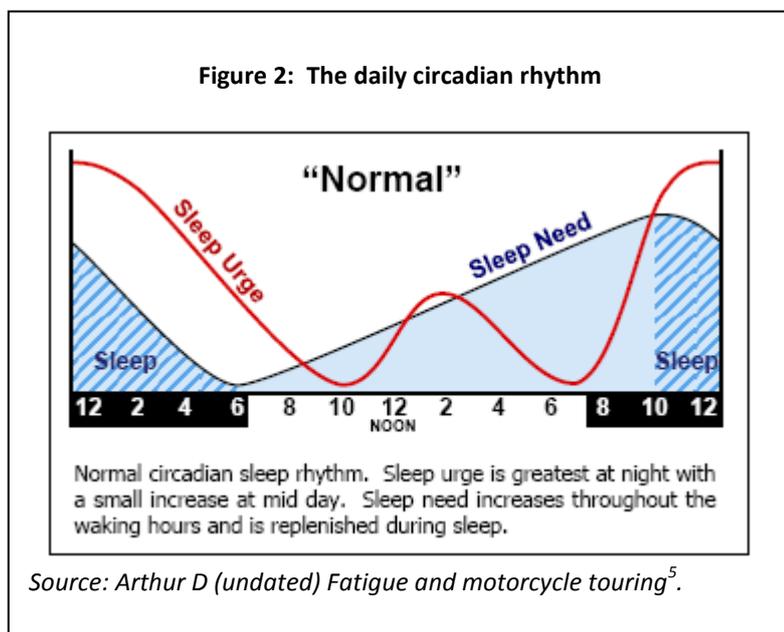
Figure 1 shows the 24 hour sleep need figures from birth to adulthood as recommended by the American National Sleep Foundation¹, but this figure for adolescents may be an underestimate; an early study by Carskadon and colleagues showed young people across the ages from 10-17 slept about nine hours and 20 minutes in laboratory conditions.²

The fact that young people sleep less than they did as younger children, and are inclined to stay up later than adults, is not the result of a need for less sleep, it is the result of what a renowned American sleep researcher has called ‘..a perfect storm of biological, psychosocial and cultural forces’.³ Like most topics in adolescent health, sleep is of course prone to a range of problems with definitions, measurements and decisions on what constitutes a problem, but there is enough consensus in the research literature for us to be certain that this is an interesting and important topic, and in this Research Update we highlight some new and emerging findings.

Adolescent sleep is important because it might be both a cause and the result of health problems. Before looking at recent research and reports on the links with health, we begin with a very brief background on the biology of adolescent sleep.

Biology of sleep: As it is currently understood, sleep is believed to involve two independent but related processes⁴:

- **A daily ‘circadian’ rhythm**, coming from the brain’s ‘central clock’, a group of nerve cells in the brain called the suprachiasmatic nucleus (SCN), located in the hypothalamus. Working roughly on a 24 hour cycle, the circadian rhythm acts as a gatekeeper for sleep (on/off). This is based on time of day, and is affected by signals from the environment, particularly light (see graph). The SCN decides what time of day it is and then controls production of a hormone called melatonin, which induces sleepiness. With less light more melatonin is produced. Melatonin secretion peaks at night and ebbs through the day. The SCN also has a role in modulating cortisol, a chemical which is important in the biology of stress. Some indoor lighting does affect circadian rhythms, but it has to be very bright and of a certain wavelength (or colour); lights in the blue range are more important in this respect.



- **The sleep-wake pressure (homeostatic) system (sleep 'urge')**, reflecting the need for or pressure for sleep. The longer the person is awake, the more the system favours sleepiness. The longer they are asleep, the more it encourages wakefulness. This is based on an individual's physical state, not time of day, and clearly sleep pressure increases with sleep deprivation. Also note the small extra urge in the middle of the afternoon shown on the graph (Figure 2).⁵

During any given period of sleep there are two main types of sleep; Non-Rapid Eye Movement (NREM), and Rapid Eye Movement (REM), the latter thought to be when more vividly recalled dreams happen. Sleep also progresses through a series of different stages, during which different brain wave patterns are displayed (theta waves in the early, lighter stages; delta waves in the latter, deeper stages). Over the course of one night a number of cycles through the various different sleep types occur. Much of the function of these various aspects of sleep remains something of a mystery.

Key characteristics of adolescent sleep: What we do know is that adolescents tend to be 'owls' rather than 'larks'. Generally speaking, subjective and objective sleepiness tends to be higher in 'evening types', especially in the morning, and so on average, and as an age group, teenagers tend to be sleepier than other age groups. Of course there will be individual differences that may range widely, but the key characteristics of usual adolescent sleep patterns include:

- The **circadian timing system** of adolescents tends to slow down through the process of puberty and lags behind that of the rest of the population.
- In addition, **the sleep pressure system** changes in a way that makes it easier to stay awake longer. More pubertally mature adolescents find it easier to stay awake longer than those at earlier stages of puberty.
- As a result, **the classic pattern is of teenagers** who take longer to fall asleep at night and do not wake spontaneously in the morning. This pubertal 'phase delay', was only identified in the lab in the early 1990s. Interestingly, this pattern has also been found in adolescents of other species, so it presumably serves some kind of evolutionary purpose.
- In addition, pubertal and postpubertal adolescents show **different patterns of alertness** across the day (younger children have more even alertness).

Why do we see these changes? There are various theories – perhaps the adolescent 'day' becomes longer; that is, pubertal changes make the circadian rhythm shifts backwards creating a sort of jet lag. Perhaps adolescents are more sensitive to light during the day or evening, which then pushes the circadian rhythm back. Alternatively, perhaps they become less sensitive to morning light. Currently, we do not know. What we do know is that the combination of societal pressure from early school and college starts, and social pressure from electronic communication devices, laptops and 24 hour entertainment cycles, work with this adolescent 'owl' tendency to create particular problems for today's generation of young people.

It is important to note that the main general-population sleep problems in adolescence are caused by (a) sleeping too little, and (b) being asked to be alert at an inappropriate point in their circadian rhythms. We return to these in the section below on links with health. Indeed, issues of sleep deprivation are the largest concern to the normal population of this age group. However, a significant proportion of children and young people experience diagnosable adolescent sleep disorders, and in the next section we outline what these might be.

ADOLESCENT SLEEP DISORDERS

What are the key adolescent sleep disorders? Classification systems vary, but the following are the most commonly recorded: ^{6,7}

- **Delayed Sleep Phase Syndrome (DSPS).** The most common of adolescent sleep disorders, this affects an estimated seven per cent of the adolescent population.⁸ A person's circadian rhythm is disrupted, so that they cannot fall asleep when they should, or wake up appropriately. People with DSPS tend not to sleep until 2-4am, wake very late in the day, feel tired until the evening, and there is a strong overlap with depression. Treatment involves efforts to reset the circadian rhythm with, for example, exposure to strong light in the morning, although co-morbid depression often needs to be treated as well.
- **Night terrors:** This is more common in younger children, but can affect adolescents (estimates around two per cent)⁹, including feelings of dread or terror, with episodes of waking bolt upright, eyes open, heart pounding, of which the child has no memory. Sometimes an overlap with post traumatic stress disorder (PTSD) and generalised anxiety disorder.
- **Sleep walking:** This is also more common in pre-pubescent children, prevalence peaking at around one in six at age 8-12 and usually outgrown without intervention.⁹
- **Sleep-onset anxiety:** Presents as difficulty falling asleep because of excessive fears or worries.
- **Obstructive sleep apnea:** Obstructed air passages can make sleep problematic. This leads to snoring and difficulty breathing during sleep, and can be treated with surgical interventions. It affects around two per cent of children; figures for adolescents not given separately¹⁰.
- **Restless legs syndrome:** This is a persistent urge to move the legs with uncomfortable and unpleasant sensations, worse at night and accompanied by distress, tiredness, cognitive and mood disturbance.
- **Narcolepsy:** This is a rare neurobiologically based genetic condition that may first appear in adolescence, and which includes sleep attacks (falling asleep suddenly and unexpectedly) and sleep onset-paralysis.

Sleep disorders normally need to be diagnosed by a paediatrician or sleep specialist. A referral to a sleep clinic may result.

LINKS WITH HEALTH

As we have noted, the most salient issues when thinking about links between adolescent sleep and health outcomes are the implications of chronic sleep deprivation and irregular sleep patterns causing disruption to circadian rhythms. In fact, sleep deprivation does not have to be extensive in order to have implications; many researchers have focused on Sadeh's work on the difference that one hour a night can make,¹¹ which we will describe in more detail below.

Health implications of sleep deprivation and disruption to sleep routines have been shown to be both short term and relatively immediate, and also longer-term or more chronic. Research is in its relative infancy and suffers from the usual problem of difficulties in separating out correlation from causality; are sleep

problems the cause or consequence of some of these associations with health outcomes? But in some cases we can be sure that it is the sleep that is causing the problem, and in all cases it is useful to note the associations. There are some associations that we have not listed because they are less relevant for adolescents; for example, the links between shift work and breast cancer¹², and disrupted sleep routines and heart disease¹³.

- **Accidents.** Contributing factors, particularly in road traffic accidents, include low nocturnal sleep time, poor quality sleep and self-assessed insufficient sleep¹⁴, all of which have been shown to be characteristic of adolescents.
- **Fatigue and stress.** The association of fatigue and mood with sleep need and sleep loss has been reported to be more pronounced in younger (adolescent) subjects.¹⁵
- **Depression and anxiety.** Extensive concurrent links have been reported, perhaps with particular links for certain types of anxiety – generalised anxiety, panic/agoraphobia and social anxiety.¹⁶ There are stronger links in adolescence than childhood, perhaps because sleep disturbance is rarer at this age than in earlier childhood. We have to be careful about the difference between self-report (lots of correlation) and objective measures (less so); depression might affect recall of sleep.
- **Behavioural difficulties** (attention and conduct). Sleep deprivation may lead to compromised alertness and neurobehavioural functioning. In a review of the association, Gregory and Sadeh concluded, “It is therefore possible that sleep problems contribute to the aetiology and exacerbation of symptoms of ADHD”.¹³
- **Risky health behaviour.** High school students have been shown to have elevated odds of engaging in smoking, substance use, sexual activity, physical fighting and physical inactivity if they have insufficient sleep (which two thirds reported).¹⁷ There are very few studies on this kind of link, but if it is robustly replicated in other samples, it requires further attention.
- **Obesity.** A number of studies have pointed to a clear association between being overweight/obese and unmet sleep need. In a meta-analysis of published studies, Cappuccio et al (2008) reported a pooled odds ratio for lack of sleep and obesity of 1.89; sleep deprivation was thus associated with an almost two fold increase in being obese in children.¹⁸

A school district in Kentucky, USA, moved its start time one hour later. Teenage car accidents in the district went down by 16%, when the rest of the state showed a nine per cent rise.

‘Sleep disorders can impair children’s IQs as much as lead exposure’

Dr Paul Suratt, University of Virginia (quoted in the *New York Magazine*, 7 October 2007).

Why might there be these links between sleep and health? A number of possible mechanisms have been proposed. These include an impact on immune function; for example, acute and chronic sleep deprivation are associated with decreasing numbers of ‘natural killer cells’ (cytotoxic lymphocytes) involved in rapid response to, for example, viruses. Many writers raise the possibility of implications for endocrine (hormone) and metabolic function. Shared lifestyle risks might underlie both sleep and health outcomes, through, for example, impact on exercise levels.

ADOLESCENT SLEEP AND LONG-TERM CONDITIONS

Finally it is important to note the high overlap between long-term health conditions such as asthma, chronic kidney disease, juvenile arthritis, epilepsy and chronic pain conditions, and sleep problems. This is

partly because of a higher rate of airway restriction in some conditions, side effects of medication, disruption to routines through hospitalisation, or effects of anxiety and stress. Studies suggest that around a half of patients with long-term, chronic conditions will show sleep disturbance.^{19,20} In a recent review, Lewandowski et al (2011) stress that poor sleep can exacerbate chronic conditions and must be considered a critical part of the assessment and treatment.²¹ The links might be particularly through an impact on depressive symptoms.²²

RECENT REPORTS

In the UK we identified two recent reports with a bearing on adolescent sleep and health outcomes:

Mental Health Foundation (2011) 'Sleep Matters'

This report features data from the 'Great British Sleep Survey', the largest ever survey of sleep in the UK, as part of a new campaign to raise awareness of the importance of sleep for mental and physical health. It reports that over 30% of the population suffers from a sleep disorder, and that people with insomnia are three times as likely to experience low mood (83% versus 27%), three times as likely to lack concentration (78% versus 26%), and twice as likely to suffer from energy deficiency (94% versus 42%). The sample included 2,000 16 – 30 year olds, but data are not presented separately for adolescents.

RCPCH (2009) Working party on sleep physiology and respiratory control disorders in childhood:

This report presents evidence-based recommendations for the diagnosis and management of disorders of sleep physiology and respiratory control in children (ie, just sleep disorders where a role is played by breathing), and the organisation of such services nationally in the UK. Includes a series of recommendations about diagnosis and treatment, and, based on a survey of consultant paediatricians in the UK, concludes that there is large unmet need for sleep services and poor awareness of local facilities. There are approximately 20 paediatric sleep centres in the UK, but only a total of around ten specialised paediatric sleep laboratory beds in the whole of the country. The report includes the British Sleep Society UK Provider Directory.

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RECENT RESEARCH

Adolescent sleep is a neglected research topic in the UK. Although other countries such as the USA, Australia, Canada and the Netherlands all have lively research units working in this area, the UK seems to lag behind. There is much that we can learn from the research studies published in other countries, and we summarise some of the key recent papers below, but it is still important to ensure that these findings are replicated in British samples. We hope that this field grows in coming years, perhaps spurred on by the development of interest in adolescent neuropsychology and psychiatry that is currently ongoing in the adolescent research field. The other thing to bear in mind when reading research about sleep is the perennial problem of finding material that focus directly on adolescents, not just on children and young people in general. We have included a couple of studies of children in primary school, as this is where some of the research has focused, but again it is important that this work is extended so that we can learn more specifically about teenagers.

We have selected some important older studies from the early 2000s, and then some more recent from the last three or four years, with an emphasis on UK based studies where that was possible.

The effects of sleep restriction and extension on school-age children: What a difference an hour makes.

Sadeh A, Gruber R and Raviv A. (2003) *Child Development*. 74, 444-455

This widely cited study from Israel monitored the sleep of 77 children (9-12 years) for five nights, with experimental sleep manipulation of either extending or reducing their sleep for the last three nights, with an average reduction of 41 minutes for the less-sleep group. This led to significant neurobehavioural functioning differences, alertness, reaction time, fatigue, and sleep latency.

Sleep and youth suicidal behaviour: a neglected field

Liu X, Buysse D (2006) *Current Opinion in Psychiatry* 19, 288-93

Both suicide and sleep show significant trends through adolescence; this review paper asks are these related? Suicidal psychiatric patients had more sleep disturbances including insomnia, hypersomnia and nightmares. The link appears to be mediated by depression, but some data suggest that nightmares may play an independent predictive role.

A retrospective examination of the relationship between body mass index and polysomnographic measures of sleep in adolescents

Landis A and Parker K (2007) *Journal of Adolescent Health*, 40, 89-91

A sample of 52 adolescents aged 12-18 underwent one night of laboratory-based polysomnography (PSG) as part of an evaluation of sleep complaints at a university-based sleep clinic in Atlanta, Georgia, USA. Adolescents were characterized as normal weight, risk of over-weight, and overweight. Over half of the sample was overweight, and BMI was associated with lighter and less deep sleep.

Meta-analysis of short sleep duration and obesity in children and adults.

Cuppuccio F, Taggart F, Kandala N-B, Currie A, Stranges S and Miller M (2008) *Sleep*, 31, 619-626

Results of a systematic search and combination of research results from 30 studies including over 600,000 participants, of whom 30,000 were children, undertaken by the University of Warwick Medical School in Coventry. Results showed a consistent increased risk of obesity for short sleepers, and in children, the pooled odds ratio from all the studies for short duration of sleep and obesity was 1.89 (1.46 to 2.43).

Adolescent sleep, school start times and teen motor vehicle crashes

Danner F and Phillips B (2008) *Journal of Clinical Sleep Medicine*, 4, 533-535

American research has been very concerned with the relationship between sleep deprivation and vehicle accidents, as significant proportions of late adolescents drive themselves to early starts at college across the country. Driving while suffering from sleep deprivation has been clearly shown to be dangerous, particularly among younger drivers. This study compared the sleep habits of students from a county-wide school district before and after a change in the school start times. Collision statistics for the same periods were collected from official data, to compute crash rates per 1000 licensed teen drivers. Average hours of nightly sleep increased with the one hour delay in school start times, and average crash rates in the two years after the change dropped 16.5%, whereas rates for the rest of the state had risen during the same period.

The tired teen: A review of the assessment and management of the adolescent with sleepiness and fatigue

Findlay S (2008) *Paediatr Child Health* 13, 37-42

Although this is a review rather than a piece of primary research, we have included this Canadian study in this section because it provides several very helpful resources for screening sleep difficulties in adolescents, for giving guidance to teens who are getting too little sleep, and for feeding back to parents about chronic fatigue.

In particular, an approach to managing the fatigued teen is outlined, consisting of the following steps:

- Improving function through increased activity and fitness
- Focusing on stabilising school and social life, leaving employment and extracurricular activities aside
- Provision of clear advice on sleep hygiene
- Potential use of cognitive behavioural therapy

Family disorganization, sleep hygiene, and adolescent sleep disturbance

Billows M, Gradisar M, Dohnt H, Johnson A, McCappin S and Hudson J (2009) *Journal of Clinical Child and Adolescent Psychology* 38, 745-52

In this Australian study of 217 adolescents aged 13-18 years, the family environment was shown to be important in 'sleep hygiene', with an effect on sleep onset latency and daytime sleepiness.

Adolescence sleep disturbances as predictors of adult sleep disturbances – a cohort study

Dregan A and Armstrong D (2010) *Journal of Adolescent Health*, 46, 482-487

Using data from the UK's National Child Development Study (full sleep data on 7,781), sleep disturbances at ages 16, 23, 33 and 42 were analysed to see the relationship across adult life. Sleep disturbance in adolescence was a significant predictor of sleep disturbance at the later ages, showing strong continuity and providing rare longitudinal data on the topic. At age 16, six per cent reported sleep disturbances, rising to 46% by 42 years. Of those with problems at age 16, approximately a third continued to report difficulties by age 23, dropping to 10% by age 42. The authors conclude that sleep disturbances seem to build from age 16, and depression seemed an important part of the continuity.

Earlier parental set bedtimes as a protective factor against depression and suicidal ideation.

Gangwisch J, Babiss L, Malaspina D, Turner B, Zammit G and Posner K (2010) *Sleep*, 33, 97-106

Drawing on data from the nationally representative, American National Longitudinal Study of Adolescent Health (Ad Health), this study looked at the role of parent-set bedtimes in health outcomes for young people. Depression and suicidal ideation were measured using a thorough 18 item instrument from the Centers for Epidemiological Study of Depression, in a sample of 15,659 young people aged 12-17 years. Adolescents with parental set bedtimes of midnight or later were 24% more likely to suffer from depression and 20% more likely to have suicidal ideation than those sent to bed at 10pm or earlier.

An hour less sleep is a risk factor for childhood conduct problems.

Holley S, Hill C and Stevenson J (2011) *Child: Care, Health and Development*, 37, 563-570

Sleep was measured in 91 children aged six to 11 years for six days, and parents completed the Strengths and Difficulties questionnaire (SDQ). Sleep accounted for 18% of the variance in conduct problems, and the authors concluded that a child who sleeps one hour or less than the average child may be at risk.

A motivational school-based intervention for adolescent sleep problems

Cain N, Gradisar M, Moseley L (2011) *Sleep Medicine*, 12, 246-51

Year 11 students in an Australian secondary school were subject to four 50 minute sleep education classes held weekly. A control class had no sleep education. The intervention consisted in part of a motivational interviewing technique. Students in the intervention group significantly increased their knowledge about sleep, and were more motivated to improve their sleep routines, and showed some improvement in sleep and daytime functioning, but not significantly more so than the control group. The intervention seems to have potential, but probably requires more support and follow-through to be effective.

Poor sleep quality and emotion processing in adolescents

Soffer-Dudek N, Sadeh A, Dahl R, and Rosenblat-Stein S (2011) *Sleep*, 34, p1499-1508

The sleep of 94 ten year olds was assessed every year for three years (using actigraphy for seven nights). Elevated night awakenings and decreased sleep efficiency was associated with poorer performance in an emotional information processing task.

Davis et al – Over half of school-aged children with chronic kidney disease had symptoms of a sleep disturbance

Prevalence of sleep disturbances in children and adolescents with chronic kidney disease.

Davis I, Greenbaum L, Gipson D, Sinha R, Matsuda-Abedini M, Emancipator J, Lane J, Hodgkins K, Nailescu C, Barletta G, Arora S, Mahan J and Rosen C (2012) *Pediatric Nephrol.* 27, 451-9

In this American clinic-based study, over half (53%) of 159 school-aged patients with chronic kidney disease had symptoms of a sleep disturbance. The patients included young people not on dialysis, some on dialysis, and patients with a functioning renal allograft. Sleep disturbances were in turn related to lower quality of life scores.

CURRENT UK INITIATIVES

Wilson SJ, Nutt DJ, Alford C et al (2011) British Association for Psychopharmacology consensus statement on evidence-based treatment of insomnia, parasomnias and circadian rhythm disorders. *Journal of Psychopharmacology*, 24(11) 1577-1600. Downloadable from http://www.bap.org.uk/pdfs/BAP_Sleep_Guidelines.pdf

Secondary school experiments: Unlike the USA, the UK has not systematically evaluated experiments to change the school start time, although three secondary schools in North Tyneside and Kent have tested a later start time of 10am and have reported anecdotal information on reductions in absence and persistent absenteeism. Until there is independent evaluation, it will be unclear what the effects were. It cannot be assumed that gains made in the USA schools will translate directly into the UK school systems.

IPCREST – Improving primary care resources for effective sleep treatment. A project of the East Midlands Health, Innovation, Education cluster (EM HIEC, see www.emhiecc.co.uk), to improve services to patients presenting to primary care with insomnia by providing education and training for primary care practitioners in the East Midlands.

REST – Resources for effective sleep treatment, e-learning package. www.restproject.org.uk

The Resources for Effective Sleep Treatment (REST) project was funded by the Health Foundation

to improve care for people with insomnia. The REST e-learning package is designed for health professionals working in primary care, but can also be used by others interested to learn more about insomnia and its management. It is a multimedia package including videos of primary care consultations for insomnia. There is an online self-assessment and a certificate of completion which can be used as evidence for a personal development portfolio. <http://elearning.restproject.org.uk/>

Sound Sleep Project (Scotland). A teaching pack and training day for education professionals throughout the UK, launched in 2011, aiming to raise awareness in schools of the importance of sleep for adolescent wellbeing. http://www.sleepscotland.org/teen_school_workshops.php. It provides information and resources for teaching students about sleep and supporting them in making positive changes to their sleep routines. Resources have been developed to fit within the health and wellbeing frameworks of the Scottish, English, Welsh and Northern Irish curriculums. The project arose from a teenage sleep counselling project that proved very popular.

National Attention Deficit Disorder Information and Support Service, 'Sleep seekers campaign', leaflet of advice about sleep for young people with ADD, where there is a high degree of overlap. <http://www.addiss.co.uk/sleepseekersbooklet.pdf>

Revision to the Diagnostic and Statistical Manual DSM -

<http://www.dsm5.org/ProposedRevisions/Pages/SleepDisorders.aspx>, to include a greater range of disorders, organised in different ways but with a focus on impairment and distress. Out for consultation at the moment, been in development for over 10 years. DSM V due for publication in May 2013, at the American Psychiatric Association's conference in San Francisco, and will be influential on how we think about sleep disorders for the next couple of decades.

CONCLUSION

There is plenty of international research to suggest that adolescent sleep is an important consideration in health outcomes. However, there is considerable misunderstanding about the topic. Generally there is confusion between adolescent sleep needs and adolescent sleep delay. We assume the former have dropped, but they have not – what has happened is that intrinsic biological processes have delayed the onset of sleep and changed sleep patterns, but society insists that young people burn the candle at both ends, and so the result is a generation of sleep deprived people. Although it has proved difficult to establish causality, it seems increasingly clear that poor sleep is related to poor health and wellbeing outcomes.

AYPH is calling for more widespread acknowledgement that adolescent sleep is an important topic, and better understanding that adolescent sleep patterns are driven by biological changes, not rebellious attitudes. AYPH wants sleep to move up the UK research agenda, and for anyone in contact with young people to be aware of the health implications of poor sleep habits. Sleep should be part of the discussion about healthy living, particularly in this age group.

Further reading (Useful overviews, reviews and editorials)

- Cain N and Gradisar (2010) Electronic media use and sleep in school-aged children and adolescents: A review. *Sleep Medicine*, 11, 735-742
- Carskadon M (2011) Sleep in Adolescents: The perfect storm. *Pediatric Clinics of North America*, 58, 637-647, Downloadable from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3130594/?tool=pubmed>
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- Wolfson A (2010) Editorial: Adolescents and emerging adults' sleep patterns: New developments. *Journal of Adolescent Health*, 46, 97-99

Useful resources

British Sleep Society, which has a paediatric sleep section
http://www.sleeping.org.uk/Paediatric_Sleep_Section.aspx

European Sleep Research Society www.esrs.eu

The Sleep Council: Promotes the benefits of sleeping well. Provides information leaflets on sleep and beds.

British Snoring and Sleep Apnoea Association: Information and advice, products, treatments and remedies concerning snoring. www.british.snoring.co.uk

National Sleep Foundation: American website with information on sleep and sleep disorders.
www.sleepfoundation.org

Narcolepsy Association UK (UKAN): Promotes the interests of people with narcolepsy and encourages better understanding of the illness. www.narcolepsy.org.uk

Royal College of Psychiatrists, 'Sleeping well' leaflet
<http://www.rcpsych.ac.uk/mentalhealthinfoforall/problems/sleepproblems/sleepingwell.aspx>

National Centre on Sleep Disorders Research (part of the National Institutes of Health in the USA), various resources including an 'Awake at the wheel' leaflet for teen drivers
<http://www.nhlbi.nih.gov/health/public/sleep/aaw/brochure.pdf>

Sleep disorder clinics: There are a number of Sleep Disorder Clinics throughout the UK, which can have useful information on their websites, but referral is usually made through GPs. Patients cannot refer themselves. Check http://www.narcolepsy.org.uk/AboutNarcolepsy/Findyourlocalsleepcentre.aspx#.T_G2mxdDs8c to find your local sleep centre.

Sleep for Science: the E P Bradley Hospital Sleep Research Laboratory in Rhode Island, USA, directed by Professor Mary Carskadon's: <http://www.sleepforscience.org> Useful resources and cutting edge research on young people.

NHS Choices, information for patients: Page of resources on sleep, <http://www.nhs.uk/LiveWell/sleep/Pages/sleep-home.aspx>

The Children's Sleep Charity: new charity offering training for professionals and parents in managing children's sleep. See www.thechildrenssleepcharity.org.uk

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<http://www.sleepfoundation.org/article/how-sleep-works/how-much-sleep-do-we-really-need>
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