Factors Affecting Adolescent Sleep Deprivation and Effects of Daytime Sleepiness

By
SUSAN C. FRIESEN

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To the faculty of Washington State University:

The members of the Committee appointed to examine the project of Susan C. Friesen find it satisfactory and recommend that it be accepted.

Chair: Louise Kaplan, PhD, ARNP

Renee Hoeksel, PhD, RN, CCRN

Becky Cardell, PhD, ARNP-BC
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Factors Affecting Adolescent Sleep Deprivation and Effects of Daytime Sleepiness

Abstract

By Susan C. Friesen
Washington State University
December 2007

Chair: Louise Kaplan

Adolescent sleep loss and daytime sleepiness has manifested itself in a wide range of negative outcomes from increased risk of accidents and motor vehicle crashes, to substance use, school failure, anxiety, depression, attention deficit hyperactivity disorder, obesity, and even fibromyalgia. This article addresses the ecology of adolescent sleep deprivation in the context of the individual interacting with others, the physical environment, and society. Nurse practitioners are positioned to evaluate adolescents for sleep problems, formulate interventions and implement them with the adolescent and family. Furthermore, nurse practitioners are able to promote health through education for adolescents, their families, the school system, and the community on the importance of sleep and the need to prevent sleep deprivation.
Introduction

Sleepy adolescents are in our homes, offices, schools, and on our roads. Adolescents need as many as nine to ten hours of sleep daily to maintain daytime functioning without sleepiness (Anders, Carskadon, & Dement 1980, Carskadon & Acebo, 2002). A telephone survey conducted by the National Sleep Foundation, *Sleep In America 2006*, concluded the amount of sleep twelfth grade students average is 6.9 hours. In a large study of Canadian adolescents, nearly 70% of the sample suffered from mild to severe sleep deprivation, and more than 40% reported excessive daytime sleepiness (Gibson, E. S., Powles, A.C.P., Thabane, L., O’Brien, S., Molnar, D. S., et al., 2006).

Sleep deprivation among adolescents is linked to numerous physical and behavioral problems. These include negative moods, decreased impulse control, inattention, poor school performance, risk taking behaviors, increased propensity for accidents and automobile crashes, depression, aggression, substance use, and weight gain (O’Brien & Mindell 2005; Millman 2005; Wolfson & Carskadon 1998; Shin, Kim, Lee, Ahn, & Joo, 2003; Carskadon 1990; Ireland & Culpin 2006; Johnson & Breslau 2000; Gupta, Mueller, Chan, & Meininger 2002). Aspects of sleep loss are often difficult to differentiate from behavioral disorders that are commonly diagnosed as Attention Deficit Hyperactivity Disorder (ADHD), depression, other mood disorders, substance use, and even fibromyalgia (Archbold 2006; ter Wolbeek, van Doornen, Kavelaars, & Heijnen, 2006; Wilens, 2006).
Most research on adolescents and sleep has been conducted in the sleep laboratory with little attention to the “typical” adolescent sleep environment. Knowledge of factors related to the adolescent’s functional environment can assist the nurse practitioner (NP) in promoting positive change in the adolescent patient’s sleep. This will result in reduced daytime sleepiness and improved daytime functioning. This article provides an overview of adolescent sleep deprivation, the adolescent sleep environment, and why it is important to consider these areas in conjunction with one another. NPs can promote the health and well being of adolescents by assessing the environmental factors affecting their sleep.

Developmental Theory

The basis for understanding adolescents and sleep is grounded in an understanding of developmental theory. The Contemporary Developmental Theory, a systems theory described by Lerner in the early 1980s, illustrates the phenomenon of interactions between the individual and complex levels of his or her environment (Lerner & Spainer, 1980; Lerner, 1996; Lerner & Castellino, 2002). Developing an image of the adolescent requires envisioning each individual as the outcome of his or her physiology interacting with the individual’s environment on all levels. These interactions begin at the most intimate level, with the family, and the immediate environment in which they live. Levels expand outward, to include friends, neighborhood, school, culture, community, physical ecology, and society. These multifaceted interactions create an intricately woven context, as the individual moves through time (Lerner, 1996; Lerner & Castellino, 2002) (Figure 1).
Changes in an individual occur in dynamic association with changes in his or her milieu. The reverse is also true. Any change in the context reciprocally affects the individual as well. Thus development consists of recurrent feed-back loops (Lerner, 1980). A change at any level can vary the context of an immediately adjoining level, or transform interactions at many levels. An abbreviated effect is seen with an adolescent's choice of sleep hours on a weekend, staying up late and sleeping in late. The same choice of bed time on a school night would result in a truncated sleep cycle leaving the adolescent sleep deprived, potentially affecting many levels depending on the demands of the following day, such as a final exam or driving. The adolescent would risk a failing grade in school, or an automobile accident. Either of which could alter their life course.

The Physiology of Adolescent Sleep

The physiology of adolescent sleep differs from that of younger children in several ways. The circadian rhythm that intrinsically controls rest and wakefulness changes during adolescence. Adolescent circadian alerting occurs later in the day, leading to greater activity in the evenings and early morning hours. This is termed sleep phase delay (Carskadon, Acebo, & Jenni, 2004; Markov & Goldman, 2006). As they mature, adolescents are less sensitive to sleep pressure, the homeostatic factor that induces sleep. Sleep pressure increases in proportion to waking hours, so the longer the wake period, the greater the sleep pressure. Adolescents do not feel sleep pressure until the early morning hours (Carskadon, Acebo, & Jenni, 2004; Markov & Goldman, 2006). This results in a lack of impetus to sleep at 10 pm, the usual hour required for the onset of sleep if the adolescent is to attain the requisite nine or more hours of sleep prior to awakening.
for the start of the school day. School start times and other daytime activities demand an early rise time, thus culminating in sleep deprivation and sleepy, inattentive teenagers at high risk for making poor decisions (Taylor, Jenni, Acebo & Carskadon, 2005; Jenni & LeBourgeois, 2006).

The architecture of the adolescent sleep cycle approximates that of an adult consisting of both non-rapid eye movement, (NREM), and rapid eye movement, (REM), sleep states. The NREM sleep state is further divided into four distinct sleep stages. Stage 1 occurs between the states of wakefulness and sleep, and also follows arousals during sleep. It accounts for about 3%-8% of total sleep time (TST). Stage 2 sleep is the first true sleep stage. It accounts for the largest share of TST, about 45%-55%. Sleep stages 3 and 4 together make up about 15%-20% of TST and constitute deep sleep known as slow wave sleep.

REM sleep comprises 20-25% of TST and is split into two stages, tonic and phasic. During the tonic stage, there is skeletal muscle atony, and electroencephalographic dysynchrony. Phasic REM sleep is distinguished by rapid eye movements, transient elevations in heart rate and blood pressure, irregular respirations, and myoclonic twitching. Dreaming is believed to occur during REM sleep (Kramer, 2006). These five phases of sleep occur all night long in 90-110 minute cycles beginning with the NREM stages and culminating with REM sleep. The first portion of the night typically contains larger segments of slow wave sleep, while the cycles toward the end of the sleep period contain larger segments of REM sleep (Rosenthal, 2006).

Factors Influencing Adolescent Sleep

There are many factors in an adolescent’s environment that affect time needed for adequate sleep and the ability to sleep. These factors include family life and school
responsibilities, peer and romantic relationships, employment, media and entertainment exposure, the physical environment in which the adolescents live, and individual sleep habits.

Home and School Life

The home life is affected by family circumstances including whether there are one or two parents, or whether they live in a house, in an apartment, in a city, or in a rural setting. During the school year, schedules, commitment to after school sports activity or clubs, and the amount of homework frame the majority of an adolescent’s weekday time. Additionally, adolescents may have jobs or be involved in other non-school related activities such as music lessons or community oriented youth organizations. The child’s responsibilities to the family life such as assigned duties, chores, or sibling care can create demands as well. (Carskadon, 2002; Wahlstrom, 2002).

Peer Relationships

Adolescent development involves forging an identity with friends outside the family unit. During this time of transition the adolescent seeks support to navigate the new school environment, novel activities such as driving, and changing interactions with the opposite sex from within his or her peer group. These adjustments in interactions that may seem threatening faced alone are made manageable by support from others in the same predicament (Lerner & Spanier, 1980). As an essential milestone, the adolescent seeks the future based on explorations, searching to find a sense of identity often in the face of too many conflicting possibilities and choices (Erikson, 1968). The support from companions takes on more importance. Unlike years gone by when face to face or telephone communication was the usual means of contact, the
modern adolescent’s communication options now include cell phones, e-mail, instant messaging, on-line forums such as “My Space”, and chat rooms. The portability of phones and computers provides 24 hour a day access to communication with others, permitting sleep interruptions at any hour by these means. “Those [adolescents] who used the mobile phone after lights out at least once a month or more were more than two times more likely to be in the very tired category than those who never used their mobile phone that way. Those who used their phone about once a week were more than three-times more likely to be very tired and those who used it several times a week or more were five times more likely to be very tired”, (Van den Bulck, 2007, p. 1222). Adolescents are often beginning to develop romantic involvement which may cause intense emotional responses resulting in sleepless hours as the adolescent contemplates the person or perseverates on interactions with her or him (Brand, Luethi, Planta, Hatzinger, & Holsboer-Trachsler, 2007).

*Media and Entertainment*

Entertainment can conflict with sleep time. The 24 hour availability of computer access to multi player internet gaming, gambling, pornography, DVD’s, self-selected music on MP3 players or iPods’, and other forms of media activity and stimulation distract the already sleep phase delayed adolescent. This unstructured activity can consume more time than is appropriate or healthy. There is an inverse relationship between the amount of media use and the available sleep time of adolescents (Van den Bulck, 2004). There are numerous adolescents that report using some form of media as a sleep aid. In a study of 2546 seventh and tenth grade Flemish students, it was found that 60.2% used music as a sleep aid, 36.7% used television, and 22.1%
used computer games. Students using electronic media as a sleep aid got fewer hours of sleep, generally due to later bedtimes and were notably more tired. Book reading as a sleep aid was not associated with tiredness (Eggermont & Van den Bulck, 2006).

Substance Use, Misuse, and Abuse

Various substances can affect an adolescent’s sleep. Caffeine can be found in coffee drinks, soda, energy drinks, and even foods such as chocolates. Caffeine based energy drinks are sometimes sold in school vending machines. These beverages can supply a lift to the sleep deprived adolescent, but conversely, as stimulants they are associated with difficulty sleeping (Orbeta, Overpeck, Ramcharran, Kogan, & Ledsky, 2006). See table 1.

Other substances such as nicotine, alcohol, illicit recreational drugs, and prescription drugs also have known negative effects on adolescent sleep (Zhang, Samet, Caffo, & Punjabi, 2006; Casola, Goldsmith, Daiter, & Varenbut, 2006). The nicotine in cigarettes stimulates release of neurotransmitters such as dopamine and serotonin which may shift the usual patterns of sleep away from the deep slow wave stages toward the lighter stages during non-REM sleep. During sleep, nicotine blood levels fall, leading to a state of nicotine withdrawal, possibly affecting the adolescent’s ability to remain asleep (Zhang, Samet, Caffo, & Punjabi, 2006). Alcohol has been shown to decrease sleep efficiency, disrupt sleep consolidation, and double nocturnal waking episodes in the second half of the night, (Landolt, Roth, Dijk, & Borberly, 1996). Opiates also affect sleep architecture, causing a decrease in the number and duration of REM sleep periods, and a reduction in slow wave sleep by 75% (Raymond-Shaw, Lavigne, Mayer, & Choiniere, 2005). Past ecstasy use leaves a residual decrease in an individual’s total sleep time by reducing the
amount of light sleep attained over the sleep period (Allen, McCann, & Ricaurte, 1992). This study was performed on former users of ecstasy who had typically more than 79 episodes of use.

Marijuana withdrawal in a subjective, retrospective study of both adolescents and adults, was associated with sleep difficulties (Vandrey, Budney, Kammon, & Stanger, 2005). Research involving both smoked and synthetic derivatives of marijuana reported reduced sleep onset and decreased nocturnal awakenings in both, but decreased slow wave sleep time and next day hang over effects in smoked marijuana alone (Russo, Guy, & Robson, 2007).

The majority of research involving the effects of recreational substance use involves withdrawal from the substance with little information on the effects of current substance use on sleep architecture. Cocaine use in a binge-abstinence pattern has been shown to decrease the sleep quality by increasing sleep latency, decreasing sleep duration and decreasing the total sleep time in relation to the total time in bed (Pace-Schott, Stickgold, Muzur, Wigren, Ward, et al.). Administration of amphetamine in the form of methamphetamine was also found to decrease total sleep time, generally by decreasing the NREM sleep stages and increasing the time needed to fall asleep (Comer, Hart, Black, Ward, Haney, Folton, & Fischman, 2001).

Whether prescribed or obtained illicitly, benzodiazepines cause faster sleep onset, decreased nocturnal awakenings, and increased overall total sleep time. However, they have a strong propensity for abuse and dependence. They also cause reduced cognitive and motor functions, and are associated with withdrawal symptoms when stopped (Goldsmith & Casola, 2006).
Antidepressants have a variety of effects on sleep depending on their formulation. Selective serotonin reuptake inhibitors suppress REM sleep and have variable effects on sleep latency and nocturnal awakenings. It is unpredictable whether a medication will cause sedation or insomnia in an individual (Goldsmith & Casola, 2006). Bupropion can cause insomnia and increased REM periods. Mirtazapine and Trazodone decrease nocturnal awakening, but have the side effect of daytime sleepiness (Goldsmith & Casola, 2006).

The Physical Environment

Little research is available regarding the actual physical sleep space of adolescents. Research conducted with other groups can inform the effects of the physical environment of adolescents. In some instances, an adolescent’s sense of security is impaired by the physical environment. Persons in the immediate living space or neighborhood may engender emotions of fear or mistrust. The physical structure of the housing may be in poor condition creating underlying concern for safety. Because all muscle tone is lost during REM sleep, and response time is slowed when awakening from slow wave sleep, having a safe environment in which to sleep impacts ability to attain sleep (Dahl & Lewin 2002).

The living situation of the adolescent is affected by the architecture of the family, including the number of family members, their genders, health status, and the relationships between members. In a study involving children 8-11 years old, a parentally supportive environment encouraging social maturity was linked to overall healthier sleep patterns (Spilsbury, Storfer-Isser, Drotar, Rosen, Kirchner, & Redline, 2005).
The family’s socioeconomic status influences the amount of family community space as well as the adolescent’s personal space. The scope of an adolescent’s personal space is important and can range from a single dresser drawer to several rooms or an entire house. While studies have not evaluated the impact of sharing a room with a sibling or others on adolescent sleep, there is research on the influence of spouses’ sleep problems on their partners. This research demonstrated the unaffected partner reported more frequently having less energy than others their own age, poorer health status, unhappiness and low satisfaction with marriage (Strawbridge, Shema, & Roberts, 2003).

Again, while there is no research on the effect of noise, lighting, and movement by others on adolescent sleep, these factors have been shown to negatively impact sleep. One study in a hospital pediatric unit concluded disruption of sleep by parents, nursing staff, and others entering the patients’ room caused sleep deprivation and daytime fatigue in patients (Hinds, Hockenberry, Rai, Zhang, Razzouk, et al, 2007).

The ambience of the sleeping space can be conducive to or create barriers to sleep. This includes the sleeping space’s dimensions, orderliness, odors, colors, décor, ventilation, and temperature. Light in the sleep space from intentional light sources, a night light or unintentional light sources, such as the LED lights on electronic equipment may also affect sleep. Sources of noise can also influence the character, quality, and length of sleep. Noises can be either intentional, as a fan or a radio, or unintentional, such as a barking dog or living noises from a neighboring apartment or house (Hinds, Hockenberry, Rai, Zhang, Razzouk, et al, 2007). Though there is no recent research on these issues, one study demonstrated even after acclimation to
the noisy environment of the Intermediate Respiratory Care Unit, patients experienced sleep disruptions secondary to usual unit noise (Aaron, Carlisle, Carskadon, Meyer, Hill, & Millman, 1996). Earlier research utilizing recorded truck traffic noise and aircraft noise on separate nights concluded that either caused spontaneous arousals five times more often than occurred in subjects during quiet nights (Carter, Hunyou, Crawford, Kelly, & Smith, 1994). The use of bedside sound generators was studied in effects on sleep of post-operative cardiac bypass graft patients. Ocean sounds were played for an experimental group for three nights. The follow up subjective sleep reports indicated better quality sleep than for controls (Williamson, 1992). An investigation on the therapeutic use of bedside sound generators for patients suffering from tinnitus demonstrated improved sleep quality with the choice of preferred sound relating to positive emotional effect of the sound (Handscomb, 2006).

Temperature and humidity affect sleep inversely. As temperature and humidity increase past the point of a thermal neutral comfort zone, total sleep time, slow wave sleep and REM sleep all decrease (Okamoto-Mizuno, Mizun, Michie, Maida, & Iizuka, 1999). More recent research shows that within a thermo-neutral range of temperatures, from 26 degrees Celsius (78.8 degrees Fahrenheit) to 32 degrees Celsius (89.6 degrees Fahrenheit), a gradual decrease in ambient temperature to 26 degrees Celsius during sleep increases the total time spent in slow wave sleep and causes a slight decrease in core body temperature (Togo, Aizawa, Arai, Yoshikawa, Shephard, & Aoyagi, 2007).

Aroma therapy has become popular in the recent past. Experimenting with individuality, teens begin to use fragrance both personally, and to create a unique environment. Some
adolescents struggle with hygiene issues and control of body odors. Studies on the effect of certain aromas on sleep have begun to emerge. Unpleasant odors may actually interfere with sleep (Raudenbush, Koon, Smith, & Zoladz, 2003). An investigation of the effects of jasmine or lavender on sleep provided evidence that different odors are influential in increasing sleep efficiency, decreasing anxiety, and improving performance on cognitive testing (Raudenbush, Koon, Smith, & Zoladz, 2003). Many other aspects of the sleep environment such as room color, décor, orderliness, dimensions and the presence of pets have received little attention and study.

Sleep Habits

Evaluation of the adolescent’s usual sleep habits is necessary to establish a baseline of sleep hygiene. Assessment includes determining the usual weekday bedtime and wake time, usual weekend bedtime and wake time, nighttime awakenings and any daytime napping. Sleep habits of the adolescent impact their daytime functioning, and interactions. The adolescent, interacting within the context of family or school, may find communications strained when tired. For the sleepy, inattentive teen, participation in activities with friends could become risky with impaired judgment. The adolescent may suffer from decreased energy, depressed mood, or show overt aggression while sleep deprived, resulting in arguments, accidents, injuries, and even death. These interactions may spread throughout the interfaces at all levels, possibly with unintentional consequences reaching to the outer most levels of societal and physical ecologies.

The Center for Disease Control, in the list of leading indicators in Healthy People 2010, issued the following statement: “The commission recommends that research on the natural history of sleep disorders be made an urgent national concern” (Center for Disease Control, 2007, p. 22).
With all of the possible detractors to a healthy night’s sleep, and the implications cited for sleep’s contribution to health, it is important to address these factors during clinical encounters. Promoting healthy sleep habits needs to be part of a nurse practitioner’s practice.

Implications for the Nurse Practitioner

Care of patients requires exploration of sleep due to its far reaching effects. Adolescents are dying on our roads (National Sleep Foundation, 2006). Their inexperienced driving skills may deteriorate to the point of inability to control the vehicle while in a state of extreme fatigue. Driving while tired puts not only the adolescent, but other community members at high risk. Results of an automobile accident can have life-long health consequences for the adolescent or others. Exploring driving habits and alternatives available to the adolescent who is too sleepy to drive is foremost in safety advocacy for the adolescent as well as the general public.

Adolescents are losing life chances by failing in the school systems (Wolfson & Carskadon, 1998; Shin, Kim, Lee, Ahn, & Joo, 2003; Wolfson & Carskadon, 2003). Reviewing with the adolescent patient current academic achievements and study habits in the context of sleep and other time consuming activities, may provide an opportunity for the NP to assist the adolescent in planning time management. Adequate sleep may lead to improved grades which can lead to success in the educational system while also establishing appropriate practices for future success in society.

Adolescents are participating in risky behaviors such as unprotected sex, smoking cigarettes, drinking alcohol, and using drugs (Taylor, Jenni, Acebo & Carskadon, 2005; Jenni & LeBourgeois, 2006; Zhang, Samet, Caffo, & Punjabi, 2006; Casola, Goldsmith, Daiter, & Varenbut,
The sleep deprived adolescent may choose to turn to substance use to remain awake, enhance performance and be energized, or possibly to augment sleep. The consequences of this decision may affect the adolescent from the physiologic level outward to the farthest levels of the social order. In addition to the health concerns, impaired judgment furthers the risk of negative consequences and potential legal involvement for the adolescent or the family. The NP’s assessment of adolescent involvement in these behaviors necessitates a non-judgmental demeanor. The NP provides information for prevention of sexually transmitted diseases and pregnancy, smoking cessation and treatment for drug or alcohol use. The NP further determines where support is available for the adolescent to change these behaviors and then monitors progress of the adolescent and reassesses need for further intervention.

Adolescents suffer from symptoms of depression and anxiety (Robert, Hoffman, Emsilie, Hughes, Rintelmann, et al 2006, Taylor, Lichstein, Durrence, Reidel, & Bush, 2005). It is essential that the NP consider the role of sleep deprivation in adolescent mood disorders. The spiraling effect of sleep debt night after night with inadequate recovery of sleep can rapidly give the appearance of depression or anxiety. Interactions between the adolescent and family, friends and others may become increasingly negative. Intervention from the NP again in the form of sleep habits assessment and promotion of adequate sleep, time management planning, and ongoing appraisal of results is warranted prior to diagnosis of a mood disorder.

Diagnosing the sleep-deprived adolescent will entail discrimination between emotional and behavioral disorders. Hyperactivity and the inability to stay focused may be the effects of restless leg syndrome, or the inattention and impulsivity of sleep deprivation, or iron deficient
anemia (Kotagal & Pianosi, 2006). Poor academic record and problematic behaviors may be the result of hypersomnia, circadian rhythm disorder, depression, or substance abuse. The screening for sleep disorders must have the same level of consideration as screening for ADHD, lead poisoning, Grave’s disease, or iron deficient anemia (Archbold, 2006). Health care providers have an important role in assuring that adolescents, the next generation, grow to maturity.

Screening for sleep disorders can easily be included in pre-appointment questionnaires given to adolescent patients and their parents. Patient sleep cycles, sleep environment, perceived sleep problems and daytime sleepiness need exploration. Careful interview of patients who reveal sleep difficulties, or symptoms of anxiety, depression or ADHD, as well as their families, is imperative for an accurate diagnosis. One well constructed and very complete questionnaire available for use may be found on the Brown Medical School and Bradley Hospital sleep research web site: http://www.sleepforscience.org/research/instruments.php. This questionnaire contains demographic information, family structure, health and medication, sleep habits, and daytime sleepiness elements. Additionally, use of caffeine, tobacco, alcohol and other substances are covered. Moreover, there are number of questions concerning academic achievement and involvement, extra-curricular activities, and employment (Wolfson, & Carskadon, 1998). Use of this or other instruments may facilitate ongoing sleep problem assessment as the adolescent ages and may help to avert any disability from developing sleep disorders.

The primary care provider will have the opportunity to interact with the adolescent on an individual basis. Providing education in the way teens communicate may motivate them to engage in good sleep hygiene. Text messaging a teen may get a response when a phone call is not answered. E-mail is another alternative means of contacting adolescent patients who are
inaccessible by other means. Adolescents are looking to have choices and to practice using information in decision making. Finding the balance between giving information without imposing an answer on them and using their means of communication is paramount. Open lines of communication. Invite questions. Direct the adolescent to web sites that have further information. Create a “My Space” account for your adolescent patients where they can contact you and where you can post pertinent health information for them. Keep in touch with other family members. Provide community education when possible.

It is important to remember that the architecture of adolescent sleep approaches that of the adult. The amounts of the NREM and REM sleep are unchanged from that of the young adult. The notable variable is the timing of the sleep cycle. Adolescents suffer from phase delay, and would prefer to go to bed late, and get up at noon or early afternoon. Their insomnia is less related to inducing sleep than the timing of sleep onset at the parentally preferred time to the hour needed to have adequate sleep for school. This is in sharp contrast to adults who find they are unable to sleep despite appropriate environmental considerations. The adolescent suffering from sleep disordered breathing, restless leg syndrome, arousal disorder, narcolepsy or other primary sleep disorder requires consultation with a sleep medicine specialist. Behavioral or environmental issues may be addressed by the NP with lifestyle changes, education and support.

Resources

There are numerous resources for NPs seeking information on sleep. The internet sites in figure 2 are well maintained and contain a wealth of information.
Seek to network with colleagues, obtain sleep center consultations, read publications, and attend educational seminars. Increased knowledge about adolescents and sleep will increase appreciation for how far reaching and profound the effects of sleep loss are on the individual, the family, community and society.

Educating patients and families about the importance of sleep and being well rested in their lives can result in increased adolescent alertness, decreased daytime sleepiness, reduced risk for negative moods, fewer school failures, less risky behaviors, fewer accidents, and improve the overall health of youth today.

Resources for adolescents and families needing information on sleep are in figure 3.

Conclusion

Sleep disorders must be included in the differential diagnosis for a diverse group of problems (Archbold, 2006). Patients with symptoms of ADHD, fibromyalgia syndrome, depression, or patients who are obese require scrutiny for disordered sleep before a definitive diagnosis is made or prescriptions are written. Sleep problems and chronic sleep debt can no longer be back burner issues. The lives of adolescents and the quality of their lives are at stake.

Future research may reveal more about the role a teen’s sleep environment plays in supporting or distracting from sleep. Qualitative studies of various groups of adolescents are needed to explore commonalities among both “good sleeper’s” and “poor sleeper’s” environments. Adolescent and parent subjective data need the objective support of in-home sleep studies and observations. As further studies are completed and data from them is collected and verified, it becomes the practitioner’s responsibility to bring the information to the
adolescent and family, the school system, and others who interface with adolescents. Nurse practitioner involvement in health promotion and education enables positive change and provides the basis to develop good sleep hygiene practices in our youth and our communities. Preventing loss of potential in the adolescent population through adequate sleep and averting the consequences of daytime sleepiness will benefit all levels of society.
References


http://www.biomedcentral.com/1471-2458/6/116


Figure 1.

<table>
<thead>
<tr>
<th>Resource</th>
<th>URL</th>
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<tr>
<td>National Sleep Foundation</td>
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<tr>
<td>Sleep for Science</td>
<td><a href="http://sleepforscience.org">http://sleepforscience.org</a></td>
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<tr>
<td>Dr. William Dement's Sleep Web Site</td>
<td><a href="http://www.sleepquest.com">http://www.sleepquest.com</a></td>
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**Figure 2**

Resources for providers.

<table>
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<th>Resource</th>
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<tbody>
<tr>
<td>How stuff works</td>
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<tr>
<td>Sleepdex Resources for Better Sleep</td>
<td><a href="http://www.sleepdex.org">www.sleepdex.org</a></td>
</tr>
<tr>
<td>Family sleep resources</td>
<td><a href="http://www.familysleep.com">www.familysleep.com</a></td>
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**Figure 3**

Resources for adolescents and families.
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<th>Food or Drink</th>
<th>Serving Size</th>
<th>Approximate Caffeine Content</th>
<th>Food or Drink</th>
<th>Serving Size</th>
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<td>133 mg</td>
<td>Dr Pepper</td>
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<td>44 mg</td>
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<td>Starbucks (Grande)</td>
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<td>320 mg</td>
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<td>12 oz</td>
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<td>53 mg</td>
<td>Monster Energy</td>
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<td>150 mg</td>
<td>Spike Shooter</td>
<td>8.4 oz</td>
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<td>53 mg</td>
<td>Full Throttle</td>
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</tr>
<tr>
<td>Jolt Cola</td>
<td>12 oz</td>
<td>72 mg</td>
<td>Coffee Ice Cream</td>
<td>8 fl oz</td>
<td>58 mg</td>
</tr>
<tr>
<td>Mountain Dew</td>
<td>12 oz</td>
<td>71 mg</td>
<td>Haagen-Dazs</td>
<td>1 Stick</td>
<td>33 mg</td>
</tr>
<tr>
<td>Vault</td>
<td>12 oz</td>
<td>71 mg</td>
<td>Jolt Caffeinated Gum</td>
<td>1.45 oz</td>
<td>31 mg</td>
</tr>
<tr>
<td>Coke</td>
<td>12 oz</td>
<td>35 mg</td>
<td>Hershey's Special Dark Chocolate Bar</td>
<td>1.45 oz</td>
<td>31 mg</td>
</tr>
<tr>
<td>Pepsi</td>
<td>12 oz</td>
<td>38 mg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 (Adapted from Center for Science in the Public Interest)