

# WHAT'S HOT

A Newsletter of



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## Sleep: An Essential Component of Health

**S**leep, like nutrition and exercise, is a key determinant of health and well-being. Sleep is a basic human requirement that affects endocrine, metabolic, neurological, and cognitive functions that are critical to health.

Many adults find that they have difficulty sleeping a healthy amount. According to the Centers for Disease Control and Prevention, 25% of U.S. adults report insufficient sleep or rest at least 15 out of every 30 days.<sup>1</sup> Despite myriad reasons for inadequate sleep, many adults who report disturbed sleep suffer from insomnia—unsatisfactory sleep that affects daytime functioning in an individual who has adequate opportunity to sleep.<sup>2</sup> Patients with insomnia may experience either difficulty falling asleep or difficulty staying asleep.

Among those who experience disturbed sleep, an estimated 50 million to 70 million Americans have chronic insomnia, a sleep disruption occurring at least 3 times a week and lasting for more than 1 month. In addition to hindering daily functioning, chronic insomnia has been associated with a wide range of harmful health effects, including an increased risk of hypertension, diabetes, obesity, depression, heart attack, stroke, and pain.<sup>2,3</sup>

The physiologic sequelae of sleep loss and sleep disorders not only affect individual health but also have a significant economic impact. Billions of dollars a year are spent on direct medical costs associated with doctor visits, hospital services,



prescriptions, and over-the-counter (OTC) medications for treating disturbed sleep.<sup>4</sup> Compared with other individuals, those with chronic sleep loss or sleep disorders are less productive, have greater health care needs, and have an increased likelihood of injury.<sup>3,5</sup>

The impact of disturbed sleep on health and well-being is under-recognized, and chronic insomnia is underdiagnosed and undertreated.<sup>6</sup> Barriers to appropriate recognition and treatment of insomnia include inadequate physician training, lack of time devoted to discussing sleep during office visits, beliefs that sleep complaints are not appropriate, and concerns about risks of treatments for insomnia.<sup>6</sup> Solutions are needed to address unmet needs through education, awareness, and advocacy.

A number of strategies are used in the treatment of insomnia, including both nonpharmacologic and pharmacologic approaches. Nonpharmacologic approaches include cognitive behavioral therapy, relaxation training, and exercise.<sup>2,7</sup> These interventions have been found to

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be as efficacious as some prescription options, and they produce a sustained response. In cases where these interventions do not provide an adequate response, or if an immediate response is desired, OTC or prescription medications may be used.<sup>7</sup>

OTC sleep aids include first-generation antihistamines, such as diphenhydramine and doxylamine. Several drawbacks are associated with these products—they may reduce the quality of sleep and can cause residual daytime drowsiness and functional impairment.<sup>7,8</sup> Furthermore, tolerance develops after using these products for a few nights.<sup>9</sup> These agents also are associated with anticholinergic effects, including blurred vision, constipation, dry mouth, urinary retention, and risk

of increased intraocular pressure in patients with narrow-angle glaucoma.<sup>8</sup> Although these agents are indicated for treatment of occasional sleeplessness (and are not indicated for chronic insomnia), many patients use them on a regular basis. Patients with chronic insomnia may be appropriate candidates for prescription therapies, such as benzodiazepines, sedative-hypnotics, and melatonin receptor agonists. Beyond FDA-approved therapies, several dietary supplements, including valerian and melatonin, are used as sleep aids. In general, strong evidence to support their use is lacking and questions remain about their safety, especially when used chronically.<sup>7,8</sup>

Many adults use alcohol to promote sleep, a behavior that may further com-

plicate the use of OTC sleep aids. One survey found that 13% of adults 18 to 45 years of age reported using alcohol as a sleep aid in the past year; 5% reported using a combination of alcohol and medications intended to treat insomnia.<sup>10</sup> In other surveys, up to 28% of patients have reported using alcohol to promote sleep.<sup>10</sup> Although alcohol may reduce sleep-onset latency, it is not recommended as a sleep aid because it fragments sleep in the second part of the night and can increase daytime sleepiness and promote future sleep disturbances.<sup>10</sup>

This special newsletter will feature snapshots of the latest key research, initiatives, campaigns, and programs focused on the risk and benefits of current OTC sleep aids for older adults. ♦

## Sleep and Public Health

To explore the public health impact of sleep loss and insomnia on direct and indirect medical costs, the American Academy of Sleep Medicine, the National Center on Sleep Disorders Research at the NIH, the National Sleep Foundation, and the Sleep Research Society requested that the Institute of Medicine (IOM) conduct a study.<sup>3</sup> The resulting IOM study examined the following areas:

1. The public health significance of sleep, sleep loss, and sleep disorders.
2. Gaps in the public health system and adequacy of the current resources and infrastructures for addressing the gaps.
3. Barriers and opportunities for improving interdisciplinary research, as well as medical education and training, in the area of sleep and sleep medicine.
4. Efforts to develop a comprehensive plan for enhancing sleep medicine and sleep research.

The 2006 IOM report recognized sleep loss as a public health issue and called for a national strategy to address it.

To stress the crucial importance of sleep to public health, sleep health was added as a topic to the HealthyPeople 2020 initiative.<sup>11</sup> In addition to addressing the proportion of adults who experience insufficient sleep, the objectives also address obtaining medical help for sleep apnea and focus on a selected consequence of poor sleep—motor vehicle crashes. ♦

### Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem. A Report from the Institute of Medicine

This report recognizes that along with the continued leadership of the National Center on Sleep Disorders Research, a coordinated strategy is required to ensure continued scientific and clinical advances. There must be incremental growth in the capacity of the field to meet the public health and economic burden caused by sleep loss and sleep disorders. This strategy will require

concurrent commitment to the following activities:

- Establish the workforce required to meet the clinical and scientific demands of the field.
- Increase awareness of the burden of sleep loss and sleep disorders among the general public.
- Improve surveillance and monitoring of the public health burden of sleep loss and sleep disorders.
- Expand awareness among health care professionals through education and training.

- Develop and validate new and existing diagnostic and therapeutic technologies. Expand accreditation criteria to emphasize treatment, long-term patient care, and chronic disease management strategies.
- Strengthen the national research infrastructure to connect individual investigators, research programs, and research centers.
- Increase the investment in interdisciplinary sleep programs in academic health centers that emphasize long-term clinical care, training, and research.

## HealthyPeople 2020 Objectives

Objective	Baseline	Goal
Increase the proportion of persons with symptoms of obstructive sleep apnea who seek medical evaluation	25.5% of persons with symptoms of obstructive sleep apnea sought medical evaluation in 2005–08 (age adjusted to the year 2000 standard population)	28.0%
Reduce the rate of vehicular crashes per 100 million miles traveled that are due to drowsy driving	2.7 vehicular crashes per 100 million miles traveled involved drowsy driving in 2008	2.1 vehicular crashes per 100 million miles traveled
Increase the proportion of students in grades 9 through 12 who get sufficient sleep	30.9% of students in grades 9 through 12 got sufficient sleep (defined as 8 or more hours of sleep on an average school night) in 2009	33.2%
Increase the proportion of adults who get sufficient sleep	69.6% of adults got sufficient sleep (defined as 8 or more hours for those ages 18 to 21 years and 7 or more hours for those ages 22 years and older, on average, during a 24-hour period) in 2008	70.9%

## Insomnia in the Older Adult Population

The prevalence of disturbed sleep has been shown to increase as individuals age, due to reasons including declining health, institutionalization, stress, and normal changes in circadian rhythms associated with aging. [NIH] According to the National Sleep Foundation, 44% of older individuals experience disturbed sleep at least a few nights each week.<sup>12</sup>

Research presented at SLEEP 2013, the 27th Annual Meeting of the Associated Professional Sleep Societies,

LLC, addressed sleep-related topics ranging from basic sleep science, such as cell and molecular genetics, to such clinical topics as sleep disorders and sleep and aging.

Selected abstracts from this meeting provide new insights regarding distinctions between adult and geriatric sleep. For example, data from Siebert and colleagues reveal that older adults took longer to fall asleep, spent significantly less time asleep, and were more likely to be diagnosed with nocturnal

hypoxemia. Yet, they reported fewer sleep-related complaints than younger adults, suggesting underreporting of sleep disturbances by this population. Additionally, presenters highlighted data from the National Health and Nutrition Examination Survey describing older adults' use of medications to treat disturbed sleep. These data found that, among older adults, 23% self-reported taking sleep medications in the past 4 weeks. ♦

### Patterns of similarities and differences in geriatric versus adult sleep

Siebert PS, Valerio JL, Rafia Y, et al. Presented at SLEEP 2013, the 27th Annual Meeting of the Associated Professional Sleep Societies, LLC; June 1–5, 2013, Baltimore, MD.

**INTRODUCTION:** It is commonplace for older individuals to complain that their sleep is not as good as it was when they were younger. Indeed, previous research has demonstrated that sleep architecture changes with the aging process. Emerging evidence suggests that escalating problematic health conditions, use of medications, and social challenges observed in the geriatric population are directly related to sleep disorders (SD). Evaluations of SD

are compromised by under reporting and by relying on self-report rather than professional sleep studies (i.e., nocturnal polysomnography (NPS) and multiple sleep latency tests (MSLT)). Moreover, there is a paucity of data specific to older adults.

**METHODS:** We constructed a 111 item questionnaire to use in conjunction with NPS, MSLT, the Epworth Sleepiness Scale, (ESS) and medical chart reviews of people referred for evaluation of SDs. We categorized participants into two broad age groups: adult (N=568, age 19-65, M= 46.2) and geriatric (N=151, age 66-90, M=71.6).

**RESULTS:** Our results revealed a pattern of similarities and differences. For example, the geriatric population experienced longer sleep latencies and spent significantly less time asleep, yet reported fewer sleep-related complaints. The geriatric group was

more likely to be diagnosed with nocturnal hypoxemia, poor sleep efficiency, periodic limb movement, and restless leg syndrome. Still they reported waking rested more frequently than the adult group. The adult group reported greater incidence of sleep disturbances and reported significantly more psychiatric distress, such as depression, anxiety, irritability, and stress.

**CONCLUSION:** This pattern of results could be a product of under-reporting by the geriatric population or perhaps habituation to the challenges associated with sleep disturbances. Our sample differed dramatically in size suggesting that proportionally fewer older adults are referred for sleep studies. We contemplate whether sleep complaints by older adults are marginalized, disregarded, or regarded as simply part of the aging process.

## Insomnia medication use and physical activity in older adults in the National Health and Nutrition-Examination Survey 2005–2006

Tom SE, Martin KR, Spiegel A, Rattinger GB.  
Presented at SLEEP 2013, the 27th Annual Meeting of the Associated Professional Sleep Societies, LLC;  
June 1–5, 2013, Baltimore, MD.

**INTRODUCTION:** Most prescription insomnia medications are either recommended on a limited basis or not recommended to older adults because of adverse outcomes, including cognitive impairment, poor balance, and daytime somnolence. Because physical activity (PA) may decrease as a result of such problems, we examine whether insomnia medication use, measured through inventory and self-report, is related to lower PA levels in older adults.

**METHODS:** Data are from a sample of 798 adults aged  $\geq 65$  years from the 2005–2006 NHANES who had  $\geq 4$  valid days ( $\geq 10$  hours/day) of hip-worn accelerometer wear-time. We identified prescription medications used in the past month that were indicative of insomnia from NHANES interview inventory data. In addition, self-reported sleep medication frequency in the past month was treated as a separate outcome. PA was examined using average counts per minute (CPM) during wear-time and time (min/day) spent in sedentary, light, lifestyle, and moderate/vigorous physical activity. Weighted regression analyses adjusted for potential confounding variables, including sociodemographic characteristics, health characteristics and behaviors, self-reported sleep characteristics of insomnia, daytime sleepiness, sleep duration, and sleep disordered breathing symptoms.

**RESULTS:** Nearly one quarter of respondents (23%) self-reported taking sleep medications

in the past 4 weeks: 11% reported rarely/sometimes; 12% reported often/always. However, only 13% of respondents were using an observed prescription medication indicative of insomnia. Respondents were mostly sedentary, with means of 582.6 minutes/day (95% CI: 565.1, 600.2) and 574.6 minutes/day (95% CI: 544.7, 604.5) for those not using prescription insomnia medications versus those who did, respectively. Neither observed prescription sleep medication use nor self-reported use was related to PA at any level, including CPM.

**CONCLUSION:** Insomnia medication use did not significantly contribute to lower physical activity levels among older adults in this nationally representative U.S. sample. The mechanisms contributing to similar physical activity levels between the two groups are unclear.

## Negative Health Impacts of Poor Sleep in Older Adults

In addition to the chronic conditions associated with insomnia, elders with insomnia are more likely to experience cognitive dysfunction, falls, early institutionalization, decreased quality of life, and increased mortality.<sup>9</sup> Recent data have helped to better define the extent of the impact of poor sleep in older adults. Issues explored include mobility, risk of falls, health care use, risk of institutionalization, and driving ability.

Stenholm and colleagues found that both too much sleep and too little sleep were associated with reduced mobility. In either case, “weakness or tiredness” appeared to be the most important determinant. These findings suggest that complex issues related to sleep, health, and daytime fatigue may affect mobility. Similarly, Beck reports that poor sleep quality was a significant predictor of increased likelihood of falls. Miller and colleagues captured the overall impact of poor sleep on functioning; they found that poor sleep in cognitively intact adults was a more powerful predictor of placement in a long-term care facility than either pain or depression. Additionally, Kaufmann and colleagues found that poor sleep was associated

with increased health care utilization and proposed that adequate interventions to prevent and treat sleep-related problems may reduce health care spending in older adults.

The ability to drive is critical for older adult independence. However, a number of impairments that increase in prevalence with age can interfere with safe driving ability. The AAA Senior Driver program encourages older adults to consider a number of factors that may affect their ability to drive, including vision, hearing, reaction time, medical conditions and medications,

and cognition. Within the category of medical conditions, AAA acknowledges that sleep apnea may cause drowsiness, which can impair driving, but does not discuss the impact of disturbed sleep due to other causes.<sup>13</sup> (It is important to note that disturbed sleep is often the presenting symptom of sleep apnea in elders.) Vaz Fragoso and colleagues found that disturbed sleep and drowsiness itself can result in lower levels of driving capacity in older individuals, a finding that strongly suggests a need for interventions to improve sleep in this population. ♦



## Negative Health Impacts of Poor Sleep in Older Adults

Stenholm S, Kronholm E, Sainio P, et al. Sleep-related factors and mobility in older men and women. *J Gerontol A Biol Sci Med Sci.* 2010 Jun;65(6):649-57.

**BACKGROUND:** To examine the association between sleep-related factors and measured and self-reported mobility in a representative sample of older adults.

**METHODS:** This study included 2,825 men and women aged 55 years and older participating in a cross-sectional representative population-based Health 2000 Survey in Finland. Sleep duration, insomnia-related

symptoms, and fatigue were inquired. Maximal walking speed was measured, and mobility limitation was defined as self-reported difficulties in walking 500 m or stair climbing.

**RESULTS:** Insomnia-related symptoms and fatigue were prevalent among persons aged 65 years and older in particular. After adjusting for lifestyle factors and diseases, longer sleep ( $\geq 9$  hours) was associated with a decreased walking speed in women aged 65 or more years ( $p = .04$ ) and shorter sleep ( $< 6$  hours) with a higher odds for mobility limitation in women aged 65 or more years (odds ratio [OR] = 1.68, 95% confidence interval [CI] = 1.02–2.75) and in men aged 55–64 years (OR = 3.62, 95%

CI = 1.40–9.37) compared with those having a mid-range sleep duration. Sleeping disorders or insomnia was independently associated with both decreased walking speed and mobility limitation in men aged 55 or more years but only with mobility limitation in women aged 65 or more years. Of the sleep-related daytime consequences, “weakness or tiredness” was associated with a decreased walking speed and a higher odds for mobility limitation both in men and in women aged 55 or more years.

**CONCLUSIONS:** Several sleep-related factors, such as sleep duration, insomnia-related symptoms, and fatigue, are associated with measured and self-reported mobility outcomes.

## Insomnia and health services utilization in middle-aged and older adults: Results from the Health and Retirement Study

Kaufmann CN, Canham SL, Mojtabai R, et al. *J Gerontol A Biol Sci Med Sci.* 2013 May 9; epub ahead of print.

**BACKGROUND:** Complaints of poor sleep are common among older adults. We investigated the prospective association between insomnia symptoms and hospitalization, use of home health care services, use of nursing homes, and use of any of these services in a population-based study of middle-aged and older adults.

**METHODS:** We studied 14,355 adults aged 55 and older enrolled in the 2006 and 2008 waves of the Health and Retirement Study. Logistic regression was used to study the association between insomnia symptoms (0, 1, or  $\geq 2$ ) in 2006 and reports of health service utilization in 2008, after adjustment for demographic and clinical characteristics.

**RESULTS:** Compared with respondents reporting no insomnia symptoms, those reporting one symptom had a greater odds of hospitalization (adjusted odds ratio [AOR] = 1.28, 95% confidence interval [CI] = 1.15–1.43,  $p < .001$ ), use of home health care services (AOR = 1.29, 95% CI = 1.09–1.52,  $p = .004$ ), and any health service use (AOR = 1.28, 95% CI = 1.15–1.41,  $p < .001$ ). Those reporting greater than or equal to two insomnia symptoms had a greater

odds of hospitalization (AOR = 1.71, 95% CI = 1.50–1.96,  $p < .001$ ), use of home health care services (AOR = 1.64, 95% CI = 1.32–2.04,  $p < .001$ ), nursing home use (AOR = 1.45, 95% CI = 1.10–1.90,  $p = .009$ ), and any health service use (AOR = 1.72, 95% CI = 1.51–1.95,  $p < .001$ ) after controlling for demographics. These associations weakened, and in some cases were no longer statistically significant, after adjustment for clinical covariates.

**CONCLUSIONS:** In this study, insomnia symptoms experienced by middle-aged and older adults were associated with greater future use of costly health services. Our findings raise the question of whether treating or preventing insomnia in older adults may reduce use of and spending on health services among this population.

## Sleep well: The effect of sleep quality on falls in older adults

Beck P, Ailshire JA. Presented at The Gerontological Society of America 66th Annual Scientific Meeting; November 20–24, 2013; New Orleans, LA.

Falls are the leading cause of injurious death in older adults. Sleep problems are a common disorder among older adults and poor sleep, which can reduce cognitive and motor performance and decrease proprioception, may increase fall risk. We use data from the 2002 and 2004 waves of the Health and Retirement Study to determine if older adults who report sleep

problems in 2002 have increased risk of falling between 2002 to 2004. We focus on three dimensions of poor sleep: frequent nighttime awakenings, frequency of waking too early, and feeling rested upon waking. We use logistic regression to examine associations between multiple indicators of sleep quality and risk of experiencing a fall, and experiencing an injurious fall. Frequent trouble sleeping through the night (OR: 1.17, 95% CI: 1.04–1.32) and waking up too early (OR: 1.17, 95% CI: 1.01–1.35) increased likelihood of having experienced a fall since the previous wave, suggesting that poor sleep quality increases the future risk of falls. Education (OR: 1.15, 95% CI: 0.99–1.33), being Hispanic (OR: 0.88, 95%

CI: 0.72–1.05) or Asian/Other (OR: 0.82, 95% CI: 0.57–1.16), or having trouble falling asleep (OR: 1.14, 95% CI: 0.99–1.33) did not increase risk of falling. Chronic conditions (OR: 0.99, 95% CI: 0.93–1.06), trouble falling asleep (OR: 1.04, 95% CI: 0.82–1.31), education (OR: 1.06, 95% CI: 0.95–1.18), being Hispanic (OR: 1.24, 95% CI: 0.89–1.17) or Asian/Other (OR: 1.01, 95% CI: 0.48–2.15) did not influence risk of fall injury. Sleep quality appears to impact risk of falling among older adults

## Risk of placement in a care facility: The roles of social activity, sleep, pain, and depression

Miller L, Dieckmann NF, Mattek NC, et al. Presented at The Gerontological Society of America 66th Annual Scientific Meeting; November 20–24, 2013; New Orleans, LA.

Placement in a long-term care facility is a costly and often undesirable outcome for many older adults. The purpose of this study was to determine whether several modifiable factors—social activity, sleep, pain, and depression—predicted placement

in a care facility, over and above cognitive impairment, functional impairment, medical conditions, and age. The data were derived from the Intelligent Systems for Assessing Aging Changes study, a prospective cohort ( $n = 229$ ) of community-residing older adults (mean age  $83.4 \pm 5.6$ ), with a low rate of cognitive impairment ( $n = 34, 15\%$ ) at baseline. Within 5 years, a total of 44 (19%) of the 229 participants had moved to assisted living or nursing home care and 55 (24%) were cognitively impaired. Findings of a multivariate logistic regression analysis controlling for cognitive impairment, functional impairment, medical conditions, and age, indicated that each unit decrease on a 20-point social activity scale was associated

with a 25% increase in the risk of placement in a care facility ( $p = 0.002$ ), and each unit decrease on a 5-point scale indicating the frequency of restful sleep was associated with a 60% increase in the risk of placement in a care facility ( $p = 0.008$ ). Although pain and depression significantly increased risk of placement in the unadjusted analysis, they were not significant individual predictors of placement in the multivariate model. Findings will be discussed with regard to minimizing risk of placement by improving restful sleep and increasing social activity outside of the home for community-dwelling older adults.

## Prevalence of sleep disturbances in a cohort of older drivers

Vaz Fragoso CA, Araujo KL, Van Ness PH, et al. *J Gerontol A Biol Sci Med Sci.* 2008 Jul;63(7):715–723.

**BACKGROUND:** Lower levels of driving capacity in older persons are typically attributed to cognitive, visual, and/or physical impairments, with sleep disturbances rarely considered. This is in contrast to the general adult population for whom sleep disturbances are established risk factors for crashes. We thus set out to determine the prevalence of sleep disturbances in the form of insomnia symptoms, daytime drowsiness, and sleep apnea risk in a cohort of older

drivers and to assess how these relate to self-reported driving capacity.

**METHODS:** Participants included 430 active drivers aged  $> \text{ or } = 70$  years. Questionnaires measured self-reported insomnia symptoms (Insomnia Severity Index [ISI]), drowsiness (Epworth Sleepiness Scale [ESS]), apnea risk (Sleep Apnea Clinical Score [SACS]), driving mileage, driver self-ratings (overall and nighttime), and prior adverse driving events.

**RESULTS:** Mean age was 78.5 years, with 85% being male. Overall, 64% were dissatisfied with sleep patterns and 26% had an abnormal ISI ( $> \text{ or } = 8$ ). A large proportion (60%) reported a moderate to high chance of dozing in the afternoon, and 19% had an abnormal ESS ( $> \text{ or } = 10$ ). Habitual snoring was noted by 43%, with 20% at risk for sleep apnea ( $\text{SACS} > 15$ ). Regarding driv-

ing, the most consistent finding was for lower levels of nighttime driver self-ratings in participants with insomnia symptoms or drowsiness. Lower levels of driving mileage were also noted but only with difficulty falling asleep. Otherwise, sleep disturbances were not associated with prior adverse driving events.

**CONCLUSION:** In our cohort of older drivers, insomnia symptoms and daytime drowsiness were prevalent and associated with lower levels of nighttime driver self-ratings. Although sleep apnea risk was also prevalent, it was not associated with self-reported driving capacity. These preliminary findings suggest that insomnia symptoms and drowsiness merit continued consideration as risk factors for lower levels of driving capacity in older persons, particularly given that effective interventions are available.

## Caregiver Sleep Quality

Acting as a caregiver is a common experience for older adults. According to the Caregiver Action Network, more than 65 million people in the United States provide care for a chronically ill, disabled, or aged family member or friend.<sup>14</sup> Caregivers are 49 years of age on average—illustrating that a large proportion of caregivers are in fact adults approaching old age themselves, with their own health issues.<sup>14</sup>

Although caregiving can be a labor of love, it also can be incredibly stress-

ful. Emerging data illustrate the heavy toll caregiving can have on sleep. For example, Peng found that 92% of caregivers for individuals with dementia experienced poor sleep quality. The stress associated with caregiving may be an important predictor for sleep problems—Peng and Chang, as well as Fredman and colleagues, found that depressive symptoms were associated with increased sleep problems. The interrelationships between caregiving, depression, and poor sleep can be complex. Some data suggest that 40% to

70% of family caregivers have clinically significant symptoms of depression, with approximately a quarter to half of these caregivers meeting the diagnostic criteria for major depression.<sup>14</sup> Other data suggest that the prevalence of clinical depression among caregivers may be lower, in the range of 12% to 22%.<sup>15</sup> Difficulty sleeping is well established as a significant risk for depression.<sup>16,17</sup> Although the causative factor is not clear, poor sleep may ultimately lead to declining function for caregivers. ♦

## Predictors of sleep in family caregivers of individuals with dementia

Peng H-L, Chang Y-P

Presented at The Gerontological Society of America 66th Annual Scientific Meeting; November 20–24, 2013; New Orleans, LA.

**INTRODUCTION:** Caregivers of individuals with dementia pose special challenges. The nature and severity of these difficulties vary according to illness and may differentially affect the well-being of family. This study was based on the insomnia 3P model (pre-disposing, precipitating, and perpetuating factors) to identify significant predictors (depression, coping, caregiver burden, caregiver health status, sleep hygiene, and care recipients' sleep) of caregivers' sleep.

**METHODS:** This study used a cross-sectional design. Participants were recruited from the Alzheimer's Association Western New York Chapter at Buffalo. Caregivers' sleep were measured by Actigraph (a wrist-watch measuring movement and light; worn for 7 days) and the Pittsburgh Sleep Quality Index (PSQI). Other measures included the Center for Epidemiologic Studies Depression Scale (CES-D), the Caregiver Burden Inventory (CBI), the Cumulative Illness Rating Scale (CIRS), the Sleep Hygiene Index (SHI), and Brief Cope. Regression statistics were used for data analysis.

**RESULTS:** Forty-three caregivers participated in the study. Approximately 92% of caregivers experienced poor sleep quality. The mean sleep hours was 5.99 ( $\pm$  1.56), with 37.2% of them sleeping less than 5 hours per night. Caregiver depression,

caregiver sleep hygiene, and care recipients' sleep were significant predictors of caregiver subjective sleep quality, explaining 59.4% of the total variance. Caregivers' coping and health status were significant predictors of caregiver objective total sleep hours as measured by Actigraph, explaining 19.4% of the total variance.

**CONCLUSION:** Family caregivers often experience sleep problems that was influenced by several factors. The study findings provide evidence for future research to identify effective interventions to improve caregivers' sleep quality.

## Positive affect is associated with fewer sleep problems in older caregivers but not noncaregivers

Fredman L, Gordon SA, Heeren T, Stuver SO. *Gerontologist*. 2013 May 15; epub ahead of print.

**PURPOSE OF THE STUDY:** Older adults who are depressed or are caregivers experience more sleep problems, whereas recent studies suggest that adults with high positive affect (PA) have fewer sleep problems. This study examined whether the associations of PA and depressive symptoms with sleep problems differed between caregivers and noncaregivers.

**DESIGN AND METHODS:** Face-to-face interviews were conducted with 92 caregivers to a relative or friend with Alzheimer's disease or Parkinson's disease, and 137 noncaregivers ages 60 years and older (mean 73.8  $\pm$  7.9 years) from the Boston, Massachusetts, metropolitan area. Sleep problems were assessed using the Pittsburgh Sleep Quality Index (PSQI). Respondents were categorized as high PA ( $n = 122$ ) or low PA ( $n = 69$ ), and depressive symptoms ( $n = 38$ ) based on the Center for Epidemiologic Studies Depression Scale.

**RESULTS:** The mean PSQI score was 5.19 ( $SD = 3.26$ ) and did not differ by caregiving status. In multivariable linear regression analyses among caregivers, those with high PA had significantly fewer sleep problems

than their counterparts with low PA (adjusted mean PSQI score was 4.16 [ $SE = 0.50$ ] vs. 5.69 [ $SE = 0.58$ ],  $p = .05$ ), whereas caregivers with depressive symptoms reported slightly more problems (adjusted mean 6.92 [ $SE = 0.80$ ],  $p = .22$ ). High PA and depressive symptoms were not associated with sleep problems among noncaregivers (adjusted mean PSQI scores were 4.88 [ $SE = 0.35$ ], 5.38 [ $SE = 0.51$ ], and 5.99 [ $SE = 0.73$ ], respectively). Similar associations were found with PSQI scale components.

**IMPLICATIONS:** Results suggest that routine screening and interventions to increase PA may reduce sleep problems among older caregivers.

## Nonpharmacologic Approaches to Managing Chronic Insomnia: Cognitive Behavioral Therapy

Nonpharmacologic therapies have been shown to be effective for the treatment of chronic insomnia and can produce long-term benefits.<sup>6</sup> Nonpharmacologic approaches to the treatment of insomnia include use of good sleep hygiene measures (such as creating a dark quiet environment for sleeping), relaxation strategies (such as progressive muscle relaxation or yoga), and cognitive behavioral therapy.<sup>2</sup>

Evidence suggests that the efficacy of nonpharmacologic treatments for insomnia may be reduced in older adults.<sup>7</sup> Furthermore, these interventions are not widely used due in part to a shortage of well-trained providers, the cost of treatment by such providers, and lack of insurance coverage for these services.<sup>7</sup> To overcome some of these barriers, Lovato and colleagues explored the use of group-based administration of cognitive behavioral therapy in 86

adults with insomnia (average age 64 years old). These researchers found that the group treatment approach to cognitive behavioral therapy was most effective in younger adults.  $\diamond$

## Predictors of improvement in subjective sleep quality reported by older adults following group-based cognitive behavior therapy for sleep maintenance and early morning awakening insomnia

Lovato N, Lack L, Wright H, Kennaway DJ. *Sleep Med.* 2013;14:888–893.

**OBJECTIVE:** Cognitive-behavior therapy is an effective nonpharmacologic treatment for insomnia. However, individualized administration is costly and often results in substantial variability in treatment response across individual patients, particularly so for older adults. Group-based administra-

tion has demonstrated impressive potential for a brief and inexpensive answer to the effective treatment of insomnia in the older population. It is important to identify potential predictors of response to such a treatment format to guide clinicians when selecting the most suitable treatment for their patients. The aim of our study was to identify factors that predict subjective sleep quality of older adults following group-based administration of cognitive behavior therapy for insomnia (CBT-I).

**METHODS:** Eighty-six adults (41 men; mean age, 64.10 y; standard deviation [SD], 6.80) with sleep maintenance or early-morning awakening insomnia were selected from a community-based sample to participate in a 4-week, group-based treatment program of CBT-I. Participants were required to complete 7-day sleep diaries and a com-

prehensive battery of questionnaires related to sleep quality and daytime functioning. Hierarchical multiple regression analyses were used to identify factors predicting subjective sleep quality immediately following treatment and at 3-month follow-up. Sleep diaries reported average nightly sleep efficiency (SE), which was used as the outcome measure of sleep quality.

**RESULTS AND CONCLUSIONS:** Participants with the greatest SE following treatment while controlling for pretreatment SE were relatively younger and had more confidence in their ability to sleep at pretreatment. These characteristics may be useful to guide clinicians when considering the use of a group-based CBT-I for sleep maintenance or early morning awakening insomnia in older adults.

## Cognitive-behavioral treatment for comorbid insomnia and osteoarthritis pain in primary care: the lifestyles randomized controlled trial

Vitiello MV, McCurry SM, Shortreed SM, et al. *J Am Geriatr Soc.* 2013; 61(6):947–956.

**OBJECTIVES:** To assess whether older persons with osteoarthritis (OA) pain and insomnia receiving cognitive-behavioral therapy for pain and insomnia (CBT-PI), a cognitive-behavioral pain coping skills intervention (CBT-P), and an education-only control (EOC) differed in sleep and pain outcomes.

**DESIGN:** Double-blind, cluster-randomized controlled trial with 9-month follow-up.

**SETTING:** Group Health and University of Washington, 2009 to 2011.

**PARTICIPANTS:** Three hundred sixty-seven older adults with OA pain and insomnia.

**INTERVENTIONS:** Six weekly group sessions of CBT-PI, CBT-P, or EOC delivered in participants' primary care clinics.

**MEASUREMENTS:** Primary outcomes were insomnia severity and pain severity. Secondary outcomes were actigraphically measured sleep efficiency and arthritis symptoms.

**RESULTS:** CBT-PI reduced insomnia severity (score range 0–28) more than EOC (adjusted

mean difference = -1.89, 95% confidence interval = -2.83 to -0.96;  $p < .001$ ) and CBT-P (adjusted mean difference = -2.03, 95% CI = -3.01 to -1.04;  $p < .001$ ) and improved sleep efficiency (score range 0–100) more than EOC (adjusted mean difference = 2.64, 95% CI = 0.44–4.84;  $p = .02$ ). CBT-P did not improve insomnia severity more than EOC, but improved sleep efficiency (adjusted mean difference = 2.91, 95% CI = 0.85–4.97;  $p = .006$ ). Pain severity and arthritis symptoms did not differ between the three arms. A planned analysis in participants with severe baseline pain revealed similar results.

**CONCLUSION:** Over 9 months, CBT of insomnia was effective for older adults with OA pain and insomnia. The addition of CBT for insomnia to CBT for pain alone improved outcomes.

## Use of OTC Sleep Aids by Older Adults

Recent data from the Kantar Health March 2013 National Health and Wellness Survey found that OTC sleep aid use among adults older than 60 years of age is extensive.<sup>18</sup> Among these individuals:

- Fifteen percent to 18% reported using OTC sleep aids alone, approximately 3% used OTCs combined with herbals, and about 15% to 18% took OTCs in combination with prescription sleep aids.

- More than 70% reported taking OTC pain and sleep combination products, with single-molecule product use at nearly 30%. Only a small percentage—less than 2%—reported using cold and sleep products.
- Of the respondents ages 60 years and older taking OTC sleep agents, approximately 40% also currently take one or more anticholinergic medications. (All currently available OTC sleep aids have anticholinergic properties and are

associated with cognitive impairments, especially in older adults.)

The risks and benefits of OTC sleep aids for the treatment of disturbed sleep in older adults have not been examined in randomized controlled trials. Nevertheless, a substantial body of data has identified risks associated with these products and several authoritative sources caution against their use.<sup>18</sup> Efforts to improve medication-use behaviors among older adults include

use of the Beers Criteria for potentially inappropriate medication use in older adults. Originally developed by Mark H. Beers, MD, a geriatrician, the Beers Criteria were published in 1991. The criteria were updated in 1997, in 2003, and most recently in 2012. The 2012 version is the first update to include OTC medications such as first-generation antihistamines, including diphenhydramine (the most common active ingredient in OTC sleep aids). According to the Beers Criteria, first-generation antihistamines should generally be avoided in older adults due to their anticholinergic activity. Regarding these agents, the criteria state: “Highly anticholinergic; clearance reduced with advanced age, and tolerance develops when used as hypnotic; greater risk of confusion, dry mouth,

constipation, and other anticholinergic effects and toxicity.” (The criteria do note that use of diphenhydramine in special situations, such as acute treatment of severe allergic reaction, may be appropriate.)

Although the Beers Criteria focus on anticholinergic risk associated with first-generation antihistamines, several other risks have been reported with the use of diphenhydramine in older adults. Basu and colleagues found that increased use of the OTC sleep aid diphenhydramine is associated with both increasing age and with cognitive impairment. Research by Rothberg and colleagues has found that diphenhydramine use in hospitalized patients is associated with delirium. ♦



### American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults

American Geriatrics Society 2012 Beers Criteria Update Expert Panel.  
*J Am Geriatr Soc.* 2012; 60(4):616–631.

Potentially inappropriate medications (PIMs) continue to be prescribed and used as first-line treatment for the most vulnerable of older adults, despite evidence of poor outcomes from the use of PIMs in older adults. PIMs now form an integral part of policy and practice and are incorporated into

several quality measures. The specific aim of this project was to update the previous Beers Criteria using a comprehensive, systematic review and grading of the evidence on drug-related problems and adverse drug events (ADEs) in older adults. This goal was accomplished through the support of The American Geriatrics Society (AGS) and the work of an interdisciplinary panel of 11 experts in geriatric care and pharmacotherapy who applied a modified Delphi method to the systematic review and grading to reach consensus on the updated 2012 AGS Beers Criteria. Fifty-three medications or medication classes encompass the final updated criteria, which are divided into three categories: potentially inappropriate

medications and classes to avoid in older adults, potentially inappropriate medications and classes to avoid in older adults with certain diseases and syndromes that the drugs listed can exacerbate, and finally medications to be used with caution in older adults. This update has much strength, including the use of an evidence-based approach using the Institute of Medicine standards and the development of a partnership to regularly update the criteria. Thoughtful application of the criteria will allow for (a) closer monitoring of drug use, (b) application of real-time e-prescribing and interventions to decrease ADEs in older adults, and (c) better patient outcomes.

### Sedative-hypnotic use of diphenhydramine in a rural, older adult, community-based cohort: effects on cognition

Basu R, Dodge H, Stoehr GP, Ganguli M.  
*Am J Geriatr Psychiatry.* 2003; 11:205–213.

**OBJECTIVE:** The authors sought to identify patterns and associations of prescription and over-the-counter sedative-hypnotic use in an older, rural, blue-collar, community-based cohort in southwestern Pennsylvania over 10 years.

**METHODS:** A group of 1,627 individuals ages 65 and over were recruited and

assessed during 1987–1989 and reassessed during approximately biennial waves. Data included sleep medications, demographics, depressive symptoms, sleep complaints, and cognitive functioning (Mini-Mental State Exam [MMSE]).

**RESULTS:** At Waves 1 through 5, the mean age of the cohort increased from 73.4 to 80.5 years. Use of prescription sedative-hypnotics (primarily benzodiazepines) increased from 1.8% to 3.1%, and over-the-counter sedative-hypnotic use (primarily diphenhydramine) increased from 0.4% to 7.6%. At Wave 5 (1996–1998), 8.17% of the sample reported using diphenhydramine as a sleep aid. After adjusting for age and sex, diphenhydramine use was associated

with higher education and more depressive symptoms, the latter becoming nonsignificant after controlling for initial insomnia. MMSE became significantly associated with diphenhydramine use when 143 subjects with dementia were excluded from the analysis.

**CONCLUSION:** As the cohort aged, prescription sedative-hypnotic use remained relatively stable, whereas over-the-counter sedative use, principally diphenhydramine, increased substantially. The association of this drug with cognitive impairment in persons without dementia highlights its potential for causing adverse reactions in older adults.

## Association between sedating medications and delirium in older inpatients

Rothberg MB, Herzig SJ, Pekow PS, et al. *J Am Geriatr Soc.* 2013; 61(6):923–930.

**OBJECTIVES:** To examine the association between Beers Criteria sedative medications and delirium in a large cohort of hospitalized elderly adults with common medical conditions.

**DESIGN:** Retrospective cohort and nested case-control studies.

**SETTING:** 374 U.S. hospitals.

**PARTICIPANTS:** All individuals aged 65 and older admitted to the hospital between September 2003 and June 2005 with one of six principal diagnoses (acute myocardial

infarction, chronic obstructive pulmonary disease, community-acquired pneumonia, congestive heart failure, ischemic stroke, urinary tract infection).

**MEASUREMENTS:** Primary outcome was presumed hospital-acquired delirium, defined as initiation of an antipsychotic medication or restraints on hospital day 3 or later. Logistic and proportional hazards regression were used to model the associations between sedative exposure and delirium.

**RESULTS:** The data set contained 225,028 participants (median age 82; 58% female). Four percent fit the definition of hospital-acquired delirium (median onset day 5). In all, 38,883 (17%) participants received one or more sedative medications. In the cohort study, diphenhydramine (adjusted odds ratio (AOR) = 1.22, 95% confidence interval (CI)

= 1.09–1.36) and short-acting benzodiazepines (AOR = 1.18, 95% CI = 1.03–1.34) were associated with greater risk of subsequent delirium. In the nested case-control study, diphenhydramine, short- and long-acting benzodiazepines, and promethazine were associated with delirium. Amitriptyline and muscle relaxants were not associated with delirium in either study. Confounding by indication could not be excluded for drugs that are sometimes used improperly to treat delirium.

**CONCLUSION:** An association was found between several Beers Criteria sedative medications and delirium in hospitalized medical patients. Given the prevalence of these medications and the morbidity associated with delirium, further investigation into the appropriateness of such prescribing is warranted.

## Improving Medication-Taking Behaviors of Older Adults

Surprisingly little is known about medication-taking behaviors of older adults. Available data describe the extent of medication use and illustrate that potential problems exist. For example, data from the 2008 National Social Life, Health, and the Aging Project found widespread use of both OTCs and prescription medications among older adults. More than half of older adults reported that they used five or more prescription medications, OTCs, or dietary supplements. Furthermore, 1 in 25 older adults (approximately 2.2 million in the United States) were at risk for a major potential drug-drug interaction.<sup>19</sup> These data, along with those from the Kantar Health survey showing that older adults regularly take medications on the Beers list, indicate that there is significant room for improvement in older adults' medication-taking behaviors.<sup>20</sup>

To support safe medication use for older adults, initiatives must consider a variety of factors, including health literacy, behavioral social science, and cognitive psychology, in order to develop strategies that positively influence decision-making processes surrounding medication use. Several initiatives are

underway to improve medication-taking behaviors, some of which specifically focus on older adults. For example, the Food and Drug Administration's Safe Use Initiative (<http://www.fda.gov/safeuseinitiative>) aims to create and facilitate public and private collaborations within the health care community. The goal of the Safe Use Initiative is to reduce preventable harm by identifying specific, preventable medication risks and developing, implementing, and evaluating cross-sector interventions with partners who are committed to safe medication use.<sup>221</sup>

Another notable program comes from the National Council on Patient Information and Education (NCPIE), which has been a leading patient safety coalition since 1982. NCPIE's mission is "to stimulate and improve communication of information on the appropriate use of medicines to consumers and health care professionals." One of NCPIE's recent tools is Medication Use Safety Training for Seniors (MUST for Seniors). This online educational campaign and workshop is designed to promote safe and appropriate medication use (see <http://www.mustforseniors.org>). ♦





## Use of prescription and over-the-counter medications and dietary supplements among older adults in the United States

Qato DM, Alexander GC, Conti RM, et al. *JAMA*. 2008;300:2867–2878.

**CONTEXT:** Despite concerns about drug safety, current information on older adults' use of prescription and over-the-counter medications and dietary supplements is limited.

**OBJECTIVE:** The study sought to estimate the prevalence and patterns of medication use among older adults (including concurrent use), as well as potential major drug-drug interactions.

**DESIGN, SETTING, AND PARTICIPANTS:** Three thousand five community-residing individuals, aged 57 through 85 years, were

drawn from a cross-sectional, nationally representative probability sample of the United States. In-home interviews, including medication logs, were administered between June 2005 and March 2006. Medication use was defined as prescription, over-the-counter, and dietary supplements used "on a regular schedule, like every day or every week." Concurrent use was defined as the regular use of at least 2 medications.

**MAIN OUTCOME MEASURE:** Population estimates of the prevalence of medication use, concurrent use, and potential major drug-drug interactions, stratified by age group and gender.

**RESULTS:** The unweighted survey response rate was 74.8% (weighted response rate, 75.5%). Eighty-one percent (95% confidence interval [CI], 79.4%–83.5%) used at least 1 prescription medication, 42% (95% CI, 39.7%–44.8%) used at least 1 over-the-counter medication, and 49% (95% CI, 46.2%–52.7%) used a dietary supplement. Twenty-

nine percent (95% CI, 26.6%–30.6%) used at least 5 prescription medications concurrently; this was highest among men (37.1%; 95% CI, 31.7%–42.4%) and women (36.0%; 95% CI, 30.2%–41.9%) aged 75 to 85 years. Among prescription medication users, concurrent use of over-the-counter medications was 46% (95% CI, 43.4%–49.1%) and concurrent use of dietary supplements was 52% (95% CI, 48.8%–55.5%). Overall, 4% of individuals were potentially at risk of having a major drug-drug interaction; half of these involved the use of nonprescription medications. These regimens were most prevalent among men in the oldest age group (10%; 95% CI, 6.4%–13.7%), and nearly half involved anti-coagulants. No contraindicated concurrent drug use was identified.

**CONCLUSIONS:** In this sample of community-dwelling older adults, prescription and nonprescription medications were commonly used together, with nearly 1 in 25 individuals potentially at risk for a major drug-drug interaction.

## Conclusions

Far from being an inconvenience, disturbed sleep has serious health consequences ranging from increased likelihood of chronic illness to increased risk for falls, motor vehicle accidents, and institutionalization. The vital role that sleep plays in overall health and well-being is increasingly being recognized on a public health level, and research is seeking to better define effects of sleep and its disorders, as well as the risks and benefits of interventions that address sleep disturbances.

Older adults frequently use OTC sleep aids to manage difficulty sleeping

despite evidence to suggest that this practice may be risky. Emerging data are helping to better define the risks and benefits of sleep aid use by this population, to better identify effective interventions for older adults, and to encourage appropriate medication-taking behaviors among older adults. A number of initiatives have been launched to encourage older adults to better understand their medications and ensure that they use them appropriately.

This newsletter highlights recent research and initiatives that address sleep and its disorders in older adults and identifies areas that require further

exploration. Potential research topics include costs associated with inappropriate use of OTC sleep aids, the frequency with which inappropriate medications are prescribed or recommended for sleep, older adults' use of medications that interfere with sleep, health care provider training to address sleep issues, and strategies for encouraging appropriate use of sleep aids. Researchers and practitioners who are seeking additional sleep-related information are encouraged to explore the information available at the websites listed in the Resources. ♦

## Resources

A number of comprehensive and informative online resources are available for further information. Selected resources for researchers and practitioners, as well as for patients, are listed here.

### American Academy of Sleep Medicine

A sleep medicine association for professionals dedicated to the treatment of sleep disorders, such as sleep apnea and insomnia.  
<http://www.aasmnet.org>

### American Sleep Association

A national organization focused on improving public awareness about sleep disorders and sleep health, promoting sleep medicine research, and providing a portal for communication among patients, physicians and health care professionals, corporations, and scientists.  
<http://www.sleepassociation.org>

### National Sleep Foundation

A charitable, educational, and scientific not-for-profit organization dedicated to improving sleep health and safety through education, public awareness, and advocacy.  
<http://www.sleepfoundation.org>

### NIH National Center on Sleep Disorders Research

A program of the National Institutes of Health that coordinates government-supported sleep research, as well as training and education.  
<http://www.nhlbi.nih.gov/about/ncsdr/index.htm>

### NIH Senior Health: Sleep and Aging

A program of the National Institutes of Health that makes aging-related health information easily accessible for family members and friends seeking reliable, easy-to-understand online health information. The overall program addresses many topics, including sleep and aging.  
<http://nihseniorhealth.gov/sleepandaging/aboutsleep/01.html>

### Sleep Research Society

A leading professional association for sleep scientists.  
<http://www.sleepresearchsociety.org>

### Society of Behavioral Sleep Medicine

An interdisciplinary organization committed to advancing the scientific approach to studying the behavioral, psychological, and physiological dimensions of sleep and sleep disorders.  
<http://www.behavioralsleep.org>



## References

- Centers for Disease Control and Prevention, Epidemiology Program Office. Perceived insufficient rest or sleep among adults: United States, 2008. *MMWR*. 2009;58:1175–1179.
- Hamblin JE. Insomnia: an ignored health problem. *Prim Care Clin Office Pract*. 2007;34:659–674.
- Institute of Medicine. Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem. March 2006. <http://www.iom.edu/Reports/2006/Sleep-Disorders-and-Sleep-Deprivation-An-Unmet-Public-Health-Problem.aspx>. Accessed August 9, 2013.
- Daley M, Morin CM, LeBlanc M, et al. The economic burden of insomnia: direct and indirect costs for individuals with insomnia syndrome, insomnia symptoms, and good sleepers. *Sleep*. 2009;32:55–64.
- Kessler RC, Berglund PA, Coulouvrat C, et al. Insomnia and the performance of US workers: results from the America insomnia survey. *Sleep*. 2011;34:1161–1171.
- Benca RM. Diagnosis and treatment of chronic insomnia: a review. *Psychiatr Serv*. 2005;56:332–343.
- Ramakrishnan K, Scheid DC. Treatment options for insomnia. *Am Fam Physician*. 2007;76:517–526.
- National Institutes of Health. NIH State-of-the-Science Conference Statement on Manifestations and Management of Chronic Insomnia in Adults. June 13–15, 2005. <http://consensus.nih.gov/2005/insomniastatement.pdf>. Accessed August 9, 2013.
- Harrington JJ, Lee-Chiong T. Sleep and older patients. *Clin Chest Med*. 2007;28:673–684.
- Johnson EO, Roehrs T, Roth T, Breslau N. Epidemiology of alcohol and medication as aids to sleep in early adulthood. *Sleep*. 1998;21:178–186.
- Healthy People 2020. Sleep health. <http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=38>. Accessed August 13, 2013.
- National Sleep Foundation. Aging and sleep. <http://www.sleepfoundation.org/article/sleep-topics/aging-and-sleep>. Accessed August 9, 2013.
- American Automobile Association. Senior driving. <http://seniordriving.aaa.com>. Accessed August 12, 2013.
- Caregiver Action Network. Caregiving statistics. <http://caregiveraction.org/statistics/>. Accessed August 12, 2013.
- Belle SH, Burgio L, Burns R, et al; Resources for Enhancing Alzheimer's Caregiver Health (REACH) II Investigators. Enhancing the quality of life of dementia caregivers from different ethnic or racial groups: a randomized, controlled trial. *Ann Intern Med*. 2006;145:727–738.
- Ford DE, Kamerow DB. Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? *JAMA*. 1989;262:1479–1484.
- Breslau N, Roth T, Rosenthal L, et al. Sleep disturbance and psychiatric disorders: a longitudinal epidemiological study of young adults. *Biol Psychiatry*. 1996;39:411–418.
- Kantar Health. March 2013. *National Health and Wellness Survey, 2012* [US]. Princeton, NJ.
- Montgomery P, Lilly J. Insomnia in the elderly. *Clin Evid (Online)*. 2007 Oct 1;epub.
- Qato DM, Alexander GC, Conti RM, et al. Use of prescription and over-the-counter medications and dietary supplements among older adults in the United States. *JAMA*. 2008;300:2867–2878.
- Food and Drug Administration. Safe Use Initiative. <http://www.fda.gov/Drugs/DrugSafety/SafeUseInitiative/default.htm>. Accessed August 12, 2013.