Published in final edited form as:

Atherosclerosis. 2011 August ; 217(2): 324–325. doi:10.1016/j.atherosclerosis.2011.03.046.

Sleep duration and cardiometabolic risk Commentary on Abe et al., “Sleep duration is significantly associated with carotid artery atherosclerosis incidence in a Japanese population”

Michael A. Grandner^{a,*} and Shawn D. Youngstedt^b

^aCenter for Sleep and Circadian Neurobiology, University of Pennsylvania School of Medicine, Division of Sleep Medicine, Department of Medicine, University of Pennsylvania, Philadelphia, PA, United States

^bDepartment of Exercise Science, Arnold School of Public Health, University of South Carolina, WJB Dorn VA Medical Center, Columbia, SC, United States

Dozens of studies, spanning over 40 years and multiple continents, have reliably documented that self-reported short and long sleep durations are associated with increased mortality risk [1,2]. A recent meta-analysis [3] reports that the pooled relative risk (RR) of all-cause mortality was RR = 1.10 for short sleep duration and RR = 1.23 for long sleep duration. Specific cardiovascular mortality was reported to be RR = 1.06 for short sleep and RR = 1.38 for long sleep.

Epidemiologic studies of habitual short sleep duration have found that sleep 6 h is associated with abnormalities in blood pressure, lipoproteins, glucose regulation, metabolic hormones, and obesity [4,5]. Less well-studied has been long sleep duration. However, many studies in the past two decades have found that individuals who report long sleep duration are at risk for a number of negative health outcomes as well [2,6]. Associations with long sleep duration have been reported for depression [7], cardiovascular disease [8], stroke [9], hypertension [10], diabetes [11], obesity [12], metabolic syndrome [13], dyslipidemia [14], and a number of cardiometabolic risk factors [2,6].

The study by Abe and colleagues in this issue represents one of the first to carefully assess atherosclerosis relative to sleep duration. This study, of >2000 residents of a Japanese community consisting of individuals 40–84 years of age examined intima-media thickness (IMT), a marker of carotid artery arteriosclerosis. Although the sample was rather small for an epidemiologic study, the authors found that mean IMT increased significantly as self-reported sleep duration increased from 6 to 7 to 8 to 9 h of sleep. Moreover, those with longer sleep durations were more likely to exhibit IMT ≥ 1.2 mm, which is a clinically accepted marker of atherosclerosis. The relationship of sleep duration with IMT was maintained even after controlling for a wide range of possible confounders, including sociodemographics, substance use, and other cardiometabolic measures. These data are consistent with other epidemiologic evidence linking long sleep with a higher risk of heart disease and stroke. Although other cardiovascular and metabolic markers were measured, including blood pressure, cholesterol, insulin, glucose, and others, the present study did not evaluate whether these also varied by sleep duration.

This study is consistent with other epidemiologic studies indicating that risks of long sleep can be greater than risks associated with short sleep. Further, these studies demonstrate that the prevalence of long sleep (8+ h) may be greater than that of short sleep <6 h. However, whereas such epidemiologic data has been an impetus for a dramatic increase in research exploring health effects of insufficient sleep, there has been far less investigation regarding potential hazardous effects of long sleep. Nonetheless, accumulating evidence from approximately 100 studies provides justification for expecting that sleep, like perhaps all other health-related behavior, is indeed hazardous in excessive amounts.

As Abe et al. note, epidemiologic studies cannot establish causality. The associations of long sleep with mortality/morbidity could be confounded by existing morbidities (as could the links with short sleep). However, the analyses of Abe and colleagues (and many other studies) have controlled for these factors to varying degrees. Moreover, a recent prospective study by Mesas et al. [15] found that the association of long sleep with mortality was equally apparent in older adults who had very good physical and psychological health at baseline. Furthermore, other recent studies show that the risks of long sleep are equally apparent when sleep is assessed objectively [16–18].

Collectively, the findings by Abe et al. and others regarding sleep duration exist in the larger context of findings that demonstrate that insufficient or excessive sleep duration and/or poor sleep quality (e.g., sleep fragmentation, sleep initiation difficulties) play an important role in several domains of health relevant to cardiometabolic outcomes, including obesity, cardiovascular disease, metabolic dysregulation, and immune dysfunction.

As existing evidence from epidemiological and experimental domains elucidates particular pathways by which sleep impacts health, and how these pathways may interact (i.e., downstream effects of sleep duration and quality), increased attention will need to be paid to the determinants of sleep (i.e., upstream factors). After all, if sleep attainment is crucial to health and longevity, a more complete understanding of how an individual's sleep is determined is necessary. As with other aspects of health driven by behavior (such as diet and physical activity), an individual's sleep attainment is an expression of factors at the individual level (e.g., demographics, genetics, behavior), which is embedded within a community level (e.g., neighborhood, culture, family), which itself exists within the wider context of societal factors which could influence sleep (e.g., public policy, exposure to electronic media, working around the clock). These factors, collectively, need to be better understood in their role as determinants of sleep duration and quality.

When the (upstream) determinants of sleep physiology and sleep-related behaviors become better understood, and this knowledge is complemented by a better understanding of the (downstream) consequences of insufficient, excessive or otherwise poor quality sleep, we will better be able to view sleep in the context of health and society. Using this knowledge, there is the potential to develop targeted interventions at the individual, community and societal level, aimed at improving the sleep, and, consequently, the health and longevity, of the population.

References

1. Grandner MA, Patel NP, Hale L, Moore M. Mortality associated with sleep duration: the evidence, the possible mechanisms, and the future. *Sleep Med Rev.* 2010; 14:191–203. [PubMed: 19932976]
2. Youngstedt SD, Kripke DF. Long sleep and mortality: rationale for sleep restriction. *Sleep Med Rev.* 2004; 8:159–74. [PubMed: 15144959]
3. Gallicchio L, Kalesan B. Sleep duration and mortality: a systematic review and meta-analysis. *J Sleep Res.* 2009; 18:148–58. [PubMed: 19645960]

4. Grandner MA, Patel NP, Gehrman PR, Perlis ML, Pack AI. Problems associated with short sleep: bridging the gap between laboratory and epidemiological studies. *Sleep Med Rev.* 2010; 14:239–47. [PubMed: 19896872]
5. Grandner MA, Patel NP. From sleep duration to mortality: implications of meta-analysis and future directions. *J Sleep Res.* 2009; 18:145–7. [PubMed: 19645959]
6. Grandner MA, Drummond SP. Who are the long sleepers? Towards an understanding of the mortality relationship. *Sleep Med Rev.* 2007; 11:341–60. [PubMed: 17625932]
7. Patel SR, Malhotra A, Gottlieb DJ, White DP, Hu FB. Correlates of long sleep duration. *Sleep.* 2006; 29:881–9. [PubMed: 16895254]
8. Sabanayagam C, Shankar A. Sleep duration and cardiovascular disease: results from the National Health Interview Survey. *Sleep.* 2010; 33:1037–42. [PubMed: 20815184]
9. Chen JC, Brunner RL, Ren H, et al. Sleep duration and risk of ischemic stroke in postmenopausal women. *Stroke.* 2008; 39:3185–92. [PubMed: 18635832]
10. Gottlieb DJ, Redline S, Nieto FJ, et al. Association of usual sleep duration with hypertension: the Sleep Heart Health Study. *Sleep.* 2006; 29:1009–14. [PubMed: 16944668]
11. Ayas NT, White DP, Al-Delaimy WK, et al. A prospective study of self-reported sleep duration and incident diabetes in women. *Diabetes Care.* 2003; 26:380–4. [PubMed: 12547866]
12. Taheri S, Lin L, Austin D, Young T, Mignot E. Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. *PLoS Med.* 2004; 1:e62. [PubMed: 15602591]
13. Hall MH, Muldoon MF, Jennings JR, et al. Self-reported sleep duration is associated with the metabolic syndrome in midlife adults. *Sleep.* 2008; 31:635–43. [PubMed: 18517034]
14. Kaneita Y, Uchiyama M, Yoshiike N, Ohida T. Associations of usual sleep duration with serum lipid and lipoprotein levels. *Sleep.* 2008; 31:645–52. [PubMed: 18517035]
15. Mesas AE, Lopez-Garcia E, Leon-Munoz LM, Guallar-Castillon P, Rodriguez-Artalejo F. Sleep duration and mortality according to health status in older adults. *J Am Geriatr Soc.* 2010; 58:1870–7. [PubMed: 20840460]
16. Kripke DF, Langer RD, Elliott JA, Klauber MR, Rex KM. Mortality related to actigraphic long and short sleep. *Sleep Med.* 2011; 12:28–33. [PubMed: 20870457]
17. van den Berg JF, Miedema HM, Tulen JH, et al. Long sleep duration is associated with serum cholesterol in the elderly: the Rotterdam Study. *Psychosom Med.* 2008; 70:1005–11. [PubMed: 18842743]
18. Stone KL, Ancoli-Israel S, Blackwell T, et al. Actigraphy-measured sleep characteristics and risk of falls in older women. *Arch Intern Med.* 2008; 168:1768–75. [PubMed: 18779464]