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## Commentary

### Sleep: The Forgotten Heart Pill, and How We Can Improve it (Fellow's)



Six months into my cardiology fellowship, I became a parent for the first time. While becoming a father is the greatest experience of my life, those first few months of being both a fellow and a new parent were exhausting. Whether it was being called in at 2AM for a STEMI, or awakened at 3AM for a diaper change, I quickly learned the value of sleep. How I felt during the day, how well I functioned at work, and how willing I was to exercise were all impacted by the quality of my sleep. As someone whose career mission is to help as many people as possible in the fight against cardiovascular disease (CVD), I realized that sleep had to be an essential part of a comprehensive program to lower patients' risk. I am somewhat embarrassed it took this experience for me to realize how important sleep is for our health, as it now seems obvious. In fact, it is so obvious that in 1997, The Guinness Book of World Records stopped tracking records for voluntary sleep deprivation due to it being too dangerous. Longest sword swallowed? Not too dangerous. Highest fall from a cliff? Not too dangerous. But depriving oneself from sleep? *That* is too dangerous. And yet, one could argue that much of our country is in fact sleep deprived. The National Heart, Lung and Blood Institute estimates that 50–70 million people in the U.S. have a sleep disorder, and 1 in 3 people do not achieve the recommended amount of sleep [1].

This pandemic of sleep deprivation is negatively affecting our health in a multitude of ways. Physiologically, sleep restriction results in impaired glucose tolerance, increased blood pressure, activation of the sympathetic nervous system, reduced leptin levels, and increased inflammatory markers – just to name a few of its deleterious effects [2]. Behaviorally, those sleeping less than 6 h per night are more likely to have poor diet quality; and in some age groups, reduced sleep is associated with lower physical activity levels [3,4]. Further, MESA data has shown that obstructive sleep apnea is associated with both lower physical activity levels and diet quality [5,6]. Therefore, it should be no surprise that poor sleep is associated with an increased risk of cardiometabolic disease.

A striking example of this was a recent UK biobank study of 385,000 participants initially free of CVD that concluded those with the best sleep patterns had a 35% reduced risk of CVD compared to those with the worst. The authors estimated nearly 10% of cardiovascular events in the cohort could be attributed to poor sleep patterns. Participants' genomes were also analyzed, and it was shown that high genetic CVD risk could be partially offset by a healthy sleep pattern, and those with low genetic CVD risk could lose some of this protection with unhealthy sleep patterns [7].

Data showing that poor sleep is associated with CVD is not new, but it was only recently that the American Heart Association updated their list of key cardiovascular health metrics to include sleep as a part of their re-branded "Life's Essential 8". One of their cited reasons for this was

"recent evidence suggests sleep metrics add independent predictive value for CVD events over and above the original seven cardiovascular health metrics" [8]. Specifically they cited the work of Makarem and colleagues who were able to show that those in the highest vs. lowest tertile of both the AHA's Life Simple 7 (LS7) Score and sleep health scores had up to 80% lower odds of prevalent CVD. Further, they showed that while the LS7 score was not associated with incident CVD over the mean 4.4-year follow-up, sleep quality was, as those in the highest vs. lowest tertile of sleep duration had 43% lower CVD risk. When metrics such as sleep regularity, OSA, and insomnia were added to sleep duration, there was a 47% lower CVD risk [3].

While it's one thing to recognize the importance of sleep, it's another thing to actually improve it. Unfortunately, many of the medications prescribed for sleep are either ineffective, associated with side effects, or highly addictive. An alternative way to improve sleep is cognitive behavioral therapy for insomnia (CBT-I), of which a critical component is sleep hygiene. With CBT-I being a limited resource, we need as many clinicians as possible promoting good sleep hygiene to our patients.

One of the most important aspects of sleep hygiene is sleep consistency. While most of us could use more hours of total sleep, a common misconception leads us to the wrong approach in terms of getting our recommended hours. This misconception is thinking of sleep as a bank. The thinking goes, if you have a sleep debt during the week you can try to repay your debt with an hour for hour swap on the weekend. Unfortunately, the data do not support this. As an example, Depner, et al. found that compared to normal sleep, consistent sleep restriction during both the week and weekend resulted in a 13% reduction of insulin sensitivity in just two weeks. Surprisingly, those who sleep restricted during the week but not the weekend, had a 27% decrease in insulin sensitivity compared to normal controls [9]. Studies like this indicate that instead of thinking of sleep as a bank, we should think of it as a sport's season. One bad night's sleep is a loss, and no matter how many hours you get the next night, it doesn't turn that loss from the previous night into a win. The only way to make up for a poor night's sleep is to continue to stack consecutive good nights of sleep. Repeating the pattern of five nights of poor sleep during the week and two nights of good sleep on the weekend is a losing game plan.

Additionally, even for people who believe they are getting the recommended amount of sleep, it is important to note that time in bed does not equate to the total amount of sleep. Sleep efficiency, the ratio of total sleep time to total time in bed, continues to decline as we age. In our 40 s, our sleep efficiency averages 85% and continues to gradually decline. Therefore, many of us who think we are getting the recommended amount of sleep are falling short because we fail to account for sleep efficiency [10].

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So how can we achieve greater sleep efficiency? While some of this is biologically intrinsic, The American Academy of Sleep Medicine recommends a few things for improving our sleep. Out of the bedroom, it is important that we put ourselves in the best possible position to be able to fall asleep at our desired time. In addition to sleep consistency as previously mentioned, this means establishing a relaxing bedtime routine, limiting exposure to bright light in the evenings, getting regular exercise during the day, not drinking alcohol before bedtime, and avoiding consuming caffeine in the afternoon or evening [11]. In the bedroom, it is important that we create an environment that is conducive to sleep. This means getting out of bed if we don't fall asleep within 20 min, keeping our bedroom only for sleep, and making our room dark, quiet, and cool [11].

Poor sleep is putting millions of patients at risk for CVD, which is already the number one cause of death in the world. While we wouldn't forget to counsel our patients on tobacco cessation, we consistently fail to address sleep with our patients. Educating patients on the importance of sleep consistency, and how to improve sleep efficiency, are two great places to start. For many of our patients, improving sleep is the forgotten heart pill. Please remember to prescribe it.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### References

- [1] Sleep Deprivation and Sleep Deficiency [Internet]. National heart lung and blood institute. U.S. Department of Health and Human Services; 2022 [cited 2023 Apr7]. Available from, <https://www.nhlbi.nih.gov/health-topics/education-and-awareness/sleep-health>.
- [2] Banks S, Dinges DF. Behavioral and physiological consequences of sleep restriction. *J Clin Sleep Med* 2007;3(5):519–28. PMID: 17803017; PMCID: PMC1978335.
- [3] Makarem N, Castro-Diehl C, St-Onge MP, Redline S, Shea S, Lloyd-Jones D, Ning H, Aggarwal B. Redefining cardiovascular health to include sleep: prospective associations with cardiovascular disease in the MESA sleep study. *J Am Heart Assoc* 2022;11(21):e025252. <https://doi.org/10.1161/JAHA.122.025252>. Epub 2022 Oct 19 PMID: 36259552; PMCID: PMC9673642.
- [4] McClain JJ, Lewin DS, Laposky AD, Kahle L, Berrigan D. Associations between physical activity, sedentary time, sleep duration and daytime sleepiness in US adults. *Prev Med* 2014;66:68–73. <https://doi.org/10.1016/j.ypmed.2014.06.003>. Epub 2014 Jun 12. PMID: 24931432.
- [5] Billings ME, Johnson DA, Simonelli G, Moore K, Patel SR, Diez Roux AV, Redline S. Neighborhood walking environment and activity level are associated with OSA: the multi-ethnic study of atherosclerosis. *Chest* 2016;150(5):1042–9. <https://doi.org/10.1016/j.chest.2016.06.012>. Epub 2016 Jun 18. PMID: 27327117; PMCID: PMC5103016.
- [6] Reid M, Maras JE, Shea S, Wood AC, Castro-Diehl C, Johnson DA, Huang T, Jacobs Jr DR, Crawford A, St-Onge MP, Redline S. Association between diet quality and sleep apnea in the multi-ethnic study of atherosclerosis. *Sleep* 2019;42(1):zsy194. <https://doi.org/10.1093/sleep/zsy194>. PMID: 30346597; PMCID: PMC6335872.
- [7] Fan M, Sun D, Zhou T, Heianza Y, Lv J, Li L, Qi L. Sleep patterns, genetic susceptibility, and incident cardiovascular disease: a prospective study of 385 292 UK biobank participants. *Eur Heart J* 2020;41(11):1182–9. <https://doi.org/10.1093/eurheartj/ehz849>. PMID: 31848595; PMCID: PMC7071844.
- [8] Lloyd-Jones DM, Allen NB, Anderson CAM, Black T, Brewer LC, Foraker RE, Grandner MA, Lavretsky H, Perak AM, Sharma G, Rosamond W, American Heart Association. Life's Essential 8: updating and enhancing the american heart association's construct of cardiovascular health: a presidential advisory from the American Heart Association. *Circulation* 2022;146(5):e18–43. <https://doi.org/10.1161/CIR.0000000000001078>. Epub 2022 Jun 29. PMID: 35766027.
- [9] Depner C.M., Melanson E.L., Eckel R.H., Snell-Bergeon J.K., Perreault L., Bergman B.C., Higgins J.A., Guerin M.K., Stothard E.R., Morton S.J., Wright K.P. Jr. Ad libitum weekend recovery sleep fails to prevent metabolic dysregulation during a repeating pattern of insufficient sleep and weekend recovery sleep. *Curr Biol.* ;29(6):957–67.e4. doi: 10.1016/j.cub.2019.01.069. Epub 2019 Feb 28. PMID: 30827911.
- [10] Desjardins S, Lapierre S, Hudon C, Desgagné A. Factors involved in sleep efficiency: a population-based study of community-dwelling elderly persons. *Sleep* 2019;42(5):zsz038. <https://doi.org/10.1093/sleep/zsz038>. PMID: 30768200; PMCID: PMC6519908.
- [11] Hershner S, Shaikh I. Healthy sleep habits. Sleep education. American Academy of Sleep Medicine; 2020. <https://sleepeducation.org/healthy-sleep/healthy-sleep-habits/>.

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