How does insufficient sleep affect your ability to regulate blood pressure?

**Background / Importance**

- Insufficient sleep, in the form of sleep restriction or disruption, is very common in society.
- Insufficient sleep has been shown to contribute to elevated blood pressure (BP), which is a risk factor for developing a cardiovascular disease.1
- Cardiovascular disease is currently a leading cause of mortality in the United States.1
- Urine output plays a key role in BP regulation over the long-term (hours to days), and has also been shown to increase significantly due to sleep deprivation.4
- If BP becomes elevated, the body may respond over the long-term (hours to days) by increasing urine production, to decrease blood pressure.5

**Aim / Hypothesis**

- Considering urine output’s role in long-term blood pressure regulation, we investigated whether repeated exposure to sleep disruption affects the regulatory influence of urine production on blood pressure.
- We hypothesize that as blood pressure increases in response to sleep disruption, the body will respond by increasing urine production to lower blood pressure.

**Method**

- Five healthy adult participants completed two separate 19-day stays in the Clinical Research Center, at Beth Israel Deaconess Medical Center (Boston, MA).
- Order of sleep condition was randomized between participants, and each stay was at least 2-3 months apart.
- **Sleep Control Condition**: 19 nights consisting of 8 hours undisrupted sleep every night.
- **Sleep Disruption and Restriction Condition**: Three 4-day sleep restriction cycles, each including 3 nights of disrupted sleep and 1 night recovery sleep. Overall, 12 nights of sleep restriction, and 7 nights of undisrupted sleep.
- BP was measured every 4 hours during the day and bi-hourly during sleep disruption nights.
- Nighttime urine output was collected every other morning throughout the study. Dietary and fluid intake were controlled and monitored throughout the study.

**Results**

- Daytime systolic and diastolic BP were increased during sleep disruption periods compared to control sleep (p<0.05 for condition effect).
- Nighttime urine output was also increased during sleep disruption period compared to control sleep (p<0.05 for condition effect).

**Discussion / Implication**

- These preliminary results suggest that sleep disrupted participants, despite urinating more, maintained an elevated blood pressure.

Implications of these preliminary results may include:

- Insight into the fundamental affects of sleep disruption on blood pressure regulation
- More accurate sleep disorder diagnosis through examination of nocturnal bladder control and urine output
- More effective use of diuretics as treatment for blood pressure disorders
- Further analysis of this ongoing study is on the way to provide more insight into the temporal effects of sleep disruption on long-term BP regulation.