

## Introduction

- Sleep disruption is common among hospitalized patients due to psychological, physiological, and environmental reasons including illness, pain, anxiety, invasive interventions, frequent monitoring, and stimuli, especially noise and light. <sup>1,2,3</sup>
- The AASM has published guidelines for the use of actigraphy in the outpatient setting, but there is a paucity of literature evaluating the validity of actigraphy in inpatients. <sup>4</sup>
- There is growing support for the use of actigraphy in the inpatient setting in certain patient populations, especially traumatic brain injury, during the postoperative window, and patients undergoing cancer treatment. <sup>5-7</sup>
- The aim of our study is to evaluate sleep in hospitalized general medicine patients undergoing sleep medicine consultation using actigraphy and qualitative surveys.

## Methods

- A single-site prospective study in hospitalized medicine patients. Patients were observed with a Fitbit® Charge3 wrist actigraphy device overnight, then administered 7 surveys:
  - Richards-Campbell Sleep Questionnaire (RCSQ), qualitative questionnaires assessing sleep history, sleep hygiene, barriers to sleep, STOP-BANG, Epworth Sleepiness Scale (ESS), and Patient-Health Questionnaire-2 (PHQ-2).
- Actigraphy data including total sleep time, slow wave sleep time, and number of awakenings was compared with patient-reported data.

## Results

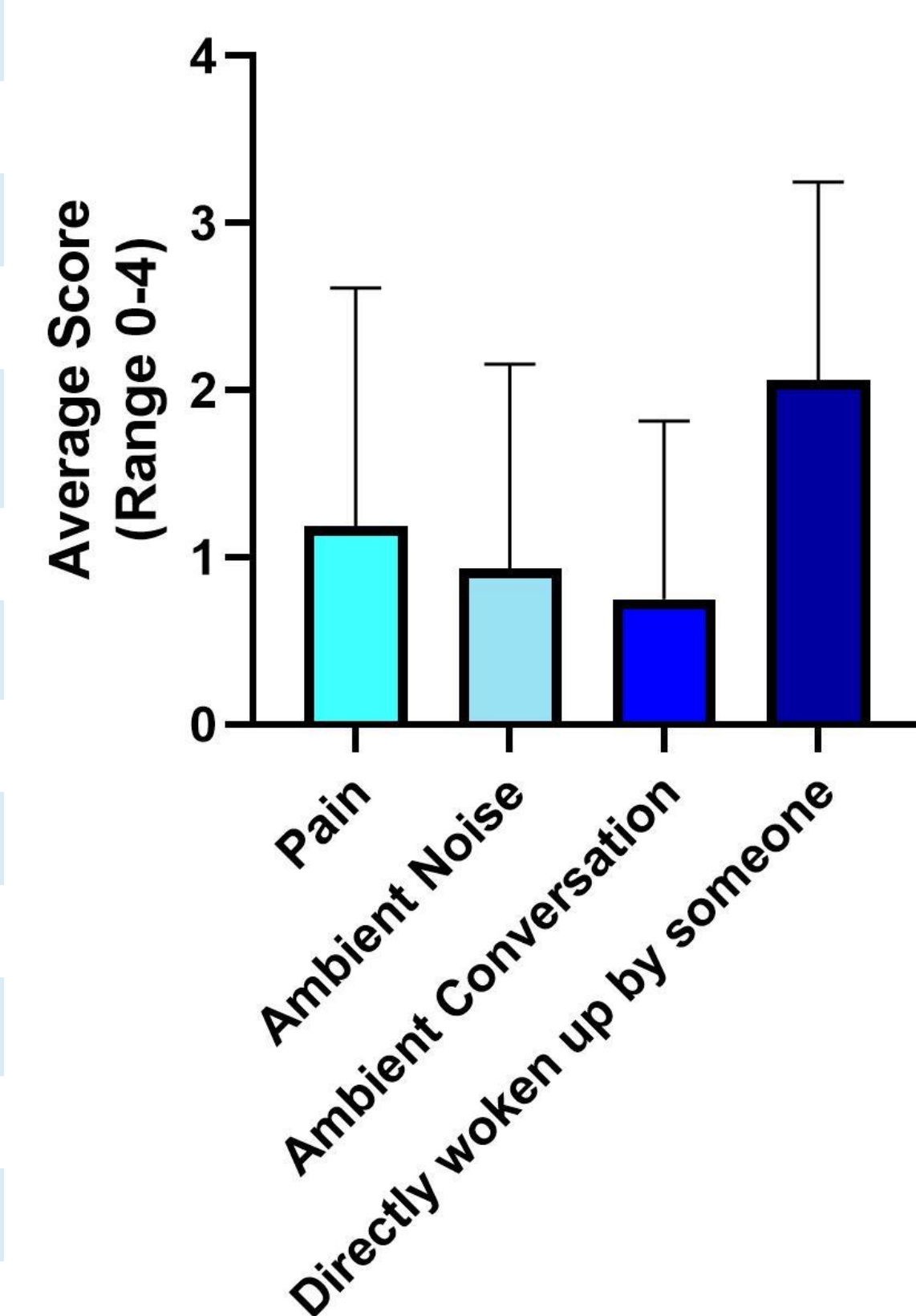
- 18 patients met inclusion criteria and were enrolled
  - They underwent sleep medicine consultation, overnight actigraphy, and completed 7 surveys
  - 3 excluded because actigraphy did not record. 1 excluded due to unrelated medical condition
  - Average age= 59 ± 15 years; 50% Male

### Survey Results

- Average STOP BANG was 5 with all patients scoring at least a 3 "intermediate risk" and 63% (n=10) with a score ≥ 5 "high risk"
- Average ESS was 13.2, with 40% (n=6) with a score 16-24 indicating severe excessive daytime sleepiness
- 63% (n=10) screened in for depression → primary care team notified

Survey Results	
Sleep History Intake:	
Average Bedtime	8:51 PM
Average Sleep Latency	43 min ± 34
Average Wake up time	6:04 AM
Average Total Sleep Time (TST)	401.6 ± 186 min
Average # Awakenings	4.33 ± 3
Average Time Back to Sleep	51.6 ± 68 min
Sleep Hygiene:	
Phone/Electronics in bed?	Yes 69% (n=11)
TV in bed?	Yes 75% (n=12)
Read in bed?	Yes 31% (n=5)
STOP-BANG:	5.1 ± 1.3 (out of 8)
ESS:	13.2 ± 6 (out of 24)
PHQ-2:	63% (n=10) screen IN

### Barriers to Sleep Survey Results

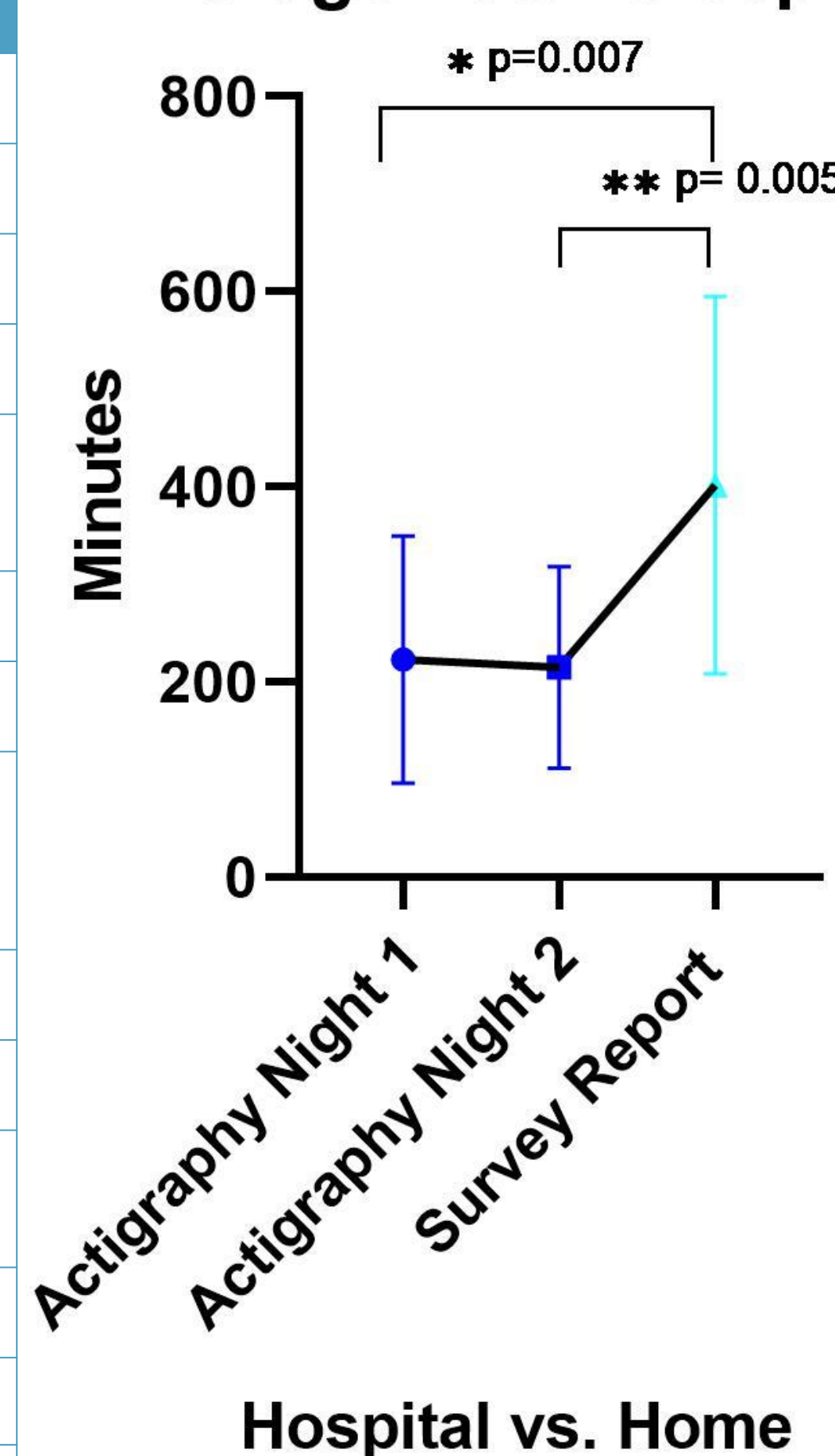


## Results

RCSQ Question Prompts	Average Response
My sleep last night was: light sleep (0) ----- deep sleep (100).	52.6 ± 25.9
Last night, the first time I got to sleep, I: just never could fall asleep (0) ----- fell asleep almost immediately (100).	54.8 ± 25.9
Last night, I was: awake all night long (0) ----- awake very little (100).	71.4 ± 20.1
Last night, when I woke up or was awakened, I: couldn't get back to sleep (0) ----- got back to sleep immediately (100).	56 ± 30.4
I would describe my sleep last night as: a bad night's sleep (0) ----- a good night's sleep (100).	61.6 ± 28.4
I would describe the noise level last night as: very noisy (0) ----- very quiet (100).	56.7 ± 33.8

Parameters (means)	Actigraphy Results:	
	Night 1	Night 2
Bedtime	10:11 PM	8:08 PM
Wakeup time	3:39 AM	2:56 AM
TST (min)	223 min ± 122 min	233 min ± 81 min
Restless time	76 ± 55 min	65.6 ± 62 min
Number of times restless	6 ± 3	5.4 ± 4
Awake time	24 ± 2 min	25 ± 31 min
Awake time %	13 ± 9%	14 ± 9%
Number of nocturnal awakenings	2.4 ± 2	2.3 ± 2.4
REM time (min)	59 ± 34 min	48 ± 37 min
REM %	14 ± 10%	15 ± 10%
Light sleep time (min)	219 ± 89 min	207 ± 49 min
Light sleep %	60 ± 15%	64 ± 12%
Deep time (min)	27 ± 22 min	12.5 ± 9 min
Deep sleep %	7 ± 6%	4 ± 2%

### Average Total Sleep Time



## Discussion

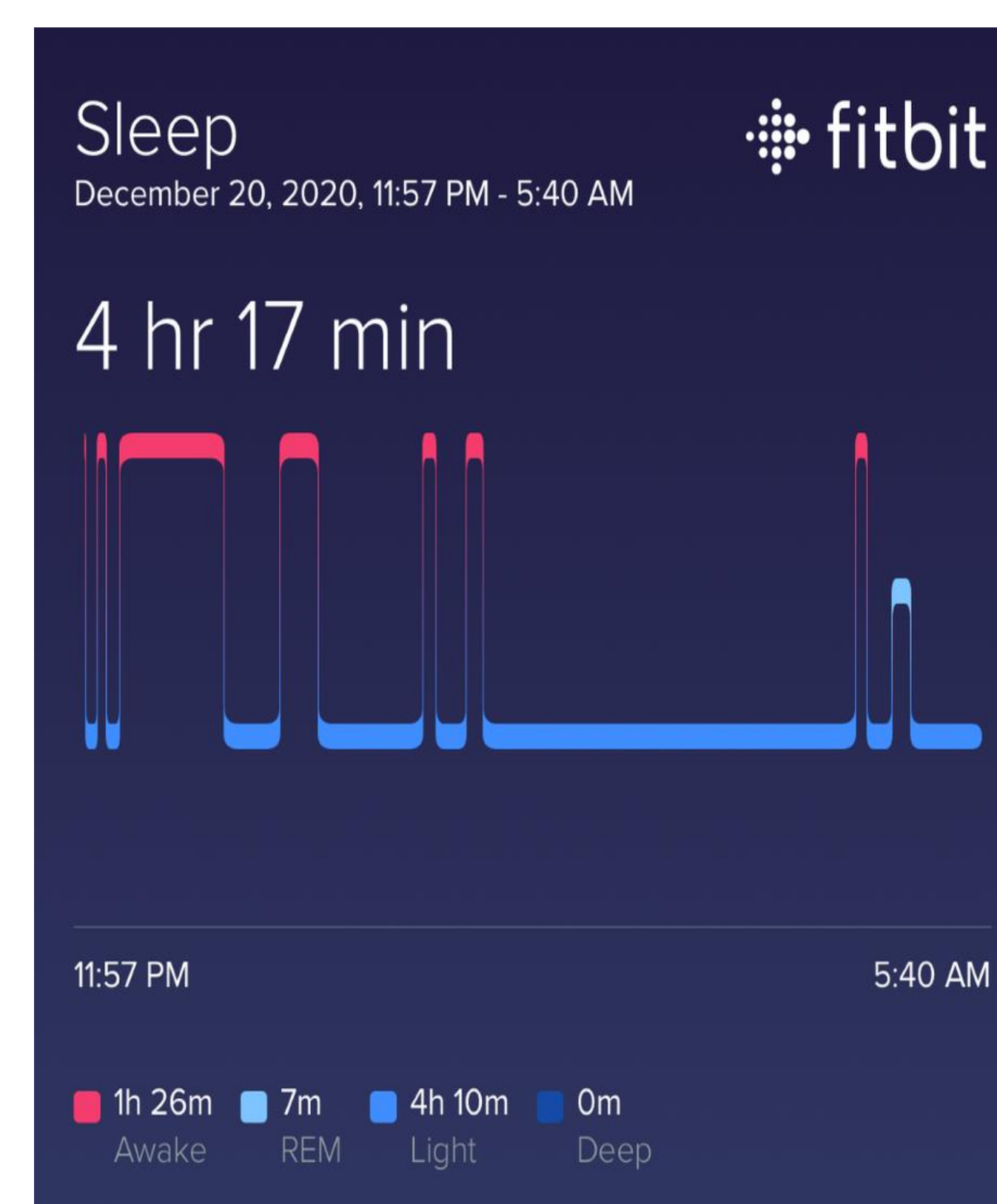
- Average TST at home is nearly double TST in the hospital
- Total sleep time was significantly reduced in the inpatient setting compared to patient's normal sleep schedule at home (223 vs. 401.6 minutes, p=0.007)
- Given high incidence of positive STOP-BANG and ESS screening results, sleep disordered breathing could be a contributing factor to patients' disrupted sleep. Average ESS for our patients was 13.2 indicating a baseline elevated level of daytime sleepiness, which further indicates possible presence of SDB among our study population.
- On average, patients went to bed around the same time as they do at home, however they woke up much earlier (3:17 AM in hospital vs. 6:04 AM at home) which further indicates how hospital environment can interfere with normal sleep patterns.
- Patients' total sleep time was predominately light sleep as per actigraphy, around 62% across both nights. This can be due to what patients perceived as affecting their sleep quality.
- Interestingly, the average number of awakenings of around 2 as detected by actigraphy is lower than subjectively reported average of 4 awakenings overnight by patients.
- Factors cited by patients as affecting their sleep quality in the hospital include:
  - Pain (either chronic or secondary to one of the reasons they were admitted)
  - Being woken up for vital signs or lab draws
  - Noise in the hallways or from monitors
  - Difficulty falling back asleep after being woken up for healthcare related interventions.

## Conclusion

- Restorative sleep warrants consideration alongside complex medical care during hospitalization.
- Patients experience decreased total sleep time while in the hospital compared with their subjective estimates of sleep at home.
- Actigraphy provides a non-invasive and reliable way to monitor some sleep parameters in the inpatient setting.
- Patient-identified barriers to sleep are targets for quality improvement.
- Future studies should compare inpatient actigraphy data to polysomnographic data and the effect of sleep-directed interventions on sleep quality in the hospital.

## References

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Fitbit report of overnight actigraphy data from 2 separate patients.

