

# Objective Markers of Sleep Quality in the Acute Postoperative Period after Primary Total Knee Arthroplasty: A Pilot Study

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## INTRODUCTION

- Total knee arthroplasty (TKA) patients are frequently subjected to immediate postsurgical pain and sleep disruption.
- Recent studies have explored postoperative sleep disruption using subjective assessments. However, literature remains sparse.
- The aim of this pilot study was to assess objective sleep quality measures in the immediate postoperative period following TKA.

## METHOD

- Patients undergoing primary TKA at a level two medical center were enrolled in a prospective study.
- Each patient was given a wearable sleep tracking device (WHOOP, USA).
- WHOOP devices recorded resting heart rate (RHR), heart rate variability (HRV), hours of sleep, number of sleep disturbances per hour, hours of deep sleep (N3), hours of rapid eye movement (REM) sleep, and restorative sleep (deep and REM sleep combined).
- These markers were tracked for one week preoperatively and four weeks postoperatively.

## RESULTS & DISCUSSION

- A total of eight patients were enrolled in the study, with a mean age of 65+/-10 years. The mean hours of deep sleep (0.7 vs. 1.1; p=0.043) and restorative sleep (1.7 vs 2.3; p=0.043) were decreased in the first postoperative week compared to the fourth postoperative week. There were no other significant differences regarding any other outcomes.

**TABLE 1:** Objective markers of sleep quality in patients undergoing primary total knee arthroplasty as measured by a wearable sleep tracking device.

	Baseline	Week 0	Week 1	Week 2	Week 3
RHR (bpm)	68 (5.4)	74 (10)	72 (3.8)	68 (3.9)	69 (9.6)
HRV	33 (15)	34 (17)	33 (18)	40 (22)	38 (23)
Hours of Sleep	6.2 (1.1)	4.8 (2.2)	5.6 (2.0)	6.2 (1.4)	6.2 (0.9)
Sleep Efficiency (%)	81 (7.5)	72 (14)	79 (6.3)	76 (11)	76 (7.5)
Sleep Disturbances per Hour	1.4 (0.3)	1.2 (0.5)	1.5 (0.3)	1.3 (0.4)	1.5 (0.4)
REM Sleep (hrs)	1.4 (0.5)	1.0 (0.6)	1.2 (0.5)	1.4 (0.7)	1.2 (0.9)
Deep Sleep (hrs)	1.1 (0.3)	0.7 (0.5)	1.0 (0.4)	1.1 (0.5)	1.1 (0.5)
Restorative Sleep (hrs)	2.5 (0.8)	1.7 (0.9)	2.3 (0.8)	2.5 (0.9)	2.3 (1.3)

RHR: resting heart rate; HRV: heart rate variability; REM: rapid eye movement

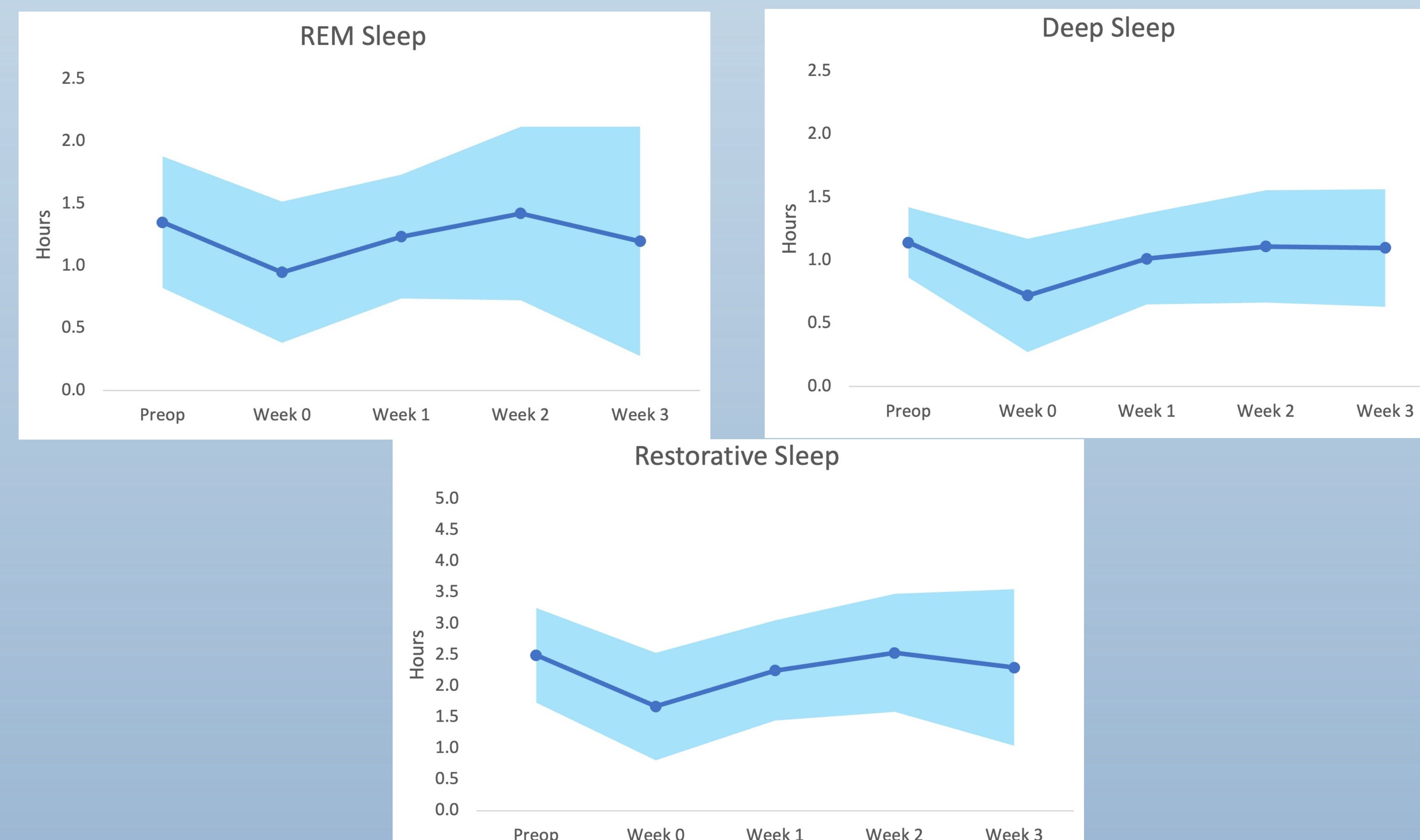


Figure 1-3: Mean hours of rapid eye movement (REM) sleep (left), deep sleep (right), and restorative sleep (middle) during sleep in patients undergoing primary total knee arthroplasty as measured by a wearable sleep tracking device.

## CONCLUSION

- This pilot study suggests that TKA patients have disruptions in deep and restorative sleep in the immediate postoperative period.
- These sleep disturbances may have a detrimental effect on the physical, social, and psychological aspects of recovery following TKA
- Sample size was limited by patient compliance with the wearable devices.
- Further study with a greater sample size is warranted to further explore post-operative sleep quality.

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## ACKNOWLEDGEMENTS

Funding for this study was made possible by the Osteopathic Research and Education for Orthopedics (ORE-O) Grant from the American Osteopathic Foundation and the American Osteopathic Academy of Orthopedics Foundation.