Long-term effects of complex surgery and hospital stay on adolescents' sleep patterns.

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AIM

This study aimed to assess sleep patterns in adolescents undergoing a Posterior Spine Fusion (PSF).

BACKGROUND

Sleep disturbance is one of the determinants of poor postsurgical outcomes. General anesthesia and complex operations can result in the total elimination of rapid eye movement (**REM**) sleep and changes in deep sleep, changes that can last for months. We enrolled adolescents scheduled for PSF, and gave them a Fitbit Charge 4 to wear before and during the hospital stay, and for 3 months after the PSF. The device recorded total sleep time (**TS**), duration of **REM** and **DEEP** sleep phases, and sleep efficiency.

Patients were given a PROMIS sleep questionnaire delivered to their cellular phone using Qualtrics the week before the hospitalization, during the hospitalization, and 3 months after surgery.

Pain scores were obtained every 4-6 hours during the patient's hospital stay using the self-reporting numeric scale.

RESULTS

16 patients (10 girls (62%) and 6 boys (38%)) completed the 3 months study period. Mean age was 16±1.9 years. The average length of the hospital stay was 3 days.

TS

TS time prior to admission was 387±111 minutes. 45% of the patients spent less time asleep while in the hospital compared to the preoperative period (Table 1), 33% of the patients spent more time asleep while in the hospital compared to the preoperative period. TS increased during the follow-up period going back to baseline values by the 3rd post-surgery week in 72% of the cases.

REM sleep

Duration of REM sleep was abnormal (less than 18% of the TS time) in 33% of the patients before their hospital admission and was abnormal in 56% of the patients during their hospital stay. REM sleep normalized within 3 weeks.

DEEP phase (DP)

DP sleep decreased by 50% in 67% of the patients during the hospital stay compared to the pre-admission value. DP increased once patients were discharged home. The duration of DP was never less than 13% of TS time.

Sleep efficiency

The sleep efficiency recorded during the study period was never below the normal value of 85%.

PROMIS

Patients' perception of their quality of sleep worsened during the hospital stay. Scores normalized by the 3rd month after surgery in 86% of the patients. (Table 3).

Pain scores

Pain scores ranged between 2 and 4 on a numeric scale throughout the study period.

DISCUSSION

Sleep phases of adolescents are affected after a major surgery. The changes are short-lived and not consistent amongst patients'. TS and sleep phases were abnormal before surgery in a small percent of cases. PROMIS and Fitbit data correlated.

Table 1: Percent of patients in whom we registered changes in the total sleep patterns at different points during the study with the changes in minutes spent in total sleep compared to pre-admission data. The average duration of total sleep pre-admission was 387±111 minutes

	Hospital	1st week	2nd week	3rd week	3 months
Decreased	45%	60%	33%	28%	20%
Minutes	-172±59	-87±40	-71±43	-100±71	-48±37
Increased	33%	10%	45%	36%	60%
minutes	+130±74	+53±1	+106±101	+127±105	+86±74
unchanged	22%	30%	22%	36%	20%