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Earplugs and eye masks *vs* routine care prevent sleep impairment in post-anaesthesia care unit: a randomized study

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Editor's key points

- The biological function of sleep is the subject of discussion and debate.
- Sleep deprivation has numerous deleterious consequences.
- Factors responsible for sleep deprivation in post-anaesthesia and intensive care units include excessive light and noise.
- The effects of simple interventions on sleep quality in a post-anaesthesia care unit were studied.

Background. Post-anaesthesia care units (PACUs) with 24/7 activity and consequently artificial light and noise may disturb the sleep of patients who require prolonged medical supervision. After one postoperative night, we compared sleep quality in patients with and without noise (earplug) and light (eye mask) protection.

Methods. After ethical board approval, 46 patients without any neurological or respiratory failure undergoing major non-cardiac surgery were prospectively included. They were randomized to sleep with or without protective devices during the first postoperative night in the PACU. Sleep quality was simultaneously measured by sleep-quality scales (Spiegel score and Medical Outcomes Study Sleep), nurses' assessment, and through a wrist actigraph (Actiwatch®). Secondary outcomes such as pain control and nocturnal activity were recorded. Comparisons between groups were made by Student's *t*-test or non-parametric test for repeated measures as appropriate (SPSS 10.0). A *P*-value <0.05 was considered significant.

Results. Data from 41 patients were analysed. Protective devices during the first postoperative night prevented a decrease in sleep quality compared with standard care, as evaluated by the Spiegel scale: 20 (4) *vs* 15 (5), $P=0.006$. These devices significantly decreased the need for a nap [50% 95% confidence interval (CI) (20–80) *vs* 95% 95% CI (85–100), $P<0.001$], but had no effect on sleep length evaluated by Actiwatch®. The total consumption of morphine was significantly reduced in the first 24 h [respectively, 15(12) mg and 27(17) mg, $P=0.02$].

Conclusions. Earplugs and eye masks applied in the PACU during the first postoperative night significantly preserve sleep quality. Such non-invasive and cheap devices may be generalized in the PACU or in intensive care units.

Keywords: devices; postoperative care; sleep

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During the postoperative period, sleep deprivation, sleep fragmentation, and altered architecture are common.[1–3] The aetiology of this impairment is multifactorial and includes postoperative pain, anxiety, residual effects of the anaesthetic agents, and an unfamiliar environment.[4 5] Moreover, because of round-the-clock care activity, the intensive care unit (ICU) and post-anaesthesia care unit (PACU) environments have bright artificial lighting and are subjected to a high level of noise. Although the National Institute for Occupational Safety and Health has recommended that the noise intensity in hospitals should not exceed 35 dBA during the night and 40 dBA during the day,[6] noise levels in the ICU and PACU commonly exceed these recommendations. Peak sounds louder than 80 dBA can lead to sudden arousals from sleep.[7] As a consequence, sleep is fragmented, with decreased or absent slow-wave and rapid eye movement sleep.[8] Observational studies have shown that at least one-third of sleep-deprived patients have symptoms consistent with the 'ICU psychosis' syndrome with a large anxiety component.[9] Sleep deprivation and fragmentation have a deleterious effect on daytime task performance, mood, alertness, and fatigue, and can also decrease immune defences.[10 11] Common causes of sleep discomfort in these units were well identified by patients and included nursing by care-givers, conversations, and noise from the vital alarms (EKG, Sp_{O_2}, ventilator).[12] On the other hand, previous studies have demonstrated that the implementation of guidelines to reduce noise and light levels was feasible, but this improvement was only transient and required constant compliance to succeed.[13 14] Airline companies have long been offering eye masks and earplugs to improve passengers' comfort. In healthy subjects exposed to simulated ICU noises in a sleep laboratory, these devices significantly improved subjective sleep quality and sleep architecture assessed through polysomnography.[15 16] However, the environment of a sleep

laboratory during an 8 h period cannot really simulate the auditory, somatic and visual conditions experienced during the length of stay in an ICU/PACU. Therefore the assessment of sleep quality during an ICU/PACU stay should be performed on site.

The aim of the present study was to assess the effect of eye masks and earplugs, recognized as passive devices, applied to surgical patients during the first postoperative night in a PACU, on sleep quality.

Methods

This study was prospectively performed in the PACU of the Pitié-Salpêtrière Hospital, Paris, France, a 1200-bed university-based teaching hospital. It was conducted in accordance with French legislation and was approved by the local ethics committee board.

Post-anaesthesia care unit

Our PACU is an L-shaped open ward close to the operating theatres. This unit consists of 19 beds with devoted monitoring, with mechanical or non-invasive support available and a central monitoring console. It is open 24 h d^{-1} and 7 day wk^{-1} throughout the year. About 11 000 patients per year are admitted after scheduled or urgent surgery. The majority of patients are admitted from the operating theatre after mechanical ventilation withdrawal in the operating theatre. The usual length of stay is short, with a median of 3.2 (1.5) h, except in cases of severe co-morbidities requiring specific support, monitoring, or nursing with a consequent prolonged length of stay in the unit. The nurse ratio is 1 nurse for 2.5 patients and a physician is available at all times. Moreover, 1200 critically ill patients per year are admitted from the emergency department or from out-of-hospital areas (multitrauma patients). This latter activity peaks from 17:00 to 03:00 and contributes to disturbance of the sleep of the patients whose surgery or co-morbidities require a prolonged stay in the PACU the night after their surgery.

Methods

During the 5-month inclusion period, patients were prospectively and consecutively eligible if they had undergone a scheduled major surgery under general anaesthesia with the previous night in hospital and an expected postoperative night in the PACU related to co-morbidities or surgery. This former criterion ensured similar sleep conditions between groups. At admission and after written consent, patients filled out a questionnaire about their usual sleep as a reference [Medical Outcome Study (MOSS) scale] to diagnose possible severe sleep disorders.[17] Exclusion criteria were bilateral deafness, blindness, severe sleep disorder requiring daily treatment and neurological disorders with shaking or cognitive preoperative dysfunction measured by mini-mental state evaluation and day-case surgery. After surgery, additional exclusion criteria were intrathecal morphine related to sedative effects and a need for postoperative non-invasive ventilation. In each group, postoperative analgesia was multimodal, and only i.v., including nefopam, except in the case of contraindication, paracetamol, and morphine with patient-controlled analgesia (PCA). In cases of re-operation or transfer to another unit during the night, the patient was excluded from the final analysis.

Randomization was performed on admission to the PACU after surgery using sealed envelopes. Patients were allocated to two different groups: the control group received routine care during the night and the intervention group received routine care plus eye mask (Slaapmasker® Schlafmaske, Stuttgart, Germany) and earplugs (Samurai®, Vandeputte Group, Netherlands). Patients were encouraged by nurses to use these devices during the night without any restriction (Supplementary material, Figure S1).

Sleep quality was assessed by three different methods. First, self-assessment was performed by patients using two psychometric and validated questionnaires, the MOSS scale and the Spiegel scale[18] (Supplementary material, Appendix). The MOSS questionnaire consists of 12 items leading to 6 subscales or domains: sleep disturbance, sleep adequacy, daytime sleepiness, 'supposed or known' snoring, being awakened by shortness of breath or by a headache, and quantity of sleep.[17] The usual MOSS scale as used to diagnose sleep disorder refers to a mean of the last 4 weeks. For this study, we twice repeated an adapted version, validated with the sleep federation, without changing any questions, but with a different temporal reference because only two nights (nights before and after surgery) were considered instead of 4 weeks. The Spiegel scale is a very simple and widely used scale with six questions about sleep. It is specifically efficient for repeated measures.[18] The maximum score is 30 and impaired sleep is defined as a score <24; a pathological sleep pattern exists if the score is <15. The second method for assessing sleep was an external and intermittent measurement of the patient's sleep by a nurse with a specific chart collecting the patient's behaviour and any external disturbing events. The third method was the wrist actigraph (Actiwatch®, Cambridge Neurotechnology Ltd, UK), an objective measure of motor activity (duration and intensity) (Supplementary material, Appendix S1). This accelerometer was placed on the non-dominant wrist at 20:00 and set to monitor movements every 5 s for a period of 12 h. Measures were stored in the device and downloaded the day after to a PC for analysis (Sleep Analysis 7®, Cambridge Neurotechnology Ltd, UK). This is a convenient tool for ambulatory recording of either limb activity or general physical activity for clinical use and research purposes[19] and has been validated in comparison with polysomnography.[20 21] The activity plots are coupled with the specific software, serving to quantify the intensity and duration of daily physical activity. The software provides an indirect measurement of sleep duration, sleep onset latency, sleep efficiency (total time without activity during the total time of the study), activity score (times with movement during the expected interval), and sleep fragmentation (total number of periods with breaks in the sleep pattern). Finally, data were collected on nocturnal care activity, total morphine consumption during the first 24 postoperative hours through PCA, acceptance of devices, and occurrence of early delirium.