



# A prospective analysis of sleep deprivation and disturbance in surgical patients



Ross Dolan <sup>a,\*</sup>, Jae Huh <sup>a</sup>, Neil Tiwari <sup>a</sup>, Tom Sproat <sup>a</sup>, John Camilleri-Brennan <sup>b</sup>

<sup>a</sup> Colorectal Unit, Department of Surgery, Forth Valley Royal Hospital, Stirling Road, Larbert, Stirlingshire, Scotland, FK5 4WR, UK

<sup>b</sup> Consultant General and Colorectal Surgeon Forth Valley Royal Hospital Honorary Clinical Senior Lecturer, University of Glasgow, UK

## HIGHLIGHTS

- This study is a prospective questionnaire survey of 102 surgical patients who procedures over a set time period.
- The aim of the study was to determine factors contributing to sleep deprivation postoperatively on a surgical ward.
- Unexpectedly, patients were not sleep deprived postoperatively but slept more during the daytime.
- Pain and noise were the main factors contributing to sleep deprivation.
- The authors then conclude that their study supports a drive towards single bed bays.

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## ABSTRACT

**Introduction:** Sleep deprivation has a potentially deleterious effect on postoperative recovery. The aim of our prospective study was to identify the factors contributing to postoperative sleep deprivation and disturbance in order to recommend improvements in postoperative care.

**Methods:** 102 consecutive patients attending for elective general and orthopaedic surgery were interviewed preoperatively (baseline) and postoperatively on their duration of sleep, number of awakenings during the night, factors contributing to sleep loss and the use of analgesia and night sedation.

**Results:** Patients woke up a median of 5 times in the first postoperative night compared to a median of 3 times preoperatively ( $p = 0.01$ ). Pain was the predominant factor preventing sleep, affecting 39% of patients preoperatively and 48% of patients on the first postoperative day. Other factors included noise from other patients and nursing staff, and using the toilet. Analgesia was taken by more than 90% of patients in the first two days, this number gradually reducing over the postoperative period. On the other hand, in the first two postoperative days, only about 5% of patients had night sedation.

**Discussion and conclusions:** Apart from highlighting the need for effective pain management post-operatively, we believe that our study supports the drive towards single bed bays, where steps can be taken to minimize the impact of environmental factors on sleep.

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## 1. Introduction

The sleep wake cycle occurs over a period of approximately 24 h. Normal sleep forms part of the circadian rhythm of the body which is accompanied by many bodily changes, such as variations in the levels of glucagon, cortisol and catecholamines which inhibit protein synthesis and are at their highest during the day [1]. During sleep the levels of growth hormone increases leading to the

physiologically plausible theory that wakefulness causes tissue catabolism and sleep induces anabolism [2].

Sleep deprivation is defined as the reduction in the total sleep time relative to one's usual baseline during a 24-h period. It can have potentially dangerous multi-systemic effects in the critically ill, including surgical patients [3–8]. The need for adequate sleep must therefore be taken into account in both the preoperative and the postoperative care of surgical patients. The stress of poor sleep when coupled with surgical stress can lead to increased catabolic activity and tissue breakdown as well as reduced anabolic activity, which will affect post operative recovery [1,5,7] Indeed animal models have shown that sleep deprivation leads to the depletion of

\* Corresponding author.

E-mail address: [rdolan@nhs.net](mailto:rdolan@nhs.net) (R. Dolan).

glycogen stores and increases in oxidative stress and free radical production as well as the production of pro-inflammatory cytokines all implicated in poor post operative recovery [9,10].

Hospital wards have been shown to be particularly difficult places to get a good night's sleep [3–8,11]. By their very nature surgical wards are very noisy often with noise levels in excess of 70 dB [3]. Surgical wards are also bright with a lot of night time activity and patient interventions occurring. Indeed it is not uncommon for painful and distressing procedures such as urinary catheterisation and cannulation to occur between 2am and 5am [3–8,11]. Nursing interventions while often necessary have also been reported as causing disturbance [12].

In general, studies into sleep in an inpatient setting tended to focus on the intensive care units [13]. Few studies have been done on sleep in the postoperative setting in a surgical ward [8], with one study comparing sleep disturbances between laparoscopic and open surgery [7].

Using a large cohort of patients, the aim of this study was to identify those factors that were contributing to sleep deprivation and disturbance in the postoperative patient on a surgical ward. By identifying and critically analyzing these factors, recommendations to improve the quality of sleep in the postoperative patient may be made in the future but these interventions are not the main focus of this study.

## 2. Patients and methods

Patients admitted to a Teaching General Hospital over a 3 month period for routine elective major orthopaedic and general surgery were identified preoperatively. A questionnaire was administered to the patients on a daily basis by the authors, starting from the day of their admission and continuing until discharge home for up to the sixth postoperative day. Questions were asked on the number of hours of sleep, the number of awakenings during the night, factors contributing to sleep loss and disturbance, and the use of analgesia and night sedation. The duration of patients' sleep was divided into two periods: nocturnal sleep (hours of sleep between 9pm and 7am) and daytime/afternoon sleep (hours of sleep between 7am and 9pm). The patients' baseline sleep pattern was taken to be the sleep pattern for the day and night prior to surgery spent at home. Patients were then asked to declare if they had any underlying sleep disorders or a history of chronic sleep disturbance.

Patients were nursed in six-bedded bays postoperatively in general surgical or orthopaedic wards. Those who required High Dependency or Intensive Therapy Unit care postoperatively were excluded.

Clinical data were entered into a Microsoft Excel database and analysed using a Wilcoxon signed rank test (Microsoft, Redmond, Washington, USA). A p value less than 0.05 was considered statistically significant.

The study was approved and registered as Quality Improvement Project E453 with the NHS Forth Valley Quality Improvement board.

## 3. Results

A total of one hundred and two patients (58 women, median age (range) 69 (21–87) years) participated in the study. A power calculation produced an ideal sample size of 84 so this study is well powered. Sixty four had orthopaedic operations (28 had a Total Hip Replacement and 36 had a Total Knee Replacement) whilst the other 38 patients had various abdominal operations (5 right hemicolectomy, 3 sigmoid colectomy, 5 anterior resection, 4 closure of ileostomy, 3 open repair of abdominal wall hernia, 2 cholecystectomy, 2 fundoplication, 6 rectopexy and 8 other abdominal

operations). The total length of stay was 7 days (one pre op and six post op), 102 patients were present on day 1 post op, 88 of day 2, 68 on day 3, 47 on day 4, 34 on day 5 and 23 on day 6 post operatively.

No patients reported a history of sleep disorders or of chronic sleep disturbances other than reduced sleep due to pain. There was no significant difference in the mean number of hours of sleep before and after surgery (Table 1). In the postoperative period, however, the patients reported more sleep during the daytime and afternoon.

Night-time sleep at hospital was more disturbed post-operatively when compared to the preoperative night. Patients reported waking up a median of 5 times in the first postoperative night, compared to a median of 3 times preoperatively ( $p = 0.01$ ).

A number of factors disturbing nocturnal sleep were cited by patients (Table 2). Pain was identified as the predominant factor, with 48.0% and 47.7% of patients giving this as the main reason for their interrupted sleep (this was quantified using a standard numerical 1–10 score) in the first and second post operative days respectively. Environmental factors were identified as significant factors disturbing patients' sleep over the course of the study. These factors included noise and disturbances from other patients, and nursing staff.

Analgesia was taken by more than 90% of patients in the first two postoperative days, this number decreasing over time. A much lower percentage of patients used night sedation over the course of this study (Fig. 1).

## 4. Discussion

The aim of this prospective study was to identify those factors that disturb nocturnal sleep in postoperative patients in general surgical and orthopaedic wards. These patients underwent major abdominal and orthopaedic surgery and were nursed in general orthopaedic or surgical wards. It is hoped that identifying these factors in a surgical ward in particular as opposed to ITU would allow for intervention methods to be developed to help aid patient sleep in the ward setting to be formulated with future studies.

Although there was no significant difference in the total number of hours slept in a 24 h period before and after surgery, we observed that postoperatively the patients were sleeping more in the daytime and afternoon. This disturbance in the circadian sleep rhythm has also been observed by Gogenur et al. in their study on patients undergoing cholecystectomy [7].

Preoperatively, with the patient at home, pain was the main factor responsible for sleep disturbance at night (Table 2). Often patients were not taking adequate analgesia at home which exacerbated this problem. The need to use toilet facilities was also a main contributing factor. Postoperatively however, this pattern changed. Pain was the predominant factor yet again, although environmental factors became more apparent. These factors include disturbance from nursing staff and noise; unsurprising given that these patients were nursed within bays typically accommodating between 4 and 6 patients. Additional factors such as need to use the toilet decreased post-operatively, possibly due to postoperative sedation or the use of urinary catheters.

The presence of pain as an important factor in both the pre and post operative periods is an interesting finding. It is to be expected particularly in orthopaedic patients who are having elective joint replacement for severe arthritis with associated resting pain. However this should not be used as a means to discount the importance of post operative pain control and its impact of patients sleeping patterns [11]. While there is a change in the type of painful stimulus, the initial cause of the joint pain has been removed and our ability to manage post operative pain is essential to aid patients' recovery.

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