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What prevents patients sleeping on an acute medical ward? An actigraphy and qualitative sleep study

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ABSTRACT

Objectives: Poor and fragmented sleep is a common problem amongst patients hospitalized on medical wards, and is associated with a number of poor outcomes. The present study aimed to objectively measure night-time sleep duration and efficiency in an acute medical ward, and to identify barriers to sleep in this setting.
Methods: Fifty-four consecutive patients on an acute medical ward were observed with wearable actigraphy devices for one night, then administered the Richards-Campbell Sleep Questionnaire and a semi-qualitative questionnaire to determine the major barriers to sleep.
Results: Patients had a wide variety of reasons for admission. Mean overnight sleep duration was 4.6 hours, with mean sleep efficiency 63%. The Richards-Campbell Sleep Questionnaire mean was 52/100, indicating poor quality sleep. Major barriers to sleep identified were the need to urinate, pain, noise, and light.
Conclusions: A mixture of environmental and illness-related factors contribute to poor sleep in the hospital setting. Further research looking at ameliorating these factors may improve sleep and recovery in this population.

Introduction

Poor sleep is common amongst individuals hospitalized for medical problems. One study measured insomnia rates at 37% of hospitalized inpatients, with a correlation between insomnia and higher scores on the Hospital Anxiety and Depression Scale[1] that likely reflects a bidirectional relationship. In addition to this correlation, poor night-time sleep leads to daytime tiredness and somnolence that interferes with medical rehabilitation,[2] can lead to hyperalgesia,[3] promotes delirium,[4,5] and is associated with poor quality of life following an acute episode of illness.[6] Despite this, usual clinical assessment with admitted inpatients often omits questions about sleep and thus problems are not detected.[7] There are few studies in this patient population that utilize objective measures such as actigraphy in determining sleep duration and efficiency; however, in our experience, subjective measures of sleep duration such as sleep diaries have been difficult to use in patients with acute medical illness.

There are many causes for poor sleep in hospital. These can be loosely divided into patient factors (such as pre-existing sleep disorders or patient attitudes about sleep), illness factors (such as pain, breathlessness, itch, the circadian rhythm disturbance of delirium) and hospital environmental factors (such as ambient light and noise). While some of the illness-related factors are best managed by treating the underlying condition, these other factors could lend themselves to further intervention.

The aim of this cross-sectional study was to objectively measure the amount of sleep gained by hospital inpatients on a general medical ward with the aid of actigraphy, and to measure sleep quality and barriers to sleep in order to find potential targets for intervention.

Methods

Recruitment

Participants were recruited from inpatients admitted to the Medical Assessment Unit ward at Wollongong Hospital (New South

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Wales, Australia) aged 18 years or over. This ward is a 30-bed short-stay medical admissions ward where acutely unwell medical patients are admitted after their initial assessment in the Emergency Department, containing four-bedded rooms for the majority of patients, as well as some single rooms for those with special needs (behavioral disturbance, infection control risk, etc). Potential participants were approached for information and consent as soon as possible following admission from day two of admission onward (to enable potential participants to settle into ward routine). Exclusion criteria were the inability to consent for any reason, determined by interview during approach for the study, including dementia, delirium or other confusional state (detected by clinical interview and bedside cognitive screens such as the Folstein Mini-Mental State Exam), as well as any level of English language skills deemed insufficient to fully understand the written materials.

Intervention

Participants wore a Bodymedia Sensewear actigraphy armband (Bodymedia Inc., Pittsburgh, Pennsylvania), which has previously been shown to accurately measure sleep duration and sleep efficiency in clinical populations.[8] The actigraphy monitors were placed on patients in the late afternoon (approximately 4 pm) and removed in the morning at 9 am. They have a dual-axis accelerometer, as well as a heat flux sensor, a galvanic skin response sensor, a skin temperature sensor, and a near-body ambient temperature sensor, which are used to automatically calculate several physiological measures (using proprietary algorithms from the manufacturer). For the purpose of this study, only the sleep-related measures (ie, sleep duration and sleep efficiency (time spent asleep as a proportion of total time laying down)) are reported. Although the majority of time spent in hospital is in bed and laying down, it is important to note that the Sensewear armbands multiple sensor array is able to differentiate such sedentary activity from sleep.[9] They then continued their normal routine on the medical ward overnight—this included an evening meal at 6 pm, and lights out at 10 pm (patients have their own lights for reading they could use after this time). Lights came on again at 6:45 am. Overnight routines include observations dictated by medical need, with nursing staff using personal torches for observations or response to nursing call bells (with the bells a source of significant noise, according to staff and patients).

After wearing the device overnight, two linked questionnaires were administered—the Richards-Campbell Sleep Questionnaire (5-question Likert scale on quality of sleep, validated in medical and critical illness settings)[10] and a research team-devised semi-qualitative questionnaire to determine any impediments to sleep (asking about specific elements that interfered with sleep such as pain, urination, heat/cold, shortness of breath, noise, light, etc). The patient medical record was also checked for admission reason and for any use of sedative hypnotics (or medications with prominent sleep-promoting side effects).

Data analysis

Outcome measures were the mean total sleep duration and sleep efficiency as derived from the Sensewear armband data, the mean score on the Richards-Campbell Sleep Questionnaire, and responses on the semi-structured qualitative questionnaire. Summary statistics were produced.

Ethical approval

Ethical approval was gained from the UoW/ISLHD Combined HREC (AURED#: HREC/17/WGONG/74).

Results

Fifty-four participants were recruited (mean age 70.5 years (SD 17), 48% female). Their admission reasons varied considerably, and included common medical admission indications—the most common were respiratory disorders such as exacerbations of chronic obstructive pulmonary disease and pneumonia (comprising 37% of admissions cumulatively), with the remainder including congestive heart failure, investigation for syncope, medical detox for alcohol dependence, pyelonephritis and others. These are detailed in Table 1.

Mean actigraphy-based sleep duration overnight was 4.7 hours (SD 2.8 hours), with mean sleep efficiency 63% (SD 20%) based on the ward routine lights-out to lights-on. The only individual who reported good sleep had been admitted for benzodiazepine-assisted alcohol detoxification (their sleep duration was 7 hours, efficiency 83%). The mean score on the Richards-Campbell Sleep Questionnaire was 52/100, with a lower score indicating worse quality sleep. Hypnotics were prescribed in 15/54 (28%) admitted patients, with a mixture of benzodiazepines, melatonin, low-dose tricyclic antidepressants and mirtazapine, with no significant differences in sleep duration or efficiency in this group (duration 5.1 hours, SD 2.4 hours; efficiency 67%, SD 17.5%).

The major barriers to sleep are noted in Fig. 1. The major concerns were needing to urinate (50% of respondents), too much noise (43%), shortness of breath/cough (31%), with other causes such as light, pain, nausea and temperature concerns all being endorsed less frequently.

Discussion

The results of this study indicate that poor sleep is endemic overnight in medical wards, with mean total sleep time (278 minutes) in this acute setting worse than seen in a recent study into a similar acute ward population (~500 minutes depending on group)[11] and comparable to some critical care population studies.[12] Illness factors and hospital environmental factors predominated in individual's self-declared barriers to sleep. While outcomes were not assessed

Table 1
Reasons for Admission to Medical Unit

Condition	Number of cases (n = 54)
Infective exacerbation of chronic obstructive pulmonary disease	11
Pneumonia	9
Congestive heart failure	3
Syncope	3
Urinary tract infection	3
Bacteremia	2
Pyrexia of unknown origin	2
Anemia	2
Seizure	2
Limb cellulitis	2
Pyelonephritis	2
Headache	1
Alcohol detoxification	1
Asthma	1
Chest pain	1
Vasculitis	1
Acute renal failure	1
Dehydration	1
Constipation	1
Ureteric obstruction	1
Gout	1
Diarrhea	1
Pneumothorax	1
Encephalitis	1

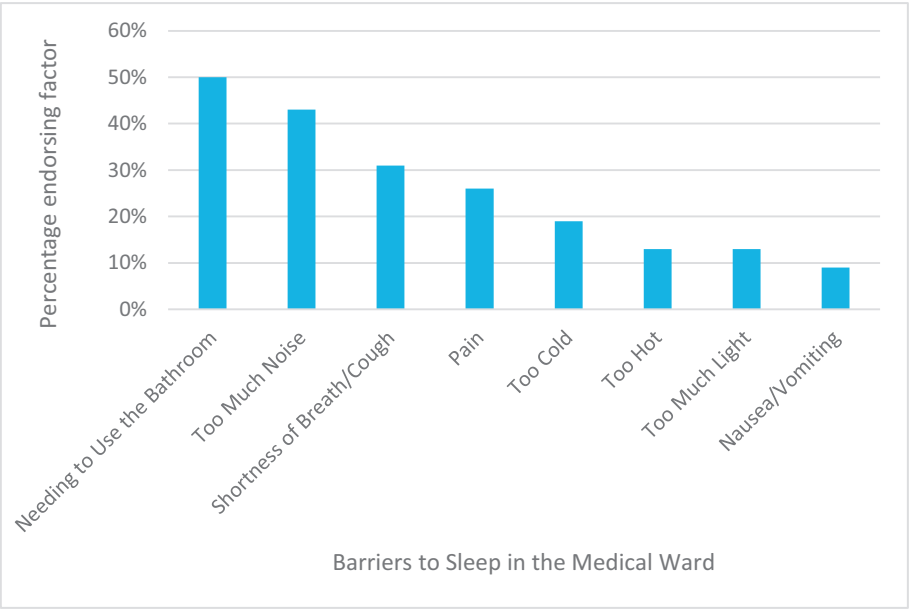

Fig. 1. Barriers to sleep in the acute hospital setting.

in this study, as discussed earlier poor sleep in this population is likely to lead to problems with pain, increased rates of delirium and slowed recovery. There is also evidence that sleep post-hospitalization is also impaired,[13,14] likely leading to further health problems in the longer term.

The most common barrier to sleep was the need to urinate. Potential causes for this problem include pre-existing or presenting genitourinary pathology (although only 3/54 individuals had a urinary tract infection as their admission reason). Another likely cause is the presenting medical problem causing immobility, making independent toileting impossible. There may also be iatrogenic factors such as use of diuretics (particularly in the latter part of the day), as well as poorly timed maintenance IV fluids that are often charted to run continuously over 24 hours despite NICE guidelines.[15]

Noise, temperature and light were the most important environmental contributors, and this is similar to the results seen in studies from the ICU environment.[16] While the subjects in this cohort did not specifically cite night-time nursing and medical interventions such as blood pressure monitoring or venepuncture, this has been mentioned in other studies and is a potential focus for intervention.[17]

Other potential interventions to improve these include use of earplugs[18] as well as staff education[19] in the critical care environment, and eye masks in coronary care environments.[20] There may also be a role in prioritizing single-patient rooms in the design of future medical wards, a measure already being considered for its potential infection-control benefits. To date, there are few studies of sleep in a medical ward, non-critical care environment, and only a few studies that examine a suite of measures such as interventions into nursing staff routines,[21] rather than a single intervention to reduce the impact of environmental disturbances to sleep.

This study has a number of limitations. Due to its cross-sectional nature, it is difficult to determine whether sleep patterns normalize or worsen throughout the course of a longer hospitalization. Similarly, the choice of an acute medical ward for this study means these results may not generalize to wards with less acute presentations (such as medical rehabilitation wards). We did not assess daytime sleep, but would expect that this would be prevalent in patients attempting to 'catch up' from a poor night. The actigraphy devices used in this study did not allow for more granular measurement of sleep such as sleep bouts or other measures of fragmented sleep, and the use of the Sensewear proprietary algorithms are less reproducible than the use of a more comprehensive measure of sleep such as polysomnography – the latter is difficult to implement at research scale in a medical ward environment.

Conclusion and recommendations

This area of research is underserved and has the potential for intervention trials looking at altering environmental factors such as noise and light in ward environments, as well as auditing use of diuretics and IV fluids. The results of this study support efforts made to look at modifying hospital environmental factors, but future intervention studies that utilize objective measurement via polysomnography (difficult in acutely unwell patient groups) or actigraphy, including 24-hour or entire hospital admission duration measurements, will have more scope for measuring improvements in sleep duration and efficiency.

Due to the large number of potential barriers to sleep in hospital, it is likely that effective interventions will involve a number of measures in tandem. The robust links between poor inpatient sleep and medical outcomes already discussed suggest that such measures may produce significant benefits in recovery times, length of stay and mood symptoms within hospital, and these could potentially be outcome measures in future studies.

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