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# Sleep patterns as a predictor for length of stay in a psychiatric intensive care unit



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## ABSTRACT

Systematic evaluations of the relationship between sleep patterns and length of stay in psychiatric intensive care units (PICUs) are lacking. The aims of the present study were to explore if sleep duration or night-to-night variations in sleep duration the first nights predict length of stay in a PICU. Consecutive patients admitted to a PICU were included ( $N=135$ ) and the nurses registered the time patients were observed sleeping. In the three first nights, the mean sleep duration was  $7.5 (\pm 3.2)$  h. Sleep duration the first night correlated negatively with the length of stay for patients with schizophrenia. The mean difference in sleep duration from night one to night two were  $3.3 (\pm 3.0)$  h and correlated with length of stay for the whole group of patients, but especially for patients with schizophrenia. Patients of all diagnostic groups admitted to a PICU had pronounced intra-individual night-to-night variations in sleep duration. Stabilizing night-to-night variations of sleep duration might be a major goal in treatment.

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## 1. Introduction

Normalization of sleep is an important goal in acute psychiatric treatment, but systematic evaluations of the relationship between sleep patterns and length of stay in psychiatric intensive care units (PICUs) are lacking.

In the hospital of the present study, the PICU is a part of the closed acute psychiatric in-patient ward. In the PICU patients with the most disturbed behaviour and severe symptoms are treated, and there is a low patient/ staff ratio. The patient's behaviour and symptoms, including sleep are daily registered as a part of the ordinary clinical practise. To promote sleep there are fixed points in time for eating, activity and sleep in the PICUs. Patients are usually transferred from the PICUs after improvement in symptoms, function and behaviour. Different levels of segregation are used, a treatment method supposed to have effects through control of sensory and emotional stimuli (Hodgkinson, 1985; Vaaler et al., 2011). In addition to pharmacological treatment, the therapeutic milieu in PICUs is organized to manage challenging behaviours. One might expect that sleep is normalized and that length of stay is a parameter indicating the global effects of the interventions.

Among outpatients with schizophrenia and bipolar disorder,

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increasing night-to-night variations in sleep duration seem to correlate with symptom severity (Gruber et al., 2011; Waters et al., 2011). In bipolar disorder a large mood change is imminent if variation of sleep duration from one night to the next night is more than 3 h (Bauer et al., 2006). Thus, out-patients with severe mental disorders may have large night-to-night variations in sleep, especially in episodes of exacerbation of their illness. Descriptions of night-to-night variations in sleep duration among acutely admitted inpatients are needed both for better monitoring of the status of patients and possible refine treatment interventions.

The aims of the present study were to explore if sleep duration a single night or night-to-night variations in sleep duration the first nights predict length of stay in the PICU. We also wanted to compare sleep duration and night-to-night variations in sleep duration among patients with schizophrenia, mania and other disorders in a PICU.

## 2. Methods

In this study sleep duration were registered for all inpatients admitted to the PICU at the university hospital.

The Østmarka Psychiatric Department, St Olavs University Hospital, had a catchment area of 140,000 inhabitants from both the city of Trondheim (50%) and the rural areas (50%) in Sør-Trøndelag County at the time of the study. About 700 inpatients above 18 years were admitted each year. Acute admissions to other psychiatric hospitals occurred only when inhabitants temporarily

resided outside the catchment area. Norwegian acute psychiatric services are public and available to everyone.

The patients were admitted to the one of two closed acute wards with most free capacity. These wards consisted of an ordinary ward area and a PICU area. The PICU was used for containment of the most behaviourally disturbed patients. The patients were admitted to the PICU after assessment from the physician taking into account function, symptoms and behaviour. The therapist in the ward discharged the patients from the PICU after evaluating the patient's, no written criteria for admittance or discharge existed (Vaaler et al., 2006). The PICU consisted of two separate wings with sitting room, bathroom, toilet and two single patient rooms. The patients in the PICU were segregated together with staff, and expected to stay in their rooms and sleep between 22.30 and 7.30. The patients were encouraged to come to breakfast at 8.30 and to avoid daytime napping. The patients received treatment as usual including pharmacological treatment.

In one ward all patients admitted to the PICU in two periods of 4 and 5 months and in the other ward all patients admitted to the PICU in a period of 6 months, were included in the study. All patients who stayed at least one night were included. One patient was excluded due to severe dementia. Patients with multiple admittances were only included once.

### 2.1. Diagnostic groups

Diagnoses according to ICD-10 diagnostic criteria for research (WHO, 1993) were set in a weekly consensus meeting in the department's staff including the patient's therapist and at least two psychiatrists of whom at least one had personally examined the patient.

The patients with main or secondary diagnosis from F20 to F29 were defined as patients with schizophrenia. The patients with main or secondary diagnosis from F30 to F31.2 were defined as patients with mania. Patients with schizophrenia and mania dominated among patients with a long stay in the PICU and were compared to the rest of the patients defined as other disorders.

### 2.2. Sleep registrations

The time patients were observed to sleep was registered in a separate sleep diary and in the medical records by the nurses in the PICU. The nurses observed the patients at least every 30 min, often more frequently. The sleep diary consisted of a column for each 24 h and a square for each 30 min. The sleep duration in a day were defined as observed sleep from 12 a.m. to 12 a.m. Sleep registrations started the first night after admission and continued until discharge.

### 2.3. Variations in sleep duration were defined in three variables, absolute values were used

1. The differences in sleep duration between two nights. 2. The differences between the night with the longest and the night with the shortest sleep duration, A; among the three first nights and B; among the seven first nights (Gruber et al., 2011). 3. The patients were also divided in those with more and those with less than 2.5 h differences in sleep duration between the first and the second nights. The 2.5 h where chosen due to observations by Bauer (Bauer et al., 2006), that the frequency of new mood episodes increased with a three hour or more variation in length of sleep.

### 2.4. Statistics

Statistical analyses were performed using SPSS 21.0 for MAC. Categorical data were analysed with chi-square tests. Normally

distributed data were analysed with Students *t*-test or ANOVA and data not normally distributed were analysed with non-parametric tests. Data were expressed as mean and standard deviations (SD) unless otherwise noted. The significance level was set at  $p < 0.05$  (two tailed). The sample size was not calculated before the study started, previous studies could not give an estimate of results and the included number of patients was based on the capacity of the department.

### 2.5. Ethics

The study was approved by The Regional Committee for Medical and Health Research Ethics, Central Norway.

## 3. Results

### 3.1. Description of the sample

In the study 135 patients, 61 females and 74 males, representing 949 nights were included. There were missing data on 12 nights. A description of the patients is given in Tables 1 and 2. Median nights per admission were 3 (min 1, max 77, mean 7.0). More patients with other psychiatric disorders than schizophrenia or mania were discharged after one night and had shorter lengths of stay than patients with schizophrenia or mania (Table 2).

### 3.2. Sleep duration

Distribution of sleep duration for night one, two and three for all patients are demonstrated in Fig. 1. Sleep duration the first ( $6.9 \pm 3.1$  h), second ( $8.0 \pm 3.3$  h) or third ( $8.1 \pm 2.9$  h) night did not differ between patients with schizophrenia, mania and other disorders (Table 3). Sleep duration the first night did not differ between patients discharged after one night (mean  $7.5 \pm 2.8$  h) and patients that stayed for more than one night (mean  $6.7 \pm 3.2$  h).

### 3.3. Night-to-night variations in sleep duration

Night-to-night variations in sleep duration are given in Table 3. In the whole sample, the mean absolute difference in sleep duration from night one to night two were  $3.3 (\pm 3.0)$  h and from night two to night three  $2.8 (\pm 2.6)$  h. The mean difference between the night with the longest and the night with the shortest sleep duration the three first nights was  $4.7 (\pm 3.5)$  h and the mean difference between the night with the longest and the night with the shortest sleep duration the seven first nights was  $7.1 (\pm 3.7)$  h for the whole sample, with no significant differences between the three groups of patients.

**Table 1**

The number of patients and number of nights in a psychiatric intensive care unit distributed on main diagnostic groups.

	Diagnostic groups	Patients	Nights
	All	135	949
<b>F00–09</b>	Organic mental disorders	11	64
<b>F10–19</b>	Substance abuse	27	61
<b>F20–29</b>	Schizophrenia	49	563
<b>F30–39</b>	Mood disorders	28	190*
<b>F40–99</b>	Anxiety, personality and development disorders	20	71

\* F30–31.2 Mania: 11 Patients and 107 nights

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