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Sleep improvement intervention and its effect on patients' sleep on the ward

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Abstract

Aim and objective: The aim of the study was to investigate how the sleep improvement interventions developed for the wards were associated with patients' sleep. The objective was to promote patients' sleep.

Background: The quality of sleep is vital for patients' health and recovery from illness. However, patients generally sleep poorly during hospitalisation. Sleep-disturbing factors are connected to the hospital environment, patients' physical illness, emotional state and the activities of the staff. Many sleep-disturbing factors can be influenced by appropriate nursing interventions.

Design: A two-group intervention study including the development of nursing interventions aimed at supporting patients' sleep. One group received a sleep promotion intervention and the other received standard care. Both groups evaluated their sleep in the morning.

Methods: A survey of participants' sleep evaluations was collected with the five-item Richards-Campbell Sleep Questionnaire. The data were analysed statistically. The STROBE checklist was used to report the study.

Results: From the participants' perspective, sleep was better in the intervention group, even though statistically significantly only among men. The pain intensity correlated with sleep quality. The number of patients in the room or whether participants had had an operation had no effect on their sleep evaluations.

Conclusions: Interventions targeted at supporting and promoting the sleep quality of hospital inpatients may be effective. They should be developed in collaboration with patients and nurses. Several nursing interventions can be proposed to promote better sleep among patients; however, more research is needed to confirm the results. Sleep promotion should include both standardised protocols and individualised sleep support.

Relevance to clinical practice: Investing in nursing interventions to promote patients' sleep is important. Patients' individual sleep-related needs should be part of their care plan. Training programmes that support nurses' knowledge and skills of patients' sleep promotion should be part of nursing education in healthcare organisations.

1 | INTRODUCTION

The quality of sleep has considerable significance for patients' health and recovery from illness. Both physical and psychological well-being are affected by decreased sleep quality, and poor sleep is associated with a variety of health issues, such as inflammation (Buysse, 2014; Irwin, 2015), increased activity of the sympathetic nervous system and various metabolic effects (Delaney et al., 2015). The short-term consequences of poor sleep may include increased stress response, pain, emotional distress, mood disorders, as well as cognitive, memory and performance deficits (Medic et al., 2017), all likely to lengthen the recovery process. Existing evidence suggests that patients sleep poorly during hospitalisation (Delaney et al., 2018; Gellerstedt et al., 2014; Morse & Bender, 2019). It is well known that hospital wards are not ideal places for resting, and the poor quality of sleep during hospitalisation may even lead to further sleep problems at home (Bernhofer et al., 2014; MacFarlane et al., 2019). Many sleep-disturbing factors in the hospital setting are of such nature that they can be influenced by appropriate nursing interventions, such as clustering night-time care and reducing environmental noise (Smith & Grami, 2017). More knowledge is needed about how to support patients' sleep on hospital wards and how different nursing interventions affect patients' sleep quality.

2 | BACKGROUND

Various factors affect patients' sleep quality on hospital wards (Wesselius et al., 2018). The factors that hamper sleep are connected to the hospital environment, patients' physical illness, emotional state and the activities of the staff on the ward (Delaney et al., 2018; Gellerstedt et al., 2014; Wesselius et al., 2018). The strange and noisy environment (Delaney et al., 2018; Nasari et al., 2018; Yoder et al., 2012), light (Bernhofer et al., 2014; Giménez et al., 2017) and treatments and nursing care at night (Delaney et al., 2018; Hultman et al., 2012) may disturb patients' sleep. Routine offering of eye masks and earplugs to patients on hospital ward has improved sleep quality (Sweity et al., 2019). However, changing the sound and light environment has been more effective (DuBose & Hadi, 2016). Silence and nature sounds can promote sleep among patients on hospital wards (Nasari et al., 2018).

What does this paper contribute to the wider global community?

- Poor sleep quality and lack of sleep are common, yet often ignored problems of hospitalized patients even though good quality sleep is important for the recovery of both the body and mind.
- Reasons for patients' poor sleep quality are multifaceted, originating from the environment, care, and patient's condition.
- Nurses are the key players in promoting patients sleep, thus knowledge about the effects of disturbed sleep and how to promote sleep is vital.
- Nurses and patients should work together in developing a variety of general and individualized sleep promotion methods.

Symptoms of the illness may worsen sleep quality. Patients can experience both physical and psychological discomfort. (Doping et al., 2016) The discomfort, such as pain (Doping et al., 2016; Wesselius et al., 2018) and respiratory symptoms (Lou et al., 2017), can impair the quality of sleep. Pain has been associated with the greatest sleep loss, in contrast to vital signs, tests and noise, for example (Grossman et al., 2017; Kulpatcharapong et al., 2020; Thomas et al., 2012). Patients' pain should be assessed systematically and treated proactively to promote rest and sleep (Grossman et al., 2017).

Patients may worry about the uncertainty of their health situation. They may suffer from emotional stress and anxiety which prevents restful sleep. (Gellerstedt et al., 2014; Grossman et al., 2017; Lane & East, 2013). Worrying thoughts may deprive patients of sleep at night. Patients' concerns should be approached and discussed already in the daytime (Salzmann-Erikson et al., 2016).

Patients need care also at night (Fafara et al., 2018). Thus, nurses visit patients' rooms, and they need light to carry out treatments and care. Discussions with patients may also be necessary. These actions may disturb not only the patient in question but other patients in the room as well. (Grossman et al., 2017). Unnecessary movement in patients' rooms should be avoided at night. Likewise, nurses should only perform the required nursing activities during the night. (Casida

et al., 2018; LaReau et al., 2008). Rooms should be darkened and room temperature adjusted for good sleeping conditions, and if necessary, the TV should be turned off for the night (Thomas et al., 2012).

The effects of different non-pharmacological sleep promotion methods have mostly been studied in ICU settings (Cooke et al., 2020). Aparicio and Panin (2020) found four studies performed in acute ward setting and concluded that only light conditions and the use of sleep medications varied between ICUs and acute wards. A multi-component sleep promotion protocol including the control of the environment, minimisation of care interventions and a sleep hygiene teaching session has proven to be feasible (Gathecha et al., 2016). Individualised sleep promotion based on the assessment of the patient's sleep disturbing factors with a FAIS scale has been suggested to improve sleep in hospital (Ye et al., 2019) and evidence-based instructions on how to promote patients' sleep have been published (Gilsenan, 2017). However, the evidence of the effect or usefulness of either sleep promotion method is lacking. Patient participation in the development of sleep promotion interventions has been limited to identification of sleep disturbing factors, instead of sleep promotion. Patients' perceptions on how to promote sleep may give new insights into the problem, as many factors affecting quality of sleep are highly personal, such as patients' condition, sleep habits and the anxiety level (Delaney et al., 2018; Gellerstedt et al., 2014; Wesselius et al., 2018).

Nurses have an important role in supporting patients' sleep (Alparslan et al., 2016; Salzmann-Erikson et al., 2016). Therefore, it is vital to evaluate patients' sleep quality (Hoye et al., 2014) and define which nursing interventions can promote the quality of patients' sleep on hospital wards (Morse & Bender, 2019; Salzmann-Erikson et al., 2016).

The objective of the study was to investigate how the sleep improvement interventions developed for the wards were associated with patients' sleep and consequently, promote patients' sleep.

3 | METHODS

3.1 | Design

The study was a two-group intervention study including the development of nursing interventions to support patients' sleep quality. The data were collected from four wards: a 46-bed surgical, 19-bed neurological, 20-bed pulmonary and 25-bed medical ward in an acute care hospital.

3.2 | Intervention development

The intervention was created based on earlier research findings, patient interviews and workshops for nurses. First, we conducted a scoping review of the factors related to inpatients' quality of sleep. Second, we interviewed patients on the four hospital wards

that participated in the study. We asked patients to tell which factors impair sleep and which factors would improve sleep on the ward (Heino et al., 2020). Third, we organised four workshops with nurses on each participating ward. The nurses reflected on the challenges of patients' sleep on the wards and how they could support patients' sleep quality. One researcher (MH) acted as a moderator in the workshops where six areas of sleep-disturbing factors were identified: (i) pain and other symptoms of the illness, (ii) discomfort related to the nursing interventions, (iii) hospital environment and round-the-clock activities on the ward, (iv) patient room as sleeping environment, (v) fear, worry and uncertainty; and (vi) disturbance of the circadian rhythm (Table 1). Nursing procedures for all six areas were developed and instructions for nurses were prepared. The instructions were reviewed and discussed with the ward nurses before the implementation of the intervention to ensure the feasibility of the intervention on every ward. Procedures were individualised to each ward based on the discussions with the nurses.

3.3 | Instrument and data collection

Participants were recruited from four wards at a 400-bed acute care hospital. The inclusion criteria were: adult patient (at least 18 years), able to speak and write Finnish, had slept two nights on the ward, was oriented and able to answer the questions and use the visual analogue scale (VAS).

Participants ($n = 105$) for the standard care group were recruited from March to August 2017. The intervention was implemented in autumn 2017. When the nurses had used the intervention protocol for at least three months, another set of participants ($n = 104$) were recruited to the intervention group on the same wards, using the same inclusion criteria as before, in spring 2018.

The Richards-Campbell Sleep Questionnaire (RCSQ) was used to measure the sleep quality of the eligible patients. The RCSQ is a five-item visual analogue scale to evaluate perceived sleep by five domains: sleep depth, falling asleep, number of awakenings, percentage of time awake and quality of sleep. Participants evaluated each item on a VAS scale of 0–100 mm, where 0 indicates the poorest sleep quality and 100 indicates optimum sleep quality. (Richards et al., 2000). The Finnish version of the RCSQ (Ritmala-Castrén et al., 2014) was used. The participants answered by drawing a mark on the scale. If the participant was not able to do this her/himself, a researcher would mark the point on the scale indicated by the participant.

The RCSQ has been widely used, particularly to determine critically ill patients' sleep quality (e.g., Aitken et al., 2017; Missildine et al., 2010; Nasari et al., 2018; Ritmala-Castrén et al., 2014). Earlier, the instrument has been found to be valid. Its reliability has been good, with the Cronbach's alpha coefficient varying from 0.82 in the study of LaReau et al. (2008) to 0.96 in the study of Nasari et al., (2018). In our study, the Cronbach's alpha was 0.90 at the measurement of the standard care group and 0.89 at the measurement of the intervention group.

Areas of sleep disturbing factors	Alleviating nursing procedures (examples)
Pain and other symptoms of the illness	Anticipate the care of symptoms Relieve pain effectively
Discomfort related to the nursing interventions	Work as quietly as possible at night Relieve discomfort caused by being without nourishment
Hospital environment and round-the-clock activities on the ward	Answer patient call quietly Admit new patients quietly
Patient room as sleep environment	Plan patients' placing to support sleep Darken the sleep environment
Fear, worry and uncertainty	Provide a safe and peaceful environment Encourage patients to discuss the matters that trouble them
Disturbance of the circadian rhythm	Regulate the brightness of the room according to the circadian rhythm Provide activities for the patients in the daytime

TABLE 1 Identified areas of sleep-disturbing factors and examples of alleviating nursing procedures focusing on these factors

The background characteristics were collected as follows: gender, age, type of ward, number of patients in the room, surgical treatment during the hospitalisation, use of sleep medication at home, use of nervous system medication including sleep medication at night on the ward and pain intensity during the night. Pain intensity was measured with a 0–10 cm VAS scale, where 0 represented no pain and 10 represented the strongest imaginable pain.

3.4 | Analysis

The data were analysed statistically. Frequencies and percentages were used to describe the background data. Sleep index was calculated as a mean of the five items of the RCSQ (Richards et al., 2000). The quality of sleep was described with median (MD), interquartile range (IQR), minimum and maximum of each domain and the sleep index of both group measurements. The normality of study variables was tested using the Kolmogorov–Smirnov test. The differences in the background characteristics between the standard care and the intervention group were explored using the Chi-square test. The differences between the standard care and the intervention group measurements of sleep and pain evaluations were tested with the non-parametric Mann–Whitney U-test because of the skewness of the results. Correlations of pain and sleep evaluations were tested with Spearman's rho. Differences between male and female participants' sleep evaluations in the standard care and the intervention group were tested with Mann–Whitney U-test. A significance level of <.05 was used to determine statistical significance. Data analysis was performed using the IBM SPSS Statistics version 25.0 (IBM Corp.).

3.5 | Ethical considerations

This study received ethical approval from the local ethics committee on 15 November 2016. The permission to conduct the study was obtained from the hospital authorities (Decision 5/2017, Satakunta Hospital District/114/13012017). The permission to use the RCSQ was received from the developer of the instrument (e-mail K. Richards/MRC, August 12, 2016). All the participants consented in writing to participate in the study and were free to withdraw from the study at any time during the process. The participants received information about the study both verbally and in writing. Privacy, confidentiality and anonymity were ensured throughout the process. (European Commission, 2013; Finnish National Board on Research Integrity, 2019). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement checklist (Supplementary File 1) was used to report the study.

4 | RESULTS

The standard care group had 105 and the intervention group 104 participants. No significant differences were found between the two groups' demographics (Table 2).

Participants' sleep evaluations were consistently, albeit not statistically significantly, slightly better in each RCSQ domain in the intervention group (Table 3). The mean sleep index was 58 mm (SD 25.3 mm) in the intervention group and 53 mm (SD 25.0 mm) in the standard care group. The intervention group rated their quality of sleep highest in the domains of falling asleep in the evening and the number of awakenings. The standard care group's highest evaluations were in the domains of falling asleep in the evening and again during the night.

No association was found with gender and sleep in the analysis of the whole data. However, the subgroup analysis indicated that the male participants in the intervention group evaluated the overall quality of sleep as better than the male participants in the standard care group (Table 4). Also, the sleep index was better in the male participants in the intervention group. No correlation was found with the sleep evaluation results and room size, the number of patients in the same room, if the participant had had an operation or had received nervous system medication, including sleep medication.

TABLE 2 The background characteristics of the standard care group and the intervention group

	Standard care group, n = 105 n (%)	Intervention group, n = 104 n (%)	p value
Gender			.367
Female	53 (50.5)	46 (44.2)	
Male	52 (49.5)	58 (55.8)	
Age			.130
Under 60 years	42 (40.0)	40 (38.5)	
60 years and over	63 (60.0)	64 (61.5)	
Ward			.880
Pulmonary	26 (24.8)	27 (26.0)	
Medical	27 (25.7)	26 (25.0)	
Neurology	26 (24.8)	21 (20.2)	
Surgery	26 (24.8)	30 (28.8)	
Patients in the room			.649
One or two	34 (32.4)	39 (37.5)	
Three	48 (45.7)	40 (38.5)	
Over three	23 (21.9)	25 (24.0)	
Surgical treatment			.204
Yes	27 (25.7)	32 (30.8)	
No	78 (74.3)	72 (69.2)	
Sleep medication at home			.717
Yes	24 (22.9)	26 (25.0)	
No	81 (77.1)	78 (75.0)	
Nervous system medication, incl. sleep medication at night on the ward			.820
Yes	42 (40.0)	40 (38.5)	
No	63 (60.0)	64 (61.5)	
Pain at night			.113
No pain or slight pain	62 (59.0)	71 (68.3)	
Moderate pain	22 (21.0)	21 (20.2)	
Strong or the strongest pain	21 (20.0)	12 (11.5)	

Participants evaluated their pain intensity on a VAS scale of 0–10 cm as 2.23 cm on average (SD 2.16, min 0.00, max 8.30) in the intervention group and 2.78 cm (SD 2.59, min 0.00, max 9.80) in the standard care group. Despite the lower numbers in the intervention group, the difference was not statistically significant. Pain correlated strongly with sleep evaluations; the less pain the participants experienced, the better they evaluated their sleep in both groups together ($r = -.239$, $p < .001$). Subgroup analysis showed a correlation in the intervention group ($r = -.304$, $p = .002$) but not in the standard care group ($r = -.165$, $p = .093$).

5 | DISCUSSION

The objective of the study was to promote patients' sleep by investigating how the sleep improvement intervention developed for the wards is associated with patients' sleep. Our main finding was that

there were no significant changes in the sleep quality in the studied wards after the clinical intervention. However, the quality of sleep of the participants in the intervention group was consistently slightly better than in the standard care group in all measured areas except in the domain of falling asleep again. The non-significant yet systematic differences may be partially explained by the somewhat large distribution of the responses. Patient experiences are always personal and unique; thus, it may be difficult to demonstrate the effect of a sleep intervention that contains mainly general means focused on all patients on the ward.

Our results show that the intervention was somewhat effective on male participants, yet not on females. Further research is required to determine if different sleep promotion interventions should be offered, not only on individual basis but also by gender.

Our results suggest that the intervention group may have experienced falling asleep in the evening to be easier and the number of awakenings to be lower than the standard care group. Several

TABLE 3 Quality of sleep in the intervention group and the standard care group measured with the RCSQ instrument VAS scale 0–100 mm; 0 represents the poorest and 100 the best sleep

Sleep domain	Intervention group _n_ = 104		Standard care group _n_ = 105		MD difference	_p_ value
	MD (IQR) mm	Min/Max mm	MD (IQR) mm	Min/Max mm	mm	
Depth of sleep	50 (54)	1/100	45 (56)	0/97	5	.194
Falling asleep	73 (43)	2/99	68 (54)	0/98	5	.157
Awakenings	64 (49)	2/100	53 (47)	2/99	11	.255
Fall asleep again	60.5 (56)	1/100	62 (50)	1/99	−1.5	.623
Sleep general quality	60.5 (68)	1/100	49 (58)	1/100	11.5	.279
Sleep index	60.1 (44)	2/98	53 (39)	3/98	7.1	.222

Abbreviations: IQR, interquartile range; MD, median; RCSQ, Richards-Campbell Sleep Questionnaire; VAS, visual analogue scale.

TABLE 4 Quality of sleep by gender, measured with the RCSQ instrument VAS scale 0–100 mm; 0 represents the poorest and 100 the best sleep

Sleep domain	Male group MD (IQR) mm		_p_ value	Female group MD (IQR) mm		_p_ value
	Intervention	Standard		Intervention	Standard	
Depth of sleep	54.5 (52)	43 (51)	.090	46 (58)	47 (60)	.969
Falling asleep	70.5 (44)	59.5 (52)	.087	74.5 (41)	68 (51)	.641
Awakenings	75.5 (39)	56 (51)	.059	49.5 (49)	53 (40)	.565
Fall asleep again	74 (50)	62.5 (48)	.094	50 (63)	62 (52)	.292
Sleep general quality	74.5 (65)	47 (56)	.007	49.5 (63)	50 (61)	.250
Sleep index	65.4 (44)	51.5 (39)	.026	52.5 (37)	58 (42)	.587

Abbreviations: IQR, interquartile range; MD, median; RCSQ, Richards-Campbell Sleep Questionnaire; VAS, visual analogue scale.

interventions, such as decreasing light and noise and discussing patients' worries with them, were aimed creating at a safe and peaceful environment, which seems to have a positive effect on patients' sleep quality in these sleep domains. Likewise, paying special attention to pain assessment and treatment seemed to decrease the amount of experienced pain intensity during the night in the intervention group, even though not statistically significantly. In this study, the experienced pain intensity was strongly associated with sleep quality as has also been shown in previous studies (Grossman et al., 2017; Kulpatcharapong et al., 2020; Wesselius et al., 2018). The intervention had better effect on male than female participants. How to promote female patients' sleep requires more investigation.

In this study, the number of patients in the room did not affect the sleep evaluations. However, the use of private room was rare during the study, only 11 of the 209 participants, which might explain these results. Dobing et al., (2016) have shown the connection between a private room and longer sleep time. Furthermore, private rooms decrease environmental noise and thus provide better sleeping conditions.

We involved patients in the development of the interventions by collecting their perspective of what would improve sleep during hospitalisation. In earlier studies, the focus has been on patients' perspective of the sleep disturbing factors (e.g., Doping et al., 2016; Gellerstedt et al., 2014; MacFarlane et al., 2019). General assumption behind that may be that by removing these factors, patients' sleep would improve. However, we believe that sleep promotion should include different techniques to relax, calm and prepare patients for sleep, rather than merely the removal of the known disturbing factors.

We also involved all the nurses in the implementation process and enabled them to have a say on what interventions were appropriate for their ward. That was imperative to ensure their commitment to the sleep promotion interventions in practice.

One of the limitations in this study was the lack of data on the realisation of the interventions. Now, it is only known that several interventions were used per participant. Also, the sample size was rather small considering several different participating wards. However, the sample size was sufficient enough to show the difference in sleep measured with the RCSQ between the two groups, had there been one.

6 | CONCLUSION

This study suggests that interventions targeted at supporting and promoting the sleep quality of hospital inpatients may be effective. They should be developed in collaboration with patients and nurses. Several nursing interventions should be proposed to promote better sleep among patients; however, more research is needed to confirm the current results. Sleep promotion should include both standardised sleep protocols and individualised sleep support.

7 | RELEVANCE TO CLINICAL PRACTICE

Investing in nursing interventions to promote patients' sleep in hospitals is important. Patients' individual sleep-related needs should be part of their care plan. Training programmes that support nurses' knowledge and skills of patients' sleep promotion should be part of nursing education in healthcare organisations.

AUTHOR CONTRIBUTIONS

Study design: MRC, SS, AH, MH, HLL, MK; data collection: MH, AH, MK; data analysis: MRC, AH, MK; manuscript preparation: MRC, MK; critical commenting of the manuscript: SS, AH, MH, HLL.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.