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Clinical, psychological and environmental factors that affect sleep quality of in surgical patients

Fatores clínicos, psicológicos e ambientais que afetam a qualidade de sono do doente cirúrgico

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KEYWORDS
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ABSTRACT

Objective: To assess the quality of sleep among surgical inpatients and to determine the associated clinical, environmental, and psychological factors. **Method**: A cross-sectional observational study using descriptive correlation analysis was conducted on 150 surgical inpatients at a Portuguese hospital center. A sociodemographic and clinical questionnaire and the Pittsburgh Sleep Quality Index - Portuguese version (PSQI-PT) were administered. **Result**: Most participants seemed to experience poor sleep quality (PSQI > 5 = 89.3%) during hospitalization.Factors associated with poor sleep quality include several clinical variables whose scores were significantly worse among cancer patients, patients undergoing colorectal surgery or esophagogastroduodenoscopies, those with longer hospital stays, and those experiencing pain and health-related complications. Variables related to sleep disturbances included noise, persistent changes in sleeping position, feelings of anxiety, and health concerns. **Conclusion**: Findings revel a high prevalence of poor sleep quality during hospitalization caused by an increased sleep latency period, a decline in total sleep time, and lower sleep efficiency.

PALAVRAS-CHAVE
Sono
Doentes
Hospitalização
Cirurgia Geral

RESUMO

Objetivo: Avaliar a qualidade de sono do doente cirúrgico internado e determinar os fatores clínicos, ambientais e psicológicos associados. **Método:** Estudo observacional com matriz transversal e análise descritivo-correlacional, realizado com 150 doentes internados para procedimento cirúrgico, num centro hospitalar português. Foi aplicado um questionário para caracterização sociodemográfica e clínica, bem como o Índice de Qualidade do Sono de Pittsburgh – versão portuguesa (PSQI-PT). **Resultado:** A maioria dos participantes apresentou uma má qualidade de sono (PSQI > 5 = 89,3%) durante o internamento. Os fatores associados à má qualidade de sono incluem variáveis clínicas com piores escores nos doentes oncológicos, submetidos a cirurgia colorretal e esofagogastroduodenal, maior tempo de internamento, presença de dor e complicações. Como variáveis perturbadoras do sono destacam-se o ruído, a alteração da posição para dormir, sentir-se ansioso e a preocupação com a própria saúde. **Conclusão:** Observou-se uma elevada prevalência da má qualidade de sono, resultante do aumento do período de latência, diminuição do tempo total de sono e da sua eficiência durante o internamento.

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INTRODUCTION

Sleep is a biological process deemed crucial for repairing and maintaining a human being's biopsychosocial balance and for promoting overall health. Good sleep quality greatly contributes to reducing the risk of developing cardiovascular diseases, controlling diabetes, preventing weight gain, stimulating growth, reducing stress levels, rejuvenating the skin, improving the immune system and sexual life, and increasing pain threshold[1].

Hospitalization is a significant determinant of inadequate sleep because it frequently causes insufficient sleep, time lags, and poor sleep quality. It is also associated with physical and psychological disturbances that negatively impact the patient's healing process[2].

Scientific evidence shows that poor sleep quality is frequently observed among post-surgical patients and is associated with worse clinical outcomes, increased morbidity and mortality rates, longer hospital stays, higher healthcare costs, and poor quality of life[3,4]. Intrinsic and external/environmental factors can affect inpatients' sleep quality and negatively impact their recovery process[2,4,5].

Evidence clearly demonstrates that during hospitalization the sleep quality observed among patients undergoing surgical treatment is significantly worse than that among nonsurgical patients. In addition, surgical patients with comorbidities are more likely to experience a greater decline in sleep quality. Surgical patients require closer monitoring during the night, which consequently leads to sleep interruptions. This situation does not appear to affect nonsurgical patients who are allowed to receive sedative or hypnotic medication[5].

In the same line of thought, Singh et al.[6] conducted an analysis of the quality of sleep experienced by 338 hospitalized patients selected from medical, surgical, and critical care units and discovered that the lowest level of sleep quality was observed among inpatients admitted to surgical units.

Sleep is therefore crucial to an individual's physical and psychological balance and well-being and will consequently influence their recovery from illness/surgery. Despite the relevance of this topic, studies conducted to define which external and internal factors truly affect patients' quality of sleep during hospitalization are still scarce in Portugal.

The primary aim of this study was to assess the quality of sleep of surgical inpatients and to determine which clinical, psychological, and environmental variables influence sleep quality during hospitalization.

METHODS

An observational study using a cross-sectional matrix and descriptive correlation analysis was conducted. The study used a non-probabilistic convenience sample consisting of patients admitted to the general surgery department of a hospital center located in central Portugal between December 2022 and March 2023. Some inclusion criteria were defined for the participants as follows: they should be 18 years or older, have been admitted for elective surgery, possess the cognitive ability to understand what was being proposed, and have provided informed consent to participate in the study. The exclusion criteria included the presence of pathologies that could compromise the participants' mental and intellectual capacity to understand the proposed treatment (dementia syndrome, mental disabilities).

A questionnaire designed by the authors was applied to collect data on the participants' sociodemographic and clinical background, while the Portuguese version of the Pittsburgh Sleep Quality Index - (PSQI-PT), adapted for inpatients, was employed to measure sleep quality.

PSQI is a subjective method used to assess sleep quality. It was developed by Buysse, Reynolds, and Monk in 1989[7] and validated for the Portuguese population by João, Becker, Jesus, and Martins in 2017[8]. Its primary objective is to assess sleep quality and disturbances over a 1-month time interval and consists of 19 items that generate seven components: 1) subjective sleep quality, 2) sleep latency, 3) sleep duration, 4) habitual sleep efficiency, 5) sleep disturbances, 6) use of sleep medication and 7) daytime dysfunction. Each component is weighted equally on a 0-3 scale. The sum of these components provides a global score that ranges from 0 to 21. The higher the score, the worse the quality of sleep. A score between 0 and 5 indicates that the individual has good sleep quality, whereas a score above 5 indicates poor sleep quality[7,8].

Cronbach's alpha for the PSQI-PT in this study was 0.754, which indicates an acceptable level of reliability of the scale items for measuring the construct under study.

The study assessed different sociodemographic variables such as age, gender, marital status, and academic qualifications. Clinical variables included diagnosis, type of surgery, duration of hospitalization, pain, and complications during hospitalization. The psychological and environmental variables studied included noise, light, provision of care, changes in sleeping position, anxiety, and concerns about one's health and family.

The study obtained a favorable opinion from the Health Ethics Committee of the Hospital Center, and authorization was granted by the Board of Directors for its implementation (ref. No. 05/18/11/2022). The objectivesof the research were dully explained and the participants' understanding was validated. Following these procedures, written informed consent was obtained from all participants.

The data was analyzed using the Statistical Package for Social Sciences software (IBM® SPSS®, version 27), with a significance level set to 5%. Descriptive statistics were used to calculate the absolute (n) and percentage (%) frequencies, mean (M), standard deviation (SD), and minimum (Min) and maximum (Max) values observed. For inferential analysis, the parametric Student's t-test was employed when normality assumptions were met.Nonparametric tests, such as Mann-Whitney, Spearman's correlation, and the chi-square test were used when the normality assumption failed.

RESULTS

The sample consisted of 150 participants aged between 21 and 86 years, with a mean age of 58.4 ± 14.8 years. Of the participants, 53.3% were female. The different diagnoses were classified as 'oncological disease' (40.7%) and 'non-oncological disease' (59.3%), and the surgeries

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performed were divided into five categories. 81.3% of the participants suffered from chronic diseases. Hypertension and dyslipidemia were the most common among these conditions. In total, 14% of the participants experienced complications during hospitalization, with hemorrhage being the most common. The average length of stay was 5.83 days (minimum 2, maximum 29 days) (Table 1).

During hospitalization, nearly all participants reported going to bed between 10 p.m. and 10.30 p.m. It took 72.8% of participants 30 min longer to fall asleep than at home. 87.4% of the patients used to wake up between 6 a.m. and 7 a.m., and the total number of hours of sleep per night ranged between 3 and 6 for 72.7% of them.

As for the quality of sleep experienced during hospitalization, 0.7% of the participants rated it as 'Very good', 44.7% as 'Good', 48.0% as 'Poor', and 6.7% as 'Very poor'.

The most frequent sleep disturbances reported included 'Waking up in the middle of the night or very early in the morning' (96.7%), 'Getting up to go to the toilet' (78%) and 'Needing more than 30 minutes to fall asleep' (70.7%).

The PSQI-PT components that scored higher than the mid-point on the rating scale were: 'Component 4 - Sleep efficiency' (M=2.20), 'Component 3 - Sleep duration' (M=2.05), 'Component 2 - Sleep latency' (M=1.87), 'Component 1 - Subjective sleep quality' (M=1.61) and Sleep quality – global score (M=10.97) (Table 2).

During hospitalization, only 10.7% of the participants experienced good sleep quality (PSQI ≤5). The remaining 89.3% reported poor sleep quality (PSQI >5).

The analysis of the relationship between sleep quality and diagnosis showed that the mean values for 'Component 2 - Sleep latency', 'Component 3 - Sleep duration', 'Component 4 - Sleep efficiency', 'Component 5 - Sleep

Table 1 – Sociodemographic and clinical characterization of patients who underwent surgery from December 2022 to March 2023 (N = 150).

Variable		n	%
Age (M; SD)		58.4	14.8
Gender	Male	70	46.7
	Female	80	53.3
Marital Status	Single	18	12.0
	Married/ non-marital partnership	117	78.0
	Divorced/	5	3.3
	Widower/widow	10	6.7
Academic qualifications	No qualifications	2	1.3
	Primary education/ 4th grade	53	35.3
	Middle school (Portuguese 2nd cycle)	23	15.3
	Secondary school (Portuguese 3rd cycle)/ 9th grade	22	14.7
	Hight school/ 12th grade	27	18.0
	Higher education/ Bachelor's/ Master's/ PhD degrees	23	15.3
Diagnosis	Oncological disease	61	40.7
	Non-oncological disease	89	59.3
Chronic diseases	No	28	18.7
	Yes	122	81.3
Type of surgery	Colorectal surgery	56	37.3
	Esophagogastroduodenoscopy	41	27.3
	Hepatobiliopancreatic surgery	27	18.0
	Endocrine and thoracic surgery	10	6.7
	Abdominal wall and limb surgery	16	10.7
Length of hospital stay (M; SD)		5.83	4.81
Use of sleep medication	No	75	50.0
	yes	75	50.0
Complications during hospitalization	No	129	86.0
	yes	21	14.0

M: Mean. SD: standard deviation.

disturbances', 'Component 7 - Daytime sleepiness and dysfunction' and 'Sleep quality – global score' were higher for oncological disease and that the differences observed were statistically significant (Table 3).

Poor sleep quality was also more prevalent among patients who underwent colorectal surgery and esophagogastroduodenoscopy. The differences were found to be statistically significant ($X^2 = 11.713$; $p = 0.020$) (Table 4).

Correlations between the length of stay and all the components and the global PSQI-PT score were positive and statistically significant ($p \leq 0.001$), suggesting that an increase in the patient's length of stay results in an increase in the scores of both the components and the global PSQI-PT score. These findings demonstrate that sleep quality decreases significantly as the length of stay increases (Table 5).

Correlations between pain frequency and the global PSQI-PT score were all positive and statistically significant ($p \leq 0.05$) for most components (except for Components 6 and 7). This clearly suggests that an increase in pain frequency is associated with an increase in the global PSQI score and in most of the component scores (Table 6).

Patients who experienced complications during their hospitalization had higher average scores in Components 1, 2, 3, 4, 6, and 7 and the Sleep Quality Global Score. The differences observed were statistically significant (Table 7).

The environmental and psychological variables studied show that the mean value for patients' perception of 'Noise', 'Changes in sleeping position', 'Anxiety feelings' and 'Concerns about their health condition' is higher among individuals with poor sleep quality. Once again, the differences observed were significant (Table 8).

Table 2 – PSQI score of inpatients who underwent surgery (N = 150).

	M	SD	Min	Max
Sleep quality – global score	10.97	4.19	1	19
Component 1 – Subjective sleep quality	1.61	0.62	0	3
Component 2 – Sleep latency	1.87	1.12	0	3
Component 3 – Sleep duration	2.05	0.87	0	3
Component 4 – Sleep efficiency	2.20	0.99	0	3
Component 5 – Sleep disturbances	1.13	0.41	0	2
Component 6 – Use of sleep medication	1.38	1.42	0	3
Component 7 – Daytime sleepiness and dysfunction	0.74	0.90	0	3

M: Mean. SD: standard deviation.

Table 3 – Correlations between sleep Quality (PSQI-PT score) and surgical diagnosis (N = 150).

Component	Diagnostic	M	SD	t*	p
Component 1 – Subjective sleep quality	Oncological	1.69	0.65	1.336	0.184
	Non-oncological	1.55	0.60		
Component 2 – Sleep latency	Oncological	2.16	1.05	2.747	0.007
	Non-oncological	1.66	1.13		
Component 3 – Sleep duration	Oncological	2.23	0.74	2.158	0.033
	Non-oncological	1.92	0.93		
Component 4 – Sleep efficiency	Oncological	2.44	0.87	2.530	0.012
	Non-oncological	2.03	1.04		
Component 5 – Sleep disturbances	Oncological	1.21	0.45	1.981	0.049
	Non-oncological	1.08	0.38		
Component 6 – Use of sleep medication	Oncological	1.59	1.49	1.505	0.135
	Non-oncological	1.24	1.37		
Component 7 – Daytime sleepiness and dysfunction	Oncological	1.07	1.05	3.830	< 0.001
	Non-oncological	0.52	0.71		
Sleep quality – global score	Oncological	12.39	4.03	3.569	< 0.0001
	Non-oncological	10.00	4.04		

*Students' t-test. M: Mean. SD: standard deviation.

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Table 4 – Correlations between sleep quality and type of surgery.

Sleep quality– global score according to the type of surgery							
		PSQI Global Score (Sleep Quality) During hospitalization				Chi-square Test*	P - value
		Good sleep quality (=<5)		Poor sleep quality (>5)			
	N	N	%	N	%		
Surgery						11.713	0.020
Colorectal surgery	56	3	5.4	53	94.6		
Esophagogastroduodenoscopy	41	3	7.3	38	92.7		
Hepatobiliopancreatic surgery	27	4	14.8	23	85.2		
Endocrine and thoracic surgery	10	4	40.0	6	60.0		
Abdominal wall and limb surgery	16	2	12.5	14	87.5		

*Chi-square Test.

The correlations between the environmental and psychological variables, all the components, and the global PSQI-PT score were positive and, for nearly all the relationships, statistically significant.

Table 5 – Spearman's correlation between PSQI-PT and hospital length of stay (N = 150).

Components		Length of stay (days)
Component 1 – Subjective sleep quality	ρ	0.251
	p	0.002
Component 2 – Sleep latency	ρ	0.399
	p	< 0.001
Component 3 – Sleep duration	ρ	0.289
	p	< 0.001
Component 4 – Sleep efficiency	ρ	0.304
	p	< 0.001
Component 5 – Sleep disturbances	ρ	0.311
	p	< 0.001
Component 6 – Use of sleep medication	ρ	0.354
	p	< 0.001
Component 7 – Daytime sleepiness and dysfunction	ρ	0.423
	p	< 0.001
Sleep quality – global score	ρ	0.519
	p	< 0.001

DISCUSSION

During hospitalization, sleep deprivation poses serious consequences for patients and negatively impacts their healing process. Changes in the sleep-wake cycle, in addition to poor sleep quality and increased next-day fatigue, cause variations in circadian rhythms because they interrupt normal physiological processes, thereby hindering patients' recovery[9].

In this study, 89.3% of the participants reported having experienced 'Poor Sleep Quality' (PSQI>5) during their hospitalization.

A cross-sectional study conducted with 338 patients admitted to medical and surgical services showed a prevalence of poor sleep quality (PSQI>5) among 76.62% of the participants. However, when the study focused specifically on sleep quality experienced by surgical patients, this prevalence (PSQI>5) rose to 78.5%[6].

Tegegne and Alemnew[4] assessed the quality of sleep of 424 patients during the postoperative period and found a prevalence of poor sleep quality of 64.9%. Another study conducted with 252 participants hospitalized in medical and surgical services reported poor sleep quality (PSQI>5) among 80% of the participants[10].

Although this study is consistent with the findings provided by other studies, it reveals a higher prevalence of poor sleep quality (PSQI>5 of 89.3%). This difference may be due to the participants 'age. In this study, respondents had an average age of 58.4 years, which is notably higher than that of patients who participated in other studies. According to scientific evidence, from the age of 60 onwards, there is an increase in sleep fragmentation, which generally results in frequent awakenings. This new sleep behavior is conducive to the development of inadequate sleep.

During hospitalization, various factors can affect the quality of a patient's sleep. Some are inherent to patients, whereas others stem from the physical environment that surrounds them.

The analysis of the clinical diagnoses showed that the quality of sleep during hospitalization was poorer for oncological diseases than for non-oncological diseases. This conclusion is consistent with a study conducted with 59 oncological surgical patients, in which the prevalence of poor sleep quality (PSQI>5) was 71%[11].

Research shows the scarcity of studies focusing on the correlation between the type of surgery and sleep

quality. This study makes a significant contribution to the topic by stressing that sleep quality was significantly poorer among patients who underwent colorectal surgeries and esophagogastroduodenoscopies. Similarly, a cross-sectional study involving 114 patients with gastrointestinal cancer undergoing surgical treatment reported that 87.7% of these patients experienced poor sleep quality (PSQI>5)[12]. This particularly high percentage is due to the nature of these surgeries, which often cause gastrointestinal alterations, namely nausea, vomiting, and intestinal changes, which are known to contribute to night-time awakenings.

This study clearly demonstrates that an increased length of hospital stay is associated with a decline in sleep quality, a finding that is consistent with other studies[5,11].

Scientific evidence has proven the existence of a close connection between pain and sleep disruption. Pain is one of the main causes of poor sleep quality among patients undergoing surgical treatments[4-6,13]. There seems to be a two-way relationship between pain and sleep disorders, as pain interferes with both the onset and maintenance of sleep and sleep deprivation increases pain sensation[3]. This study also demonstrates that sleep quality significantly decreases as pain frequency increases.

The presence of complications during hospitalization significantly contributes to poor sleep quality, as emphasized by Melo et al.[13].

Regarding the environmental and psychological variables assessed, an increase in the perception of their impact was associated with higher scores across the different components and an increase in the PSQI global score. This heightened perception ultimately deteriorates sleep quality. In short, for most participants, the components and overall sleep quality experienced during

Table 6 – Spearman's correlation between PSQI-PT and 'Feeling pain' (N = 150).

Components		Feeling pain
Component 1 – Subjective sleep quality	ρ	0.181
	p	0.027
Component 2 – Sleep latency	ρ	0.175
	p	0.032
Component 3 – Sleep duration	ρ	0.189
	p	0.021
Component 4 – Sleep efficiency	ρ	0.177
	p	0.030
Component 5 – Sleep disturbances	ρ	0.367
	p	< 0.001
Component 6 – Use of sleep medication	ρ	0.127
	p	0.122
Component 7 – Daytime sleepiness and dysfunction	ρ	0.105
	p	0.201
Sleep quality – global score	ρ	0.249
	p	0.002

Table 7 – Correlations between sleep quality and complications experienced during hospitalization. 21 of the 150 patients surveyed did not experience any sort of complications.

Component	Complications during hospitalization	M	SD	U*	p
Component 1 – Subjective sleep quality	No	1.54	0.61	831.0	0.002
	Yes	2.00	0.55		
Component 2 – Sleep latency	No	1.76	1.14	860.5	0.004
	Yes	2.52	0.75		
Component 3 – Sleep duration	No	1.97	0.89	890.5	0.008
	Yes	2.52	0.51		
Component 4 – Sleep efficiency	No	2.13	1.02	1016.0	0.044
	Yes	2.62	0.67		
Component 5 – Sleep disturbances	No	1.12	0.41	1199.5	0.215
	Yes	1.24	0.44		
Component 6 – Use of sleep medication	No	1.28	1.40	973.0	0.022
	Yes	2.00	1.45		
Component 7 - Daytime sleepiness and dysfunction	No	0.66	0.85	916.0	0.009
	Yes	1.24	1.04		
Sleep quality – Global score	No	10.46	4.12	649.5	< 0.001
	Yes	14.14	3.12		

* Mann-WhitneyTest. M: Mean. SD: standard deviation.

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Table 8 – Correlations between sleep quality and environmental and psychological variables in surgical patients (N=150).

Variable		n	M	SD	U*	p
Presence of noise	Good sleep quality (=<5)	16	1.50	0.82	416.0	< 0.001
	Poor sleep quality (>5)	134	2.84	1.15		
Changes in sleeping position	Good sleep quality (=<5)	16	1.38	0.72	497.0	< 0.001
	Poor sleep quality (>5)	134	2.59	1.23		
Provision of nursing care	Good sleep quality (=<5)	16	1.19	0.54	875.0	0.132
	Poor sleep quality (>5)	134	1.50	0.85		
Anxiety feelings	Good sleep quality (=<5)	16	1.31	0.70	637.5	0.004
	Poor sleep quality (>5)	134	2.21	1.23		
Concerns about one's health condition	Good sleep quality (=<5)	16	1.75	0.93	685.0	0.014
	Poor sleep quality (>5)	134	2.52	1.22		
Concerns about one's family	Good sleep quality (=<5)	16	1.81	0.98	778.5	0.061
	Poor sleep quality (>5)	134	2.44	1.25		
Light exposure during sleep	Good sleep quality (=<5)	16	1.25	0.68	926.0	0.235
	Poor sleep quality (>5)	134	1.57	1.05		

*Mann-Whitney test. M: Mean. SD: standard deviation.

hospitalization worsened significantly as the perception of environmental and psychological variables increased.

The most frequently manifested environmental variables include 'Noise' and 'changes in sleeping position', while 'anxiety feelings' and 'concerns about one's health' stand out as the predominant psychological variables associated with poor sleep quality. These findings are consistent with those of the study conducted by D'Souza et al.[5], wherein noise and uncertainty regarding the consequences of the disease emerge as the main environmental factors influencing inadequate sleep. Additionally, negative self-rated health is associated with sleep disturbances[14]. Singh et al.[6] and Zamora[10] also reported that during hospital stays noise emerges as one of the environmental factors that most significantly impact sleep disruption.

The World Health Organization has defined guidelines for background noise levels in hospitals. According to these recommendations, noise levels should not exceed 35 dB(A) in rooms where patients are being treated or observed and 30 dB(A) in hospital wards[15].

However, studies conducted on the effects of night-time noise have shown that the values obtained exceeded the recommended levels[16,17]. An exploratory study by Alves et al.[17] showed that the average noise level recorded during a 6-h night period (from 1 a.m. to 7 a.m.) reached 51.8 dB, whereas during a 24-h period (from 9 a.m. to 9 a.m.), the average noise level was 60.6 dB. According to Cunha and Silva[16], hospital noise, specifically noise generated by clinical equipment (monitors, infusion pumps, and other hospital equipment), has a clear impact on patients' subjective well-being and represents the primary cause of sleep disturbances in approximately 31% of participants.

The results obtained serve as a major contribution to understanding the factors that influence sleep quality during hospitalization, particularly among surgical patients.

Raising awareness among healthcare professionals is crucial because it enables them to make informed decisions and mitigate the factors associated with sleep deprivation or inadequate sleep. Strategies such as reducing night-time noise, adjusting diuretic medication, and managing analgesic and sleep-facilitating medication should be adopted to reduce night-time awakenings. In addition, they should be prepared to provide appropriate psychological support to reduce patients' anxiety levels.

Some limitations of this study should be considered, namely the relatively small sample size compared with the total number of inpatients undergoing surgical procedures during the same period. The lack of homogeneity of the sample in terms of the type of surgery performed should also be regarded as a limitation.

CONCLUSION

During hospitalization, evidence showed an increase in the patients' sleep latency period, a decrease in the total number of hours of sleep, and a decline in sleep efficiency, which contributed to a high prevalence of poor sleep quality among participants.

This study highlights the relationship between poor sleep quality and several clinical variables, such as oncological disease, colorectal surgeries and esophagogastroduodenoscopies, length of hospital stay, and the presence of pain and complications. Environmental and psychological variables, such as noise, anxiety, and health concerns, are the main contributors to poor sleep quality.

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