journal homepage: http://kont.zsf.jcu.cz
DOI: 10.32725/kont.2025.043

KONTAKT / Journal of nursing and social sciences related to health and illness

Review article

Enhancing sleep quality in hospitalized children and adolescents

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Abstract
Background: Sleep is vital for maintaining a child's well-being, health, and brain development. During hospitalization, it is disrupted by external and internal factors. The purpose of this review article is to investigate possible ways and interventions to improve sleep quality in hospitalized children and adolescents.
Methods: We conducted a literature review, using databases such as PubMed, CINAHL, Cochrane Library, and ScienceDirect, following PRISMA guidelines. We used the descriptive method. Data synthesis involved content analysis.
Results: Of the 279 identified studies, 12 were included in the final analysis. The identified subcategories for interventions to improve the quality of sleep in hospitalized children and adolescents were: (1) kangaroo care and gentle human touch; (2) relaxation techniques, cognitive behavioural therapy, play and physical activity; (3) illuminated musical mobile, lullabies and bedtime stories; (4) sleep intervention, compared to standard care during chemotherapy treatment; (5) adjustment of the hospital environment; raising awareness and education, and pharmacological interventions.
Conclusion: There are not many studies that focus on sleep in hospitalized children, they mainly focus on adult hospitalized patients or children in their home. There are many approaches to improving sleep, all of which are crucial for promoting healthy sleep. However, additional research of this topic and interventions can help further improve the quality of sleep of hospitalized children.

Keywords: Hospital; Interventions; Paediatric patients; Sleep

Introduction

Sleep is vital for health, especially in childhood, as insufficient sleep can impair physical and psychological development (Vecchi, 2020). Recommended sleep duration varies by age, ranging from 11–14 hours for children aged 1–2 years, to 8–10 hours for adolescents (Cowherd et al., 2019). Hospitalization often disrupts sleep, exacerbating the need for rest due to illness and external factors such as noise, light, and medical interventions (Hybschmann et al., 2021). Sleep deprivation in hospitalized children can lead to fatigue, emotional instability, and impaired cognitive function (Burger et al., 2022).

The health of children and adolescents often worsens during hospitalization, heightening their need for sleep. However, the hospital environment, with its various disruptions, makes it difficult for them to get adequate rest (Hybschmann et al., 2021). Sleep deprivation in hospitalized children can lead to daytime sleepiness, fatigue, emotional instability, increased pain sensitivity, memory issues, and poor decision-making (Burger et al., 2022). Children and adolescents need sleep for recovery, immune function, and overall well-being (Cowherd et al., 2019). However, hospitalization disrupts their sleep, which exacerbates physiological and psychological stress (Crous and North, 2021). Parents also suffer from sleep deprivation, which can add stress and hinder their child's treatment (Cowherd et al., 2019). Improved sleep quality could potentially reduce the need for pain medication and help in recovery by supporting the immune system (Bevan et al., 2019; Cowherd et al., 2019). The hospital setting often prioritizes medical care over sleep, leading to more than an hour of lost sleep per night (Crous and North, 2021). Sleep quality is affected by both external factors like noise and light, and internal factors like nursing activities and treatments (Vecchi, 2020). While pharmacological treatments are often used to improve sleep, their effectiveness is limited, and non-pharmacological strategies remain crucial (Berger et al., 2021). High noise levels from patients, staff, and medical equipment are common sleep disruptors (Bevan et al., 2019; Sampath et al., 2022). These disturbances, including loud devices and staff conversations, can wake children frequently during sleep (Berger et al., 2021). Other factors such as uncomfortable beds, room temperature, and excessive light also impact sleep quality (Sampath et al., 2022). Even frequent daytime naps can negatively affect nighttime rest (Sampath et

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http://doi.org/10.32725/kont.2025.043
Submitted: 2025-05-23 • Accepted: 2025-09-22 • Prepublished online: 2025-09-23
KONTAKT 27/3: 239–244 • EISSN 1804-7122 • ISSN 1212-4117

al., 2022). Invasive medical procedures, like IV insertions and blood tests, often performed at night, can also disrupt sleep and increase anxiety (Meentken et al., 2020). Additionally, unnecessary nighttime monitoring, such as frequent blood pressure checks, can further disturb rest (Cook et al., 2020).

In summary, hospitalized children face significant sleep challenges due to the hospital environment affecting their recovery and emotional well-being. Addressing these disruptions could improve sleep quality and overall health outcomes. During hospitalization, the use of pharmacological strategies to improve sleep may have certain disadvantages, including the potential for unwanted daytime sedation, additional costs, and medication errors (Crous and North, 2021). That is why it is also of great importance to study the effects of non-pharmacological interventions, since admission to the hospital due to an acute illness represents risk factors for sleep disorders, which can have a negative impact on the active development of the brain during the period of illness and recovery (Kudchadkar et al., 2022).

This area deserves more attention, as most paediatric hospitals do not place sufficient emphasis on children's sleep. Of course, the focus is on the child's recovery, which is the primary reason for hospitalization, but many nurses are not aware of the impact sleep has on the course of medical treatment and the duration of recovery. Perhaps the reason for such a small share of research is precisely the lack of interest, time, and knowledge to implement interventions aimed at the quality and improvement of sleep. With this research, we want to discover methods and interventions that would contribute to quality sleep during hospitalization. Quality sleep would reduce the fear of hospitalization and shorten its time. It would also improve hospitalization as an experience, both for children and their families, as well as for nurses.

Aim

Based on a review of the literature, this study aims to investigate possible ways and interventions to improve the sleep quality in hospitalized children and adolescents.

Materials and methods

Design

A literature search was conducted to review the literature related to sleep quality in hospitalized children and adolescents. This search included systematic reviews and research based on quantitative, qualitative, and mixed methodology. It was based on the research question regarding the interventions to improve sleep in this population. We defined the research question based on the PIO (Population, Intervention, Outcome) question (Melnyk and Fineout-Overholt, 2019): Which interventions (I) can improve the quality of sleep (O) in hospitalized children and adolescents (P)?

Selection criteria

Selecting relevant studies began with the determination of inclusion and exclusion criteria. Primary studies (systematic reviews, research based on quantitative, qualitative, and mixed methodology) published between 2019 and December 2024, written in English were included (Table 1). Papers that did not meet the criteria of the aim of our study were excluded.

Search strategy

The resources search took place in December 2024 in freely available and licensed databases: PubMed, CINAHL, Cochrane Library, and ScienceDirect. We designed a search strategy with a specific search string that contained the key words of the research question in English and their synonyms: children, adolescent, hospitalization, sleep, intervention, quality. When designing the search strategy, we used the Boolean operators AND and OR. We created a final search string that reads: [(hospitalized OR hospitalized OR hospitalization OR hospitalization) AND (child* OR kid* OR adolescent OR minor)] AND (intervention) AND ("sleep quality" OR "sleep efficiency" OR "sleep latency" OR "sleep duration"). In the ScienceDirect database, we used a modified search strategy when searching for scientific literature due to the limitations of using Boolean operators: [(hospitalised OR hospitalisation) AND (child OR adolescent) AND (intervention) AND ("sleep quality" OR "sleep efficiency" OR "sleep latency") OR "sleep duration"].

In the final analysis, we included systematic reviews and research based on quantitative and qualitative methodology, as well as mixed methods research, the content of which includes ways to improve sleep quality. We excluded research that is unrelated to the topic, not of the appropriate type, and not in the English language. We also limited the research publication time to the last five years (2019–2024). The inclusion and exclusion criteria are shown in Table 1.

Table 1. Inclusion and exclusion criteria

Inclusion criteria	
Population	Hospitalized children and adolescents
Interventions	Interventions that affect sleep quality
Outcome	Improved sleep quality
Type of research	Systematic reviews and research based on quantitative, qualitative, and mixed methodology
Exclusion criteria	
Population	Patients who are older than 19 years and children and adolescents who are not hospitalized
Interventions	Interventions that are not related to our topic, or that do not affect the quality of sleep
Outcome	Sleep quality has not improved
Type of research	Other types of research, duplicates, protocols, authors' opinions…
Limits	
Availability	Freely accessible
Time frame	2019–2024 (5 years)
Language	English

Selected article incl. PRISMA diagram

Twelve studies that met the criteria for a scientific article were included in the review. The systematic search for sources is illustrated by the PRISMA diagram (Diagram 1), which visually presents the selection process for this review.

Results

Based on the methodology, a total of 12 relevant studies were found (Supplement 1). A total of 291 records were identified in the databases. These records were then transferred to the Mendeley program. Five of them were duplicates and seven were removed for other reasons. We reviewed 279 studies, of which we removed 231 irrelevant studies, and kept 48 identified ones. We then reviewed these studies and removed 10 unretrieved reports, leaving 38 suitable ones, of which we excluded 26 due to wrong population (n = 13), wrong intervention (n = 11), and wrong outcome (n = 2). In the end, we included 12 studies in the final analysis.

We categorized the included research into levels, according to the hierarchy of evidence (Polit and Beck, 2021) – which has 8 levels. We did not categorize any studies into level 1, which represents systematic review/meta-analysis of randomized control trials. In level 2, which represents randomized control trial, we categorized 3 studies (Namjoo et al., 2021; Rogers et al., 2019; Topsakal and Ekici, 2022). In level 3, which represents non-randomized trial (quasi-experiment) we did not categorize any studies. In level 4, which represents a systematic review of non-experimental (observational) studies, we categorized 2 studies (Kudchadkar et al., 2022; Park, 2020). In level 5, which represents nonexperimental and observational studies, we categorized 4 studies (Burger et al., 2024; Cook et al., 2020; Crevits et al., 2024; Lechosa-Muñiz et al., 2024). There was 1 study (Hybschmann et al., 2021) in level 6, which represents systematic review/meta synthesis of qualitative studies, and 2 studies (Berger et al., 2021; Van der Perk et al., 2024) in level 7, which represents qualitative/descriptive research. We did not categorize any research into level 8, which represents non-research source (e.g., internal evidence, expert opinion).

The research was conducted in different countries: five in the USA, two in the Netherlands, one in France, one in Denmark, one in Spain, one in Turkey, and one in Iran. The characteristics of the identified research that we included in the analysis are shown in Supplement 1. In addition, there were studies, which specified the survey sample size as the number of reviewed articles, or interviews only (n = 39). Two of the

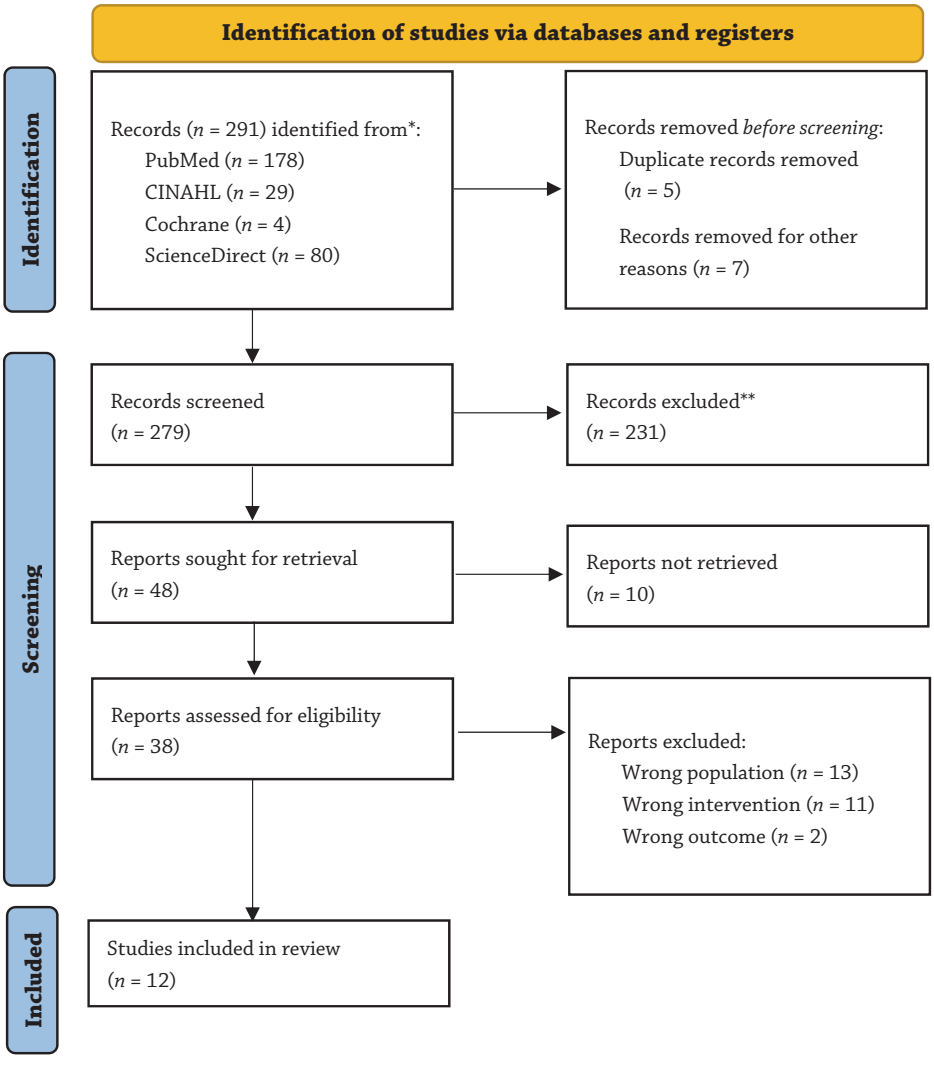

Diagram 1. Illustration of a systematic search for sources according to PRISMA recommendations

included studies did not specify the survey sample size. The included studies vary in methodology and are categorized according to the authors' methodological descriptions as follows: seven quantitative, three qualitative, and two systematic reviews.

Results of the analysis and synthesis of the identified sources

Table 2 shows the findings of the content analysis of the included research (Elo and Kyngäs, 2008). The main category we highlighted is "Interventions to improve the quality of sleep in hospitalized children and adolescents". Subcategories in the content analysis include kangaroo care and gentle human touch; relaxation techniques, CBT (cognitive behavioural therapy), play and physical activity; illuminated musical mobile, lullabies and bedtime stories; sleep intervention, compared to standard care during chemotherapy treatment; adjustment of the hospital environment; raising awareness and education, and pharmacological interventions.

Table 2. Content analysis

Category	Subcategory	Codes
Interventions to improve the quality of sleep in hospitalized children and adolescents	Kangaroo care and gentle human touch	Sleep duration, thermoregulation, caregiver and child relationship, preterm neonates, children with burns, healing touch, and soothing touch.
	Relaxation techniques, CBT (cognitive behavioural therapy), play and physical activity	Massage, exercise bike, organized play, diaphragmatic breathing exercises, relaxation training, children with cancer, premature infants, lower patient satisfaction, depression, anxiety, sleep latency, total wake time, adolescents, pediatric unit for children with eating disorders.
	Illuminated musical mobile, lullabies, and bedtime stories	Paediatric emergency room, illuminated musical mobile recorded lullaby, mother's live lullaby, bedtime stories, reading and music, premature infants.
	Sleep intervention, compared to standard care during chemotherapy treatment	Chemotherapy, fatigue, stationary bicycle, multicomponent intervention, adolescents, children with central nervous system cancer, high-dose chemotherapy, connection to sleep and fatigue.
	Adjustment of the hospital environment	Cycled light, neonatal intensive care unit, noise reduction interventions, quiet hours, earplugs, earmuffs, rational laboratory draws, nighttime vital sign checks, baths, weights and BP monitoring during night, ideal temperature, low stimulus and dark room, timing of interventions, nursing assessment during admission, a care plan, organization, coordination and schedules, dividing care among health care professionals and parents, role of guardians, important personal items, signs with the message that their child was sleeping.
	Raising awareness and education	Staff, families, patients, brightly coloured posters, home routines.
	Pharmacological interventions	First-generation antihistamines, diphenhydramine, nonprescription sleep medications, infants, placebo, nighttime awakening, alpha-agonists, clonidine, pain management, analgesics.

Kangaroo care and gentle human touch

Park (2020) found that kangaroo care improved sleep-wake organization and reduced crying. Berger et al. (2021) highlighted that it often leads to longer quiet sleep with fewer disturbances. Similarly, gentle human touch supports thermoregulation, strengthens caregiver-child bonding, and promotes sleep in preterm neonates. According to Kudchadkar et al. (2022), touch therapy enhances sleep duration and quality, particularly in children with burns. Hybschmann et al. (2021) also noted that healing and soothing touch can improve sleep in hospitalized children.

Relaxation techniques, CBT (cognitive behavioural therapy), play and physical activity

Kudchadkar et al. (2022) found that massage and relaxation techniques can improve sleep quality in hospitalized children, though further research is needed. Similarly, more evidence is needed on the effects of exercise bikes and organized play. Berger et al. (2021) reported that relaxation techniques, like diaphragmatic breathing, were successful, with children practicing these techniques showing 50 more minutes of sleep on average compared to usual care. Massage also improved sleep in hospitalized children with cancer (Berger et al., 2021) and premature infants (Park, 2020). Burger et al. (2024) highlighted that disturbed sleep is linked to emotional distress, potentially leading to depression and anxiety. Crevits et al. (2024) showed that CBT improved sleep efficiency in adolescents with eating disorders. Hybschmann et al. (2021) concluded that interventions like massage, breathing, and relaxation exercises can enhance sleep in hospitalized children.

Illuminated musical mobile, lullabies, and bedtime stories

Topsakal and Ekici (2022) found that an illuminated musical mobile improved sleep in children aged 12 to 36 months who were hospitalized in a paediatric emergency room, resulting in longer sleep duration and fewer awakenings. Namjoo et al. (2021) observed no significant difference in sleep duration between groups using recorded lullabies and live maternal lullabies before the intervention, but the recorded lullaby group experienced longer sleep afterward. Kudchadkar et al. (2022) suggested that bedtime stories could be beneficial, though more research is needed. Hybschmann et al. (2021) also emphasized that reading and music can enhance sleep quality in hospitalized children.

Sleep intervention, compared to standard care during chemotherapy treatment

In the study by Rogers et al. (2019), 29 hospitalized cancer patients, aged 7 to 18 years, who used a stationary bicycle showed improved sleep. Children aged 7 to 12 with leukaemia or lymphoma, receiving chemotherapy, also benefited from

daily walks and limited daytime naps and night care. A sleep intervention, which included education about sleep and relaxation, reading stories and books, massage, turning off the lights, white noise, covering the windows, a sign on the door that the children are sleeping, resulted in a longer sleep, compared to standard care. Although sleep was longer in the intervention group, fatigue was still present the next day, partly due to nocturnal activity and lack of sleep. In a study review by Hybschmann et al. (2021), a multicomponent intervention which included changed work practices with bundled care, led to at least 90 minutes of improved sleep. Each group woke up 14 times, however the intervention group slept 49 minutes longer than the control group.

Adjustment of the hospital environment

Cook et al. (2020) found that rational BP monitoring at night reduced awakenings by 25% and increased sleep duration by 82.4 minutes in children over 24 months, with no significant change for those under 24 months. Hybschmann et al. (2021) suggested that overnight BP monitoring improves sleep, while Berger et al. (2021) reported longer sleep durations and fewer disruptions. Cycled lighting (12 hours light, 12 hours darkness) improved sleep by supporting circadian rhythms and reducing awakenings. Park (2020) also found positive effects on preterm infants. Noise reduction measures, like quiet hours and earplugs, improved sleep, as did reducing nighttime interventions (Berger et al., 2021). Lechosa-Muñiz et al. (2024) noted that a care plan can optimize sleep, though their findings lacked statistical significance. Van der Perk et al. (2024) reported that parents found coordinated care plans and clear communication with nurses beneficial for sleep. Some parents took an active role in minimizing disruptions, by acting as guardians of their child's sleep, creating a low stimulus room and ensuring personal items were available.

Raising awareness and education

Berger et al. (2021) emphasize that education and awareness about sleep are essential for staff, families, and patients. They suggest using posters to highlight the importance of sleep, and focusing on maintaining home routines for acutely ill children. Educating parents about normal sleep patterns and sleep hygiene can improve sleep duration and reduce awakenings. Burger et al. (2024) note that healthcare professionals often lack awareness of sleep's role in recovery. Hybschmann et al. (2021) and Lechosa-Muñiz et al. (2024) agree that sleep education for children, caregivers, and staff is key to improving sleep quality and reducing disruptions.

Pharmacological interventions

Berger et al. (2021) found that the nonprescription sleep medications, which are the most frequently used for hospitalized children are first-generation antihistamines, including diphenhydramine. However, they also reported that there's no reliable data to confirm this statement with confidence. In a study involving infants aged 6 to 15 months, diphenhydramine's prevention of nighttime awakening and improvement of parental satisfaction with sleep, turned out to be comparable to a placebo. However, the most frequently prescribed medications for paediatric sleep disturbances are alpha agonists, including clonidine. In the end, results regarding the safety and effectiveness of these medications in hospitalized children are very limited. According to Burger et al. (2024), improving sleep might reduce the need for analgesics, because enhanced pain management can often lead to better sleep in hospitalized children.

Discussion

This review examines various interventions to improve sleep in hospitalized children and adolescents. While many interventions appeared effective, others lacked sufficient evidence. Quality sleep is crucial for recovery and health improvement during hospitalization. Prior to admission, assessing the child's sleep habits and raising awareness through posters about sleep's importance can be beneficial (Berger et al., 2021). Education for staff, children, and parents is vital for promoting better sleep (Berger et al., 2021; Burger et al., 2024; Hybschmann et al., 2021; Lechosa-Muñiz et al., 2024). Non-pharmacological interventions should be prioritized, given the limited reliable evidence supporting pharmacological approaches (Berger et al., 2022).

Effective interventions for premature infants include kangaroo care, gentle touch, noise and light reduction, cycled lighting, and massage (Park, 2020), and lullabies (Namjoo et al., 2021). In younger children, massage (Berger et al., 2021; Kudchadkar et al., 2022), music (Hybschmann et al., 2021), relaxation techniques (Kudchadkar et al., 2022), and rational BP measurement (Berger et al., 2021; Cook et al., 2020; Hybschmann et al., 2021) have proven effective. Bedtime stories are promising but require further research (Kudchadkar et al., 2022). In schoolchildren and adolescents, relaxation techniques, physical activity promotion, and sleep education are beneficial (Kudchadkar et al., 2022), with cognitive behavioural therapy showing effectiveness for adolescents with eating disorders (Crevits et al., 2024). Environmental adjustments also aid sleep (Lechosa-Muñiz et al., 2024; Van der Perk et al., 2024) and limiting caffeine may improve sleep in teenagers (Reichert et al., 2021), though more research is needed.

Pharmacological approaches, including first-generation antihistamines and clonidine, are commonly used, but data on their effectiveness is limited (Berger et al., 2021; Burger et al., 2024). Iron may improve sleep in anaemic infants, while melatonin is increasingly prescribed for sleep disorders, though research on its use in hospitalized children is insufficient (Bruni et al., 2019).

Conclusion

Sleep is one of the most important aspects of a child's life, especially for maintaining their health and well-being. Disturbed sleep can potentially lead to illnesses, which can be short or long term. Due to external or internal factors, hospitalization is a time and place that very often leads to disrupted sleep among children and adolescents. It seems that nurses are not aware enough of their importance and impact on promoting sleep in hospitalized children. Perhaps with further education and raising the awareness of healthcare professionals, we could contribute even more to better sleep.

We found that there are many interventions aimed at improving the quality of sleep among hospitalized children and adolescents, but there is not much research that would reliably confirm their effectiveness. Most research focuses only on adult hospitalized patients or on children and adolescents in their home environment. Hence there is the opportunity for further research into this topic and a deeper study of already existing interventions and new interventions that could contribute to better quality sleep.

Limitations of the study

Despite extending the search to other languages, we were limited by the very small number of studies found. As a result, we included articles that did not meet the exact IMRAD criteria.

Ethical aspects and conflict of interest

The authors have no conflict of interest to declare.

References

1. Berger J, Zaidi M, Halferty I, Kudchadkar SR (2021). Sleep in the hospitalized child: A contemporary review. Chest 160(3): 1064–1074. DOI: 10.1016/j.chest.2021.04.024.
2. Bevan R, Grantham-Hill S, Bowen R, Clayton E, Grice H, Venditti HC, et al. (2019). Sleep quality and noise: comparisons between hospital and home settings. Arch Dis Child 104(2): 147–151. DOI: 10.1136/archdischild-2018-315168.
3. Bruni O, Angriman M, Melegari MG, Ferri R (2019). Pharmacotherapeutic management of sleep disorders in children with neurodevelopmental disorders. Expert Opin Pharmacother 20(18): 2257–2271. DOI: 10.1080/14656566.2019.1674283.
4. Burger P, Steur LMH, Polderman JAW, Twisk JWR, Lindeboom R, Gemke RJBJ (2024). Sleep disturbances in hospitalized children: a wake-up call. Eur J Pediatr 183(9): 4063–4072. DOI: 10.1007/s00431-024-05660-x.
5. Burger P, Van den Ende ES, Lukman W, Burchell GL, Steur LMH, Merten H, et al. (2022). Sleep in hospitalized pediatric and adult patients – A systematic review and meta-analysis. Sleep Med X 4: 100059. DOI: 10.1016/j.sleepx.2022.100059.
6. Cook DJ, Arora VM, Chamberlain M, Anderson S, Peirce L, Erondu A, et al. (2020). Improving hospitalized children's sleep by reducing excessive overnight blood pressure monitoring. Pediatrics 146(3): e20192217. DOI: 10.1542/peds.2019-2217.
7. Cowherd EL, Sutton AG, Vincent JO, Humphries MS, Ritter V, Fine J, Steiner MJ (2019). Timing and duration of sleep-in hospitalized children: An observational study. Hosp Pediatr 9(5): 333–339. DOI: 10.1542/hpeds.2018-0236.
8. Crevits L, Silva C, Bat-Pitault F (2024). Preliminary study: cognitive behavioural therapy for insomnia in adolescents with anorexia nervosa. Eat Weight Disord 29(1): 3. DOI: 10.1007/s40519-023-01634-4.
9. Crous, EC, North N (2021). Sleep promotion for hospitalised children: Developing an evidence-based guideline for nurses. Curationis 44(1): e1–e10. DOI: 10.4102/curationis.v44i1.2219.
10. Elo S, Kyngäs H (2008). The qualitative content analysis process. J Adv Nurs 62(1): 107–115. DOI: 10.1111/j.1365-2648.2007.04569.x.
11. Hybschmann J, Topperzer MK, Gjærde LK, Born P, Mathiasen R, Sehested AM, et al. (2021). Sleep in hospitalized children and adolescents: A scoping review. Sleep Med Rev 59: 101496. DOI: 10.1016/j.smrv.2021.101496.
12. Kudchadkar SR, Berger J, Patel R, Barnes S, Twose C, Walker T, et al. (2022). Non-pharmacological interventions for sleep promotion in hospitalized children. Cochrane Database Syst Rev 6(6): CD012908. DOI: 10.1002/14651858.CD012908.pub2.
13. Lechosa-Muñiz C, Ruiz-Azcona L, Pérez Belmonte E, Paz-Zulueta M, Cabero-Pérez MJ (2024). Impact of an intervention aimed at improving sleep quality in hospitalized children. Children (Basel) 11(7): 848. DOI: 10.3390/children11070848.
14. Meentken MG, van der Mheen M, van Beynum IM, Aendekerk EWC, Legerstee JS, van der Ende J, et al. (2020). EMDR for children with medically related subthreshold PTSD: short-term effects on PTSD, blood-injection-injury phobia, depression and sleep. Eur J Psychotraumatol 11(1): 1705598. DOI: 10.1080/20008198.2019.1705598.
15. Melnyk BM, Fineout-Overholt E (2019). Evidence-based practice in nursing & healthcare: a guide to best practice. 4th ed. Philadelphia: Wolters Kluwer, 823 p.
16. Namjoo R, Mehdipour-Rabor R, Bagherian B, Nematollahi M (2021). Comparing the effectiveness of mother's live lullaby and recorded lullaby on physiological responses and sleep of preterm infants: a clinical trial study. J Complement Integr Med 19(1): 121–129. DOI: 10.1515/jcim-2020-0507.
17. Park J (2020). Sleep promotion for preterm infants in the NICU. Nurs Womens Health 24(1): 24–35. DOI: 10.1016/j.nwh.2019.11.004.
18. Polit DF, Beck CT (2021). Nursing research: generating and assessing evidence for nursing practice. 11th ed. Philadelphia: Wolters Kluwer Health, Lippincott Williams & Wilkins, 814 p.
19. Reichert CF, Veitz S, Bühler M, Gruber G, Deuring G, Rehm SS, et al. (2021). Wide awake at bedtime? Effects of caffeine on sleep and circadian timing in male adolescents – A randomized crossover trial. Biochem Pharmacol 191: 114283. DOI: 10.1016/j.bcp.2020.114283.
20. Rogers VE, Zhu S, Ancoli-Israel S, Liu L, Mandrell BN, Hinds PS (2019). A pilot randomized controlled trial to improve sleep and fatigue in children with CNS tumors hospitalized for high dose chemotherapy. Pediatr Blood Cancer 66(8): e27814. DOI: 10.1002/pbc.27814.
21. Sampath R, Nayak R, Gladston S, Ebenezer K, Mudd SS, Peck J, et al. (2022). Sleep disturbances and psychological distress among hospitalized children in India: Parental perceptions on pediatric inpatient experiences. J Spec Pediatr Nurs 27(1): e12361. DOI: 10.1111/jspn.12361.
22. Topsakal S, Ekici B (2022). Effect of illuminated musical mobile on sleep quality of children hospitalized in pediatric emergency departments. J Pediatr Nurs 67: e156–e164. DOI: 10.1016/j.pedn.2022.08.004.
23. Van der Perk C-J, Burger P, Maaskant J, Gemke RJBJ (2024). Parents' experiences and perspectives of their child's sleep quality during hospitalization. Clin Pediatr (Phila) 63(6): 755–763. DOI: 10.1177/00099228231188223.
24. Vecchi CR (2020). Causes and effects of lack of sleep in hospitalized children. Arch Argent Pediatr 118(2): e143–e147. DOI: 10.5546/aap.2020.eng.e143.