Intensive & Critical Care Nursing 53 (2019) 43–53

Contents lists available at ScienceDirect

Intensive & Critical Care Nursing

journal homepage: www.elsevier.com/iccn

Review article

Sleep deprivation determinants as perceived by intensive care unit patients: Findings from a systematic review, meta-summary and meta-synthesis

Elisa Mattiussi, Matteo Danielis, Lucia Venuti, Marta Vidoni, Alvisa Palese *

Department of Medical Sciences, Udine University, Italy

ARTICLE INFO

Article history:
Received 30 July 2018
Revised 16 March 2019
Accepted 19 March 2019

Keywords:
Adult patient
Intensive care unit
Meta-summary
Meta-synthesis
Qualitative research
Sleep deprivation

ABSTRACT

Objectives: To summarise evidence on sleep deprivation and/or poor sleep determinants as experienced by intensive care unit patients.
Research methodology/design: A systematic review of qualitative studies identified through PubMed, CINAHL and Scopus databases published in English up to 2018 was performed following PRISMA guidelines. The included studies were critically evaluated by using the Critical Appraisal Screening Programme tool. Study findings were then subjected to a meta-summary and a meta-synthesis.
Setting: Intensive Care Units.
Main outcome measures: Critically ill patients' experiences of sleep deprivation.
Results: Seven qualitative studies were included documenting the experience of 109 adult patients. A total of 12 codes emerged as causes of sleep deprivation and 'feeling fear/concern' was reported with the greatest frequency (71.4%) in the meta-summary. The 12 codes were categorised into three main themes influencing both directly and also interdependently the quality of sleep: (1) Experiencing complex interactions with the environment (nursing activities, frightening or disturbing sounds, acceptable sounds, time and space disorientation); (2) Undergoing intensive emotions and feelings (fear/concerns, state of abandon, inexplicable insomnia, inability to move, inability to talk) and (3) Receiving an appropriate standard of care (physical pain, feeling safe/unsafe).
Conclusions: Despite the increased relevance of sleep deprivation and poor sleep quality, only a few studies have been performed to date aimed at identifying the factors involved in the phenomenon according to patient experience. The majority of determinants as identified from patients' perspective are modifiable.

Implications for clinical practice

- Intensive Care Unit patients are disturbed during sleep mostly because of (a) complex interactions with the environment; (b) their intensive emotions and feelings and (c) the standard of care they receive.
- Most antecedents of sleep disturbance or poor sleep quality appear to be modifiable by nurses who can play a great role in preventing their occurrence.
- Interventions designed to increase the quality of sleep should be multilevel, targeting different factors involved in sleep disturbance.

Introduction

In intensive care units (ICUs) patients are frequently subjected to sleep deprivation or to poor quality sleep (Kamdar et al.,

---

* Corresponding author at: Udine University, Viale Ungheria 20, 33100 Udine, Italy.
E-mail address: alvisa.palese@uniud.it (A. Palese).

https://doi.org/10.1016/j.iccn.2019.03.006
0964-3397/

2012). Sleep deprivation (SD) has been defined as time-limited disruptions in the quantity and quality of sleep due to external factors (Hamze et al., 2015) as can occur during an ICU night stay (Romero-Bermejo, 2014). From the point of view of ICU patients, according to self-reported data (Elliott et al., 2013; Bihari et al., 2012) around 38% of them have experienced difficulty in falling asleep and around 61% have reported a greater need for sleep as compared to their routines (Orwelius et al., 2008); moreover, nearly 70% of ICU patients have reported a moderate or severe level of SD (Nelson et al., 2001). From the point of view of the diagnostic measures available, around 90% of ICU patients have been documented as spending their total sleep time (TST) in superficial sleep, characterised by multiple short, non-contiguous sleep periods and by numerous arousals (Elliott et al., 2013), experiencing up to 41 ± 28 sleep periods per 24-hours, with each sleep period averaging 15 ± 9 min (Kamdar et al., 2012; Freedman et al., 2001). Moreover, poor sleep quality in ICUs has been documented by 24-hour polysomnographic studies (e.g., Kamdar et al., 2012).

Antecedents of SD have been established at clinical level, such as immune dysfunction, impaired resistance to infections, alterations in nitrogen balance, wound healing (Pulak and Jensen, 2016; Bihari et al., 2012), cardiovascular and respiratory alterations; moreover, SD antecedents have also been identified in the ICU environment stimuli such as light, noisy alarms and the voices of staff that become more pronounced during nights (Romero-Bermejo, 2014).

Consequences of SD, on the other hand, have been recognised mainly at a psychological level, as one of the top three major sources of anxiety and stress during the in-ICU stay, along with pain and the endotracheal tube (Kamdar et al., 2012; Rotondi et al., 2002). Moreover, SD has been documented as triggering depression, continued sleep disruption and post-traumatic stress disorders (Randall et al., 2008), cognition impairments causing apathy, confusion and delirium (Pulak and Jensen, 2016). Furthermore, sleep loss has been documented as (a) decreasing physical activity in the short-term impacting patient's recovery (Kamdar et al., 2012) and (b) threatening the quality of life for a variable time after discharge from the ICU (Pisani et al., 2015).

Matthews (2011) has contextualised the theoretical 'Three Factor Model' developed by Spielman et al. (1987) by identifying predisposing, precipitating and perpetuating factors triggering the development and the continuation of SD among ICU patients. Predisposing factors have been documented at the patient level, involving physiologic and psychological dimensions such as fear, anxiety, psychosis, pain and pre-existing sleep disorders (Pisani et al., 2015; Kamdar et al., 2012). Precipitating factors, on the other hand, have been set (a) at the environmental level such as noises, light, health-care procedures and (b) at the treatment/medication level, e.g. vasopressors, antibiotics, sedatives, analgesic medications as well as mechanical ventilation and organ support treatments (Pulak and Jensen, 2016; Pisani et al., 2015). Finally, perpetuating factors have been identified at the behavioural level, as those enacted by patients to compensate for the loss of sleep as well as maladaptive coping strategies leading to chronic insomnia and changes in sleep architecture (Matthews, 2011).

Different strategies aimed at preventing SD have been documented to date, such as the control of light and noises, the reduction of unnecessary interventions and diagnostic procedures, the evaluation and treatment of pain, the better management of sedatives and benzodiazepine medications, as well as the patients' orientation regarding time and space (Patel et al., 2014). However, despite its relevance for both short- and long-term outcomes, to the best of our knowledge, no systematic review of studies describing the determinants of SD as experienced by ICU patients has been developed to date. Understanding their experiences can help in designing and testing interventions aimed at increasing both the quality and the quantity of sleep among ICU patients. Therefore, the general purpose of this study was to improve the knowledge available in the field by summarising studies exploring ICU patients' experiences regarding SD.

Methods

Review question and study aim

The research question was: 'What are the determinants of SD or poor sleep quality as experienced by ICU patients?'. Therefore, following the Population, Exposure and Outcome (PEO) framework (Bettany-Saltikov, 2012), the interest was on: (a) ICU critically ill patients (P), (b) who had suffered from SD and/or poor quality of sleep (E), (c) causes of SD and/or poor quality of sleep as experienced by patients (O). According to the research question and the PEO framework, the study aim was to summarise the evidence reported in qualitative studies regarding the antecedents of SD and/or poor quality of sleep as experienced by ICU patients.

Study design

A preliminary systematic review (Liberati et al., 2009) of qualitative studies available in the field and then a meta-summary and meta-synthesis (Sandelowski and Barroso, 2007) of the included studies whose purpose was to develop a deeper understanding of the subjective reality of patients (Walsh and Down, 2005), were sequentially performed. In conducting the study, the three phases recommended by Sandelowski and Barroso's guidelines (2007) were strictly followed: (a) conceiving the synthesis, by searching and retrieving the primary studies; (b) appraising and classifying the findings that emerged from the included studies and (c) synthesising the findings into a meta-summary and a meta-synthesis.

Searching and retrieving literature

Four researchers (VM, LV, EM, MD) independently conducted the systematic search of the primary studies in different timeframes (first and second semester 2017, first semester 2018) with the aim of ensuring that all eligible studies were retrieved. Three electronic databases were accessed: The Cumulative Index to Nursing and Allied Health Literature (CINHAL), MEDLINE (PubMed) and Scopus. Thus, the following search terms as key words and medical subject headings (MeSH) when appropriated, were used: (a) Population (P): "*intensive care units*", "*intensive care*", (b) Exposure (E): "*sleep*", "*sleep deprivation*", "*sleep disorders*", *"night care"*, *"night"*, (c) Outcome (O): *"experience"*, and (d) *"qualitative research"*, *"phenomenological study"*. The Boolean operators (AND, OR) between the key words/MeSH terms when available, were also added.

Studies were deemed eligible and included when they met the following inclusion criteria: (a) primary studies written in English; (b) based upon qualitative study designs; (c) aimed at exploring the subjective experiences of patients regarding the causes of sleep disturbances or poor quality of sleep during the night in ICU; (d) as reported during the ICU stay or after discharge and (e) published before February 2018. Therefore, studies not reporting the patient's experience, as well as those including a paediatric population (age <18 years) or performed in clinical contexts other than the ICU (e.g. semi-intensive units), were all excluded. Inclusion criteria were applied independently by four researchers (VM, LV, EM, and MD) and then agreed with a senior researcher (AP), in order to reach a full agreement on the studies included.

The database research yielded 1006 initial citations. Of those, 683 were excluded in the first screening because they were not consistent with the inclusion criteria; moreover, 18 studies were removed because they were duplicates. Of the remaining 305 studies, 297 were excluded because not consistent with (a) the population under study (=51, not ICU patients, or patients <18); (b) the exposure (=95, not regarding the sleep experience); (c) the study outcomes (=39, not documenting SD causes and/or antecedents), (d) the study design (=110), or other (=2, e.g., language). Finally, only eight were considered eligible; after having carefully analysed their full text, and excluding one article reporting aggregate patients' and relatives' experiences, seven primary studies were retained, which were all included. References of the included studies were also checked aiming at retrieving possible missed studies. In Flow Diagram 1 (Fig. 1) the studies inclusion process has been reported.

Quality appraising and data extraction

The Critical Appraisal Screening Programme (CASP) tool was used (CASP, 2018) to evaluate the methodology quality of the studies included. The tool is composed of 10 items aimed at assessing the quality of different domains including: (a) the aim of the study; (b) the appropriateness of the qualitative methodology; (c) the research design; (d) the recruitment strategy; (e) the data collection process; (f) the researcher and participant relationship; (g) the research ethics; (h) the data analysis process; (i) the findings and (j) the contribution to the development of knowledge. According to the literature available (Satink et al., 2013), each item can be scored as 'Yes' (Y), 'No' (N) or 'Unclear' (U), depending on whether the topic is described appropriately. Thus, the score can result in three options: 1 (Y), 0.5 (U), and 0 (N) (Satink et al., 2013) giving a maximum score of 10: higher scores suggest a high quality of the study.

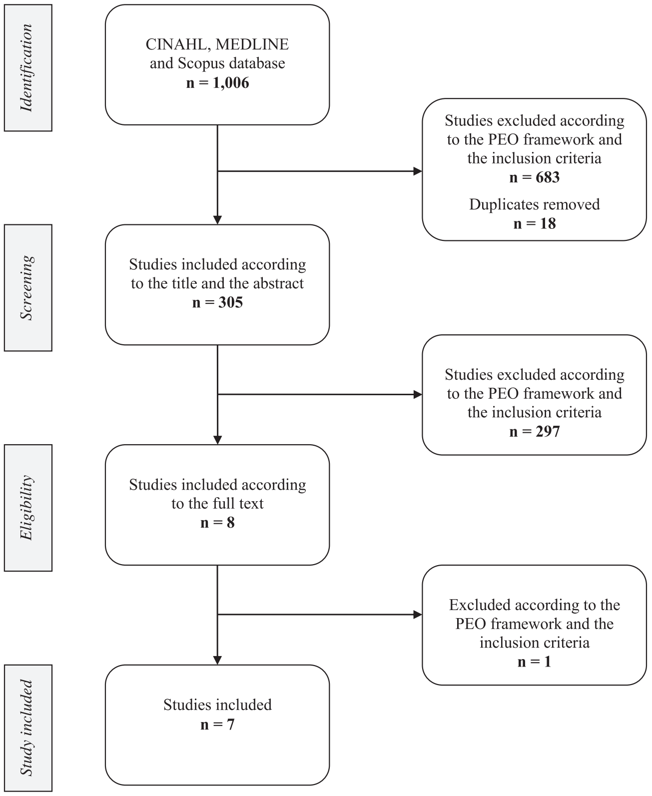

Fig. 1. Flow diagram for research strategy and study selection and inclusion (PRISMA statement, Liberati et al., 2009). CINAHL = Cumulative Index to Nursing and Allied Health Literature; PEO, Population, Exposure, Outcome; PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

According to previous studies (e.g., Rossettini et al., 2018) given that the CASP tool does not offer a cut-off, researchers agreed to consider all studies resulting in low (CASP 0-5), medium (CASP 6-8) and high (CASP 9-10) levels of quality. Thus, after having read the included studies several times, an appraisal was conducted by two reviewers independently (AP, MD) with disagreements resolved through discussion. In Table 1 the included studies and the scores that emerged in each domain under evaluation and in the total CASP score have been reported.

Then, data extraction using a matrix model (Garrard, 2003) was performed. Column headings were agreed upon by researchers by deciding to extract and include the following elements of each study: study aim(s); research methodology; sites of data collection (mono- or multicentric nature); year of data collection; participants' characteristics; methods of data collection; and main findings. Each study was read independently, the main data extracted and then read again in pairs to check the consistency of data extraction.

Synthesising findings

According to the study aims, only elements/factors influencing the quality of sleep and the occurrence of SD during the ICU stay as experienced and reported in the included studies were analysed; therefore, data regarding, for example ICU general experiences, were not considered. Moreover, in those studies including more participants (e.g. patients, family members, nurses), only those findings that emerged from patients were extracted and included or, when the analysis was performed integrating findings from two or more groups of participants (Ding et al., 2017), only those described as overlapping and grouped in the same category were considered (e.g., vital signs or timed nursing assessment were sources of disturbance for both the patient/family members group and the staff group, in Ding et al., 2017).

Then, following Sandelowski and Barroso's methods (Sandelowski and Barroso, 2007; Ludvigseng et al., 2015) an inductive analysis was performed by: (a) extracting findings and separating them from other elements of the research report; (b) editing the findings extracted to make them accessible to any reader; (c) grouping the findings in common domains; (d) abstracting findings in codes and (e) by performing the meta-summary, calculating manifest frequency and intensity effect sizes. The frequency was obtained by calculating the frequency of each code in each study included; then, these frequencies were converted into percentages to determine the prevalence of each code (Onwuegbuzie, 2003). Intensity effect sizes were established by calculating the concentration of codes in each study; intensity effect sizes were all converted into percentages (Onwuegbuzie, 2003).

Findings extracted and coded were grouped and categorised in themes by replication or confirmation, extension or refuting each other, based on with their similarity (Sandelowski and Barroso, 2007, pg. 157) as reported in Table 2. Specifically, replication or confirmation were used when a specified number of fragments of studies all reported a specific experience; on the other hand, extension was used when a specified number of studies focused on one aspect, while others emphasised different aspects completing the first aspect emerged. Refutation was used when one set of findings reported one aspect while another set of findings reported that the same aspects had no influence or relevance. Then, a conceptual diagram representing determinants of SD or poor quality of sleep in ICU according to the experience of patients as emerged through the process of synthesis, was developed.

All researchers (see authors) independently performed the aforementioned process in order to prevent biases influencing

Table 1
Quality appraisal of the included studies using the *Critical Appraisal Screening Programme* (CASP, 2018).

	Charhaoui et al., 2015	Ding et al., 2017	Johansson et al., 2012	Tembo et al., 2013	Van Rompaey et al., 2015	Wong and Arthur, 2000	Zeilani and Seymour, 2010
Item 1. Was there a clear statement of the aims of the research?	Y	Y	Y	Y	Y	Y	Y
Item 2. Is a qualitative methodology appropriate?	U	Y	Y	Y	Y	Y	Y
Item 3. Was the research design appropriate to address the aims of the research?	Y	Y	Y	Y	Y	Y	Y
Item 4. Was the recruitment strategy appropriate to the aims of the research?	Y	U	U	Y	Y	Y	Y
Item 5. Was the data collected in a way that addressed the research issue?	Y	U	Y	Y	Y	Y	Y
Item 6. Has the relationship between researcher and participants been adequately considered?	N	U	N	U	Y	N	U
Item 7. Have ethical issues been taken into consideration?	Y	Y	Y	Y	Y	U	Y
Item 8. Was the data analysis sufficiently rigorous?	Y	Y	Y	Y	Y	Y	Y
Item 9. Is there a clear statement of findings?	Y	Y	Y	Y	Y	Y	Y
Item 10. Was this research valuable?	Y	Y	Y	Y	Y	Y	Y
Overall score	**8.5**	**8.5**	**8.5**	**9.5**	**10**	**8.5**	**9.5**

Legend: Y = Yes (1); N = No (0); U = Unclear (0.5).

the process of analysis and themes coding; disagreements were resolved using consensus and reciprocal consultation.

Results

Methodological features of the studies included

A total of seven studies were included as reported in Table 3: three were conducted in Europe (Belgium, Van Rompaey et al., 2015; France, Charhaoui et al., 2015; Sweden, Johansson et al., 2012) while the remaining four studies were conducted respectively in Australia (Tembo et al., 2013), Hong Kong (Wong and Arthur, 2000), Jordan (Zeilani and Seymour, 2010) and Connecticut, US (Ding et al., 2017). With the exception of one study (Zeilani and Seymour, 2010) all were monocentric in nature.

A total of 109 patients reporting their own experience were involved and, among them, 56 (51.4%) were males. When reported, the average age of patients was 60.6 years (from 18 to 88) but in some studies the age was reported as ranges (Wong and Arthur, 2000) or classes (Ding et al., 2017).

The reasons for ICU admission varied: in Wong and Arthur (2000) patients were admitted for gastrointestinal or renal carcinoma elective surgery, while in other studies the causes differed from medical (cardiac event, pneumonia, as in Tembo et al., 2013), to surgical (e.g. abdominal surgery, as in Wong and Arthur, 2000), and to traumatic/shock events (e.g. pneumothorax, trauma, shock, in Charhaoui et al., 2015). The average length of stay (LOS) was 14.5 days (ranging from 1 to 65 days) as reported in only five studies (Charhaoui et al., 2015; Ding et al., 2017; Johansson et al., 2012; Tembo et al., 2013; Wong and Arthur, 2000).

With regards to the aims, only two studies were focused upon SD (Ding et al., 2017; Tembo et al., 2013) while the others focused on different experiences of being ICU patients. Moreover, three studies used a phenomenological approach (Charhaoui et al., 2015; Tembo et al., 2013; Wong and Arthur, 2000), two a hermeneutic approach (Johansson et al., 2012; Van Rompaey et al., 2015), one a narrative approach (Zeilani and Seymour, 2010) and the remaining one a qualitative approach (Ding et al., 2017).

Data was collected by using interviews conducted in some studies only once (Charhaoui et al., 2015; Johansson et al., 2012; Tembo et al., 2015; Zeilani and Seymour, 2010), while in others this was ≥2 times. Moreover, the time elapsed between the ICU experience and the interview was also different across studies: only in one study were patients interviewed during the ICU stay when it was possible (Van Rompaey et al., 2015) while in the remaining, patients were interviewed after their ICU discharge or immediately after hospital discharge in their homes within a variable period (from two days, in Johansson et al., 2012; up to 11 months, in Tembo et al., 2015).

Meta-summary

Twelve codes emerged. The study by Johansson et al. (2012) presented the highest code intensity (71.4%), while that of Zeilani and Seymour (2010) reported the lowest (7.0%) code intensity as shown in Table 4.

Moreover, the most frequent code across studies was ‘Experiencing fear/concerns’ (71.4%), followed by ‘Experiencing frightening or disturbing sounds’ (57.1%) and ‘Being disturbed by nursing activities’ (57.1%), as reported in Table 5. Conversely, less frequent codes were ‘Feeling in a state of abandonment’, ‘Being unable to move’, ‘Being unable to talk’, and ‘Experiencing inexplicable insomnia’, that were all reported with the same frequency of 14.3%.

Meta-synthesis

As reported in Fig. 2, the 12 codes emerged were categorised into three themes: (1) ‘*Experiencing complex interactions with the environment*’; (2) ‘*Undergoing intensive emotions and feelings*’, and (3) ‘*Receiving appropriate standard of care*’. The themes emerged have been reported as affecting the quality of sleep by also interacting each other.

Theme 1: Experiencing complex interactions with the environment

The ICU environment can disturb or facilitate night sleep through different factors sometimes perceived antithetically by patients: being disturbed by nurses with their nursing activities, experiencing frightening/disturbing sounds or acceptable sounds, and being disoriented in time and space have all been reported as affecting the quality of sleep.

Nursing care activities have been reported as influencing patients’ night stay in the ICU, for example when they move from one bed to another, they talk with other members of the staff, they manage alarms, or when they offer explanations to the patient

Table 2
Data synthesis by extracting, coding, grouping and abstracting findings in common themes: an example.

Study	Main findings extracted from the study	Quotes extracted from the study	Code as defined by researchers	Methods of grouping used (Sandelowski and Barroso, 2007)	Abstraction: Theme
Charhaoui et al., 2015	Feelings of confusion and disorientation during ICU stay Sleep disorders during stay and noise	. . .I didn't know if it was day or night, I didn't know. . ..I was totally confused. . ..I had lost all notion of time. . . .It was noisy, you're woken up all the time and when you try to sleep or rest, there are all these alarms going off, and you're woken up regularly for care. . .	- Time and space disorientation - Frightening or disturbing sounds - Nursing activities	Extension Extension Extension	Experiencing complex interactions with the environment Experiencing complex interactions with the environment
Ding et al., 2017	Most patients were satisfied with the ICU environment, and many considered in-room interruptions necessary at night They reported that being monitored closely by the health-care providers was appropriate	. . .I felt at ease. I felt secure at night, and I felt everybody was taking care of my needs to the best of their ability . . . not a lot of commotion, just a very soothing community. . .	- Feeling safe	Refutation	Receiving appropriate standard of care
Van Rompaey et al., 2015	Several patients reported spontaneously that they noticed that the normal day–night circle was disrupted. The perception of time in particular was disturbed heavily. Some patients managed to distinguish day and night, but they observed the normal procedures of the day as mixed-up. For some patients, this resulted in a changed or disturbed sleep pattern. Other patients indicated different reasons for sleeping badly in the ICU. First, the intensive care surroundings and care made it harder to fall asleep. Moreover, several patients feared falling asleep and never waking up again	. . .actually you do not know when it's day or night, in your dreams you can make it any time. When you want to call it day, then its daytime. . . . . .I asked for the day and the time. But when you looked outside it did not match. In the mornings they said sleep well, and in the evening, they said good morning or something similar. . .. . . .you know you are sleeping but yet you are not. Even the moments you think you are sleeping, you know it might be possible to be dreaming again. . . . . .I could not risk falling asleep. I thought I would never wake up.	- Time and space disorientation - Feeling unsafe - Fear/concerns	Extension Refutation Extension	Experiencing complex interactions with the environment Receiving appropriate standard of care Undergoing intensive emotions and feelings

(Johansson et al., 2012). '*People entering and leaving the unit*' has been reported as a disturbing factor because these movements make the patient wonder what's happening (Johansson et al., 2012); listening to conversations has also been reported as a cause of being awake (Wong and Arthur, 2000); moreover, receiving interventions ('*My blood is taken every three hours*', Ding et al., 2017) have been reported as a cause of being woken up several times, interrupting sleeping (Charhaoui et al., 2015; Ding et al., 2017).

Different sounds, such as loud noises, noises from dropping objects (Wong and Arthur, 2000) and all other surrounding noises (Charhaoui et al., 2015; Johansson et al., 2012), have been recalled by patients as keeping them awake. However, while in some studies these sounds have been reported as acceptable because they are capable of keeping the patient in a real and understandable world, in other studies sounds have been reported as being frightening or disturbing. In Wong and Arthur (2000), some patients have reported that they were used to being surrounded by sounds and also capable of detecting where they came from; in Johansson et al. (2012) acceptable sounds, such as the low and calm voices of nurses, or the '*Rhythmic sound of my ventilator as an ongoing hum*', have all been reported to facilitate sleep. On the contrary, in the same study by Johansson et al. (2012), sounds have also been described as being scary because the patient was not able to understand what was happening; in Ding et al. (2017) and in Johansson et al. (2012) patients identified alarms as a source of stress ('*The noise is tremendous up here . . . the alarms going off and beeps going off*'). Furthermore, the absence of sounds has also been reported as disturbing the quality of sleep: '*Some nights ago I woke up and did not recognise the surroundings at all. Since I did not hear any familiar sound I did not know where I was or what time it was*' (Johansson et al., 2012).

Time/space disorientation has been reported as confusing patients regarding what is expected of them, in terms of whether to remain awake or to sleep (Charhaoui et al., 2015; Johansson et al., 2012). Specifically, in Van Rompaey et al. (2015) a patient reported that '*You do not know when it's day or night, in your dreams you can make it any time. When you want to call it day, then it is daytime. . .I asked for the day and the time. But when you looked outside it did not match. In the mornings they said sleep well, and in the evening, they said good morning or something similar.*'

Theme 2: Undergoing intensive emotions and feelings

Several intensive emotions and feelings are experienced by patients during night-time, and these have been reported as disrupting the quality of sleep: feeling fear/concerns, feeling in a state of abandonment, being constrained in expressing their needs, and experiencing inexplicable insomnia are those reported by patients included in the studies.

Fear and/or concerns have been reported as emerging especially during night-time because patients do not know '. . .What to expect in the next minutes regarding sounds' (Johansson et al., 2012). Hearing alarms can also be frightening regarding something that might happen (e.g., '. . .*Scared to death that the machine is about to stop*', Johansson et al., 2012). Moreover, feeling fear and/or being

Table 3
Studies included: methodological profile and main findings.

Study Authors and Country	Study aim(s)	Approach, site(s), year (s) of data collection	Participants: inclusion criteria, included and profile	Data collection process and timeframe	Main findings
Charhaoui et al., 2015 France	To understand and describe the patients' psychological experiences of the ICU	Descriptive and qualitative *Site*: Monocentric *Year*: NR	Patients aged > 18 years, admitted into ICU with any organ failure requiring life support therapy; living within 30 km radius from Dijon; without neurological deficits and severe restricted mobility. Patients were enrolled until achieving data saturation *Involved*: 9 men and 11 women; average age was 68 years (SD 8.5) *ICU LOS*: average 7.5 days (IQR = 8.5)	Semi-structured interviews on the memories and the experience of patients' ICU stay and their current psychological state *Timeframe*: 3 months after patients' stay in ICU	Negative memories about ICU experience: physical restraint; sleep disorders; difficulties arising from not being able to talk; pain; feeling of incomprehension about ICU stay; fear; sensation of impending death, a feeling of being abandoned by family or carers Positive memories about ICU experience: the support received from health-care team and family Current psychological status: after discharge they continued to have negative 'reliving' experiences of their ICU stay, triggering the adoption of different coping strategies
Ding et al., 2017 Connecticut, USA	To explore the perceptions and beliefs of patients, staff and surrogates regarding environmental and non-environmental factors in the ICU that affect patients' sleep	Exploratory qualitative *Site*: Monocentric *Year*: June 2013 – February 2014	A consecutive sample of: a) Patients who stayed at least one night in the ICU, able to speak English, >21 years old, without neurological deficits and delirium b) Surrogates of excluded patients who were able to speak English and who were present during patients' admission[a] c) Clinical staff: physicians, RNs, patient-care assistants, respiratory therapists who have worked overnight and provided direct care to patients[a] *Involved*: 8 patients (3 men and 5 women) *ICU LOS*: average 4.1 (SD 5.2)	Semi-structured interviews by using an interview guide (e.g., 'Describe the environment of the ICU at night') *Timeframe*: during the period of stay in ICU, after they were medically eligible to being transferred to the general medical floor	Four main themes regarding overnight sleep emerged:[b] - Effect of environmental factors: the ICU environment is disruptive, unpredictable workflow creates disruptions and disruptive environment is expected and reassuring - Effect of non-environmental factors: emotional factors, chronic sleep problems and acute illness affect ICU sleep - Perceptions of sleep quality: sleep quality is variably reported and participants believe that medications can improve sleep - Strategies to improve sleep: cluster care, reassure patients and educate staff and patients
Johansson et al., 2012 Sweden	To illuminate the meanings of being critically ill in a sound-intense ICU patient room, as disclosed by patients' narratives	Narrative design according to Ricoeur (Lindseth and Norberg, 2004) *Site:* Monocentric *Year*: May 2007 – July 2008	A convenience sample of patients discharged from ICU, excluded if treated for head injury, suffering from hearing problems and dementia *Involved*: 13 patients (7 men) aged between 51 and 86 years (average = 66.3) *ICU LOS*: average 37.5 days (range 2–35)	Open-ended questions in the preferred place and time by patients by asking them to narrate their experience of the sound environment in an ICU patient room *Timeframe*: 2–35 days after patients had been discharged from the ICU	- Two composite stories emerged from patients' narratives: - Being at the proper pitch (a) I feel safe and secure when in a caring and familiar atmosphere (b) I am mobilising my strength and inner security - Being surrounded by piercing sounds (a) I am uncomfortable by being trapped in an uncontrolled situation (b) I am an invisible audience in an imposed drama (c) I am left alone in a strange and demanding world
Tembo et al., 2013 Australia	To describe the experience of critical illness in ICU with DSI and its impact on participants' continued existence	Phenomenological design *Site*: Monocentric *Year*: NR	A purposeful sample of critically ill patients, aged >18 years, English-speaking, ventilated for at least 48 h, underwent DSI, without cognitive impairment and capable to give informed consent *Involved*: 12 patients (6 male); average age was 54 years (23–76) *ICU LOS*: average 8.8 days (range 3–36)	Face-to-face in-depth interviews with participants in their home or place of preference where privacy, safety and comfort were ensured *Timeframe*: at two weeks after discharge from ICU; a second interview was conducted with eight participants 6 to 11 months later	The following themes highlight participants concerns regarding sleep: - Looking for normal sleep: participants reported to take sleep medications after discharge, some attributed the lack of sleep in the ICU being due to people who were dying around them. Staying awake and being vigilant ensured a sense of survival

					- Being tormented by nightmares: patients reported nightmares of ICU after discharge that bring them back to the dark and horrifying world of ICU
Van Rompaey et al., 2015 Belgium	To describe the intensive care patients' perception of delirium to develop an in-depth understanding of patients' perceptions of delirium	Hermeneutic qualitative approach *Site*: Monocentric *Year*: December 2011 and April 2012	Purposive sampling of surgical or medical ICU patients, staying at least 24 h in ICU, English- or Dutch-speaking, adult, not reporting delirium at the ICU admission and scored positive for delirium at least once during their ICU stay; with a GCS >13 at the time of interview *Involved*: 30 patients (female 43.3%); average age was 65.2 years (range 18–88) *ICU LOS*: NR	Interviews were based upon three phases of delirium: its starting, its development and its ending. For each stage, the interviewer focused on feelings, communications with the environment and the awareness of change in perceptions *Timeframe*: at least 48 h after the last positive score for delirium	Four major themes emerged: - Contact and communication: difficulties in self-expression, contact with the nursing staff (normal, difficult, bad), contact with visitors (pleasant, unpleasant) - Feelings: anger, fear, frustration, guilt, incomprehension, joy after and during delirium, loneliness, neglected, restless, shame, tired - Sleep and time: disrupted time perception/shift of day and night, disrupted sleep pattern, fear of falling asleep - Implications of delirium episode: delirious episodes concluded (yes, no, doubt), never again, indifferent, influence on further life, cause (searching for a cause, cause(s) reported)
Wong and Arthur, 2000 Hong Kong	To explore the experiences of ICU patients	Phenomenological design *Site*: Monocentric *Year*: NR	A purposeful sample of: a) ICU patients after elective surgery for cancer, conscious, without sedation, aware of the environment and able to speak during their stay in ICU b) RNs: providing direct care, >1 year of experience[a] *Involved*: 10 patients (8 male); their average age was 62.7 (range 40–67) *ICU LOS*: average 3.1 days (range 2–6)	Patients were asked in a quiet room if they could remember what happened in ICU, how they felt being in ICU, what were their needs and the support received; RNs were asked to respond to similar questions from their perspective of patients' experience *Timeframe*: within 5 days after ICU discharge	Patients reported that - Feeling experiences were based upon 'Anxiety'; 'Safety and security' - Needs during ICU stay were: 'Sleep'; 'Visits'; 'Pain relief'. Pain interfered with their sleep; noises, pain and worries contributed to poor sleep
Zeilani and Seymour, 2010 Jordan	To explore women's accounts of suffering and the representation of the complex dimensions of their experiences, aimed at reporting on Muslim women's nursing care in ICU in Jordan and in other countries in which they may receive critical care	Qualitative narrative approach *Sites*: Multicentric (2 ICUs located in 2 government-funded hospitals) *Year*: NR	A purposeful sample of women >18 years, remaining >48 h in ICU for varied reasons (e.g. intestinal obstruction, respiratory failure, road traffic accident, meningitis), capable of speaking Arabic and of providing written informed consent *Involved*: 16 women; the average age was 47.8 (range 19–82) *ICU LOS*: average 16.8 days (range 2–42)	Interviews (from one to three): - the first interview (in ICU, 16 women) was initiated with a general question 'Can you tell me about your illness?' - the second interview (three months after the women's discharge, 11 women) focused on any changes in women's stories of their experience - the third interview (six months after their discharge, 2 women) was conducted to discuss the women's experience in more detail *Timeframe:* ICU, three and six months after ICU discharge	Women's experiences of suffering were: physical; social; spiritual; and being dependent on ICU technology The intensity of pain suffered was severe and overwhelming, constantly disturbing the sleep and triggering perpetual anxiety

---

DSI = daily sedation interruption; GCS = Glasgow Coma Scale; ICU = intensive care unit; IQR, Range interquartile; LOS = length of stay; NR = not reported; RN = Registered Nurse; SD = standard deviation.

[a] Data on health-care staff have not been reported here according to the aim of the study.

[b] Data emerged from different participants were analysed and summarised as integrated in the original study.

concerned about sleeping in a place where death is pervasive have also been reported (e.g. '*I couldn't sleep in that place because everybody around me was dying*', Tembo et al., 2013); as well as fear of and/or concerns about never waking up again have also been documented as disturbing sleep (Van Rompaey et al., 2015). The same fear or concerns have also been reported in awakening moments: '*When I woke up, I was wondering, what am I doing here? And then it hit me, and I thought, am I dead? Or why am I like this?*' (Charhaoui et al., 2015). Furthermore, concerns regarding health conditions have been reported to also affect negatively the quality of sleep: '*I didn't get as much sleep as I wanted . . . but I had a lot of things on mind . . . I had had some bad, pretty bad news*' (Ding et al., 2017).

The inability to move independently or freely in bed, as well as the inability to talk have been reported as threatening the expression of needs to the staff: in Johansson et al. (2012) a patient reported that '*I couldn't say anything or move since I was too tired and connected up to the cables and the ventilator*' and '*I was too tired to get up and leave. I did not even have enough strength to tell the staff about how I felt or ask for help*'. As a consequence, patients have reported the feeling of being left alone, abandoned or without any help ('*I felt really scared and abandoned*', Johansson et al., 2012).

Finally, also experiencing inexplicable insomnia has been reported as an issue and this caused sleep disturbances ('*There was no reason why* [the lack of sleep] *– whether it was the medication or the surroundings or whatever it was – I just couldn't get back to sleep. I just couldn't*', Tembo et al., 2013).

Theme 3: Receiving an appropriate standard of care

The standard of care, when below that expected, has been reported as causing sleep disturbances: living with untreated pain as well as feeling unsafe have both been reported as decreasing sleep quality; on the other hand, receiving an appropriate standard of care has been reported as increasing the quality of sleep because the patient feels safe.

Physical pain has been reported as disturbing sleep by patients interviewed by Wong and Arthur (2000) and by Zeilani and Seymour (2010) (e.g., '*. . . I was full of pain(s); my legs hurt a lot, I was covered in plaster cast*', Zeilani and Seymour, 2010).

Moreover, the perception of being immersed in an unsafe condition has been reported as changing or disturbing sleep patterns. Some patients reported they felt at risk by falling asleep because they would never wake up (Van Rompaey et al., 2015), while others reported being incapable of sleeping because people were dying and they thought they were also at the same risk of dying (Tembo et al., 2013). Moreover, different sounds have been reported as an indication of danger (Johansson et al., 2012). Conversely, patients who received explanations from the staff, helping them to better understand what was happening around them, as well as when patients perceived that the staff were working as a team to deliver best care, reported an increased perception of safety thus an increased likelihood of sleeping: '*Several times they have explained to me the reasons for the alarm so now I feel safe and I do not even react when I hear the alarms. Instead, when I hear the equipment working well, I feel secure*' (Johansson et al., 2012). The same feelings have also been reported in Ding et al. (2017) '*I felt at ease. I felt secure at night, and I felt everybody was taking care of my needs to the best of their ability . . . not a lot of commotion, just a very soothing community.*'

Furthermore, patients cared for in open spaces instead of single rooms, have reported feeling safe because they were easily in communication (e.g., to ask for help) with the team (Wong and Arthur, 2000).

Discussion

Methodological features of the studies included

Despite the occurrence of SD (nearly 70% of ICU patients, Nelson et al., 2001) and its short- and long-term consequences (Pulak and Jensen, 2016; Pisani et al., 2015; Kamdar et al., 2012), only seven

Table 4
Meta-summary according to Onwuegbuzie (2003): code intensity in the included studies.

Studies	Categories (n = 12)	Intensity (%)
Charhaoui et al., 2015	- Experiencing time and space disorientation - Experiencing frightening or disturbing sounds - Being disturbed by nursing activities - Experiencing fear/concerns	28.5
Ding et al., 2017	- Experiencing frightening or disturbing sounds - Experiencing acceptable sounds - Feeling safe - Being disturbed by nursing activities - Experiencing fear/concerns	35.7
Johansson et al., 2012	- Experiencing frightening or disturbing sounds (n = 3) - Experiencing fear/concerns (n = 3) - Experiencing a state of abandonment (n = 2) - Being disturbed by nursing activities (n = 2) - Being unable to move (n = 2) - Being unable to talk (n = 2) - Experiencing acceptable sounds - Feeling safe - Feeling unsafe - Experiencing time and space disorientation	71.4
Tembo et al., 2013	- Inexplicable insomnia - Experiencing fear - Experiencing fear/concerns	21.4
Van Rompaey et al., 2015	- Experiencing time and space disorientation - Feeling unsafe - Experiencing fear/concerns	21.4
Wong and Arthur, 2000	- Experiencing physical pain (n = 2) - Feeling safe - Experiencing acceptable sounds - Experiencing frightful or disturbing sounds - Being disturbed by nursing activities	35.7
Zeilani and Seymour, 2010	- Experiencing physical pain	7.0

Table 5
Meta-summary of codes according to Onwuegbuzie (2003): frequency across studies.

Codes	Studies (n = 7)	Frequency (%)
Feeling fear/concerns	Charhaoui et al., 2015 Ding et al., 2017 Johansson et al., 2012 Tembo et al., 2013 Wong and Arthur, 2000	71.4
Experiencing frightening or disturbing sounds	Charhaoui et al., 2015 Ding et al., 2017 Johansson et al., 2012 Wong and Arthur, 2000	57.1
Being disturbed by nursing activities	Charhaoui et al., 2015 Ding et al., 2017 Johansson et al., 2012 Wong and Arthur, 2000	57.1
Feeling unsafe	Johansson et al., 2012 Tembo et al., 2013 Van Rompaey et al., 2015	42.8
Experiencing time and space disorientation	Charhaoui et al., 2015 Johansson et al., 2012 Van Rompaey et al., 2015	42.8
Experiencing acceptable sounds	Ding et al., 2017 Johansson et al., 2012 Wong and Arthur, 2000	42.8
Feeling safe	Ding et al., 2017 Johansson et al., 2012 Wong and Arthur, 2000	42.8
Experiencing physical pain	Wong and Arthur, 2000 Zeilani and Seymour, 2010	28.6
Feeling in a state of abandonment	Johansson et al., 2012	14.3
Being unable to move	Johansson et al., 2012	14.3
Being unable to talk	Johansson et al., 2012	14.3
Experiencing inexplicable insomnia	Tembo et al., 2013	14.3

studies have been conducted to date focusing on patients. Among the considered studies, only two (Ding et al., 2017; Tembo et al., 2013) have been focused on SD. Involving ICU patients in studies based upon qualitative methods can be challenging due to, for example, their level of consciousness and their fatigue, which can threaten their participation. Because of this issue, Ding et al. (2017) have involved surrogates when patients were not able to report their experience but the accuracy in their reporting of sleep quality should be further evaluated. However, according to the value of patient-reported experience measures to inform on the quality of care and to promote its amelioration (Weldring and Smith, 2013) it is strongly recommended to increase patients' involvement in future studies.

Studies published to date have been well designed, as evaluated by the CASP tool (CASP, 2018). These have been conducted in different countries, mainly monocentric in nature thus involving single ICUs, and the majority have been published in the last five years. However, a large number of the studies do not report the year of data collection, which is important in the ICU context given its rapid evolution due to technology improvements, monitoring systems and layout changes (Vincent, 2013), which can all affect the quality of sleep. Moreover, studies varied regarding the methodological approaches used: although all were based on open-ended or semi-structured interviews, some were administrated more than once (≥2, Zeilani and Seymour, 2010), thus ensuring confirmability of data collected (Morse, 2015). Furthermore, the time elapsed from the ICU experience and the interview was also different across studies as well as the LOS, which could have affected the quality of the experiences and their recall accuracy. In addition, mainly adult patients were included, with a balanced representation of male and female, and with different clinical conditions, thus suggesting that the findings reflect the causes of SD from the experience of patients in general ICU.

Meta-summary

In terms of intensity, studies varied in their codes, thus providing a variable influence on the final meta-synthesis, with Johansson et al. (2012) providing the highest, and Zeilani and Seymour (2010) the lowest. The similarities between the study of Johansson et al. (2012), which developed knowledge on the meaning of being a critically ill patient in a sound ICU setting, and that provided by Ding et al. (2017) and by Tembo et al. (2013) strictly focused on the night-time and sleep, were limited to the code 'experiencing fear/concerns'. This code, which can be categorised among the predisposing factors at the individual level, according

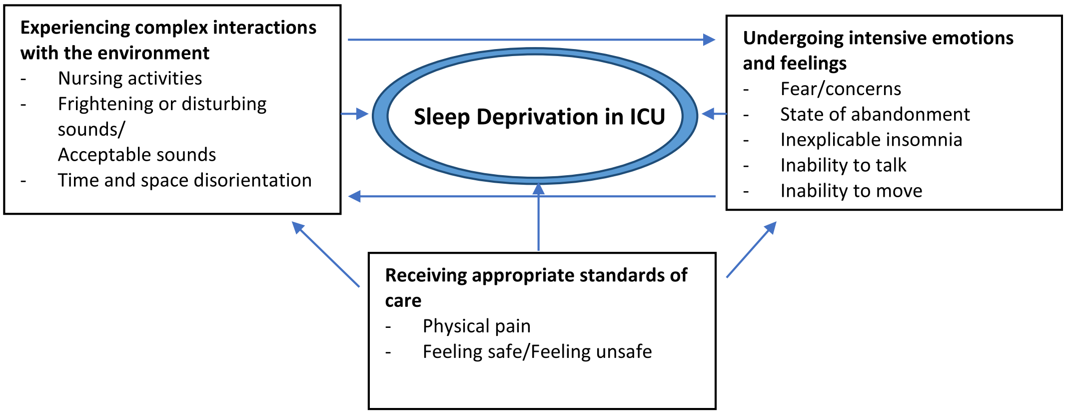

Fig. 2. Determinants of sleep deprivation in ICU according to the experience of patients. ICU, Intensive Care Unit.

to the Matthews (2011) framework, was the most frequent across studies, reaching >70% of intensity, thus suggesting that some factors at the patient level can play a great role in determining SD. The other more intensive codes (>50%) were ‘Experiencing frightening or disturbing sounds’ and ‘Being disturbed by nursing activities’, all includible among the precipitating factors (Matthews, 2011) that can be considered as being largely modifiable.

Meta-synthesis

The three themes emerged are partly in line with those described by Matthews (2011), who documented the relevance of individual, environmental and treatment/medication factors in affecting the quality of sleep. These factors have emerged as directly influencing the quality of sleep by also interacting with each other, suggesting that SD is a complex phenomenon, generated by different causes, thus requiring multi-level interventions aimed at increasing the quality of sleep.

Regarding the first theme, which has also reported the highest intensity of codes, namely ‘Experiencing complex interactions with the environment’, this reflects the precipitating factors documented by Matthews (2011) and appears to be modifiable mainly by nurses who can play a greater role in preventing SD occurrence by also involving family carers.

Nursing care activities during the night should be appropriately designed to ensure that they only involve those required for the specific clinical condition of each patient and by limiting movements and conversation among staff. However, balancing the patient’s need to sleep and his/her need to also be monitored with invasive procedures (e.g., blood specimens), as well the need for nurses to talk to each other in order to undertake the best decision, can be really challenging in some conditions and a source of moral distress (Mealer and Moss, 2016). Moreover, ICU sounds have been reported antithetically, being unacceptable for some patients and acceptable for others, suggesting that the impact of the sound on sleep quality should be evaluated at the patient level. Furthermore, time and space disorientation should be detected early and addressed (Patel et al., 2014).

The second theme ‘Living intense emotions and feelings’ seems, on the other hand, to be close to perpetuating factors expressed by Matthews (2011), including some maladaptive coping strategies enacted by patients for the complex situation they are dealing with. The negative emotions recalled by patients as being the causes of poor sleep quality should be considered by nurses in their daily care by increasing strategies aimed at reassuring them (e.g., regarding fear and concerns), by helping them to express their needs (e.g. lip reading, Ten Hoorn et al., 2016) as well as by keeping monitored those who suffer from insomnia by staying near them. Nurses should be supported in supporting patients emotionally, by interrupting the perpetuating factors influencing their quality of sleep. Continuing education strategies, with the aim of increasing nurses’ ability to assess the emotional needs as well as the maladaptive coping strategies enacted by patients, and by also improving competences in various communication techniques (Ten Hoorn et al., 2016) is strongly suggested. Moreover, involving family members in providing emotional support and reassurance to patients is also suggested.

The third theme emerged, namely ‘Receiving an appropriate standard of care’, seems not to be included among those identified by Matthews (2011) but its mechanism reflects both precipitating (e.g., pain) and perpetuating factors (e.g., perceiving to be in an unsafe and at-risk situation). Specifically, feeling in pain as a consequence of suboptimal treatment should be absolutely avoided and this requires multi-professional teamwork (Wong and Arthur, 2000), given that nurses are not in charge of analgesic prescriptions. Similarly, perceiving to be at risk or in an unsafe context or process of care should be limited by providing continuing information and reassurance to patients. If an explanation is provided to patients regarding alarms, they are more capable of tolerating them (Johansson et al., 2012). In this context the suggestion of ICUs being designed as open spaces where patients can have easy access to the staff as emerged in Wong and Arthur (2000) should also be considered: an appropriate nursing care supported by adequate nurse-to-patient ratio also during nights (Falk and Wallin, 2016), as well as an appropriate clinical environment where teamwork is continuously supported, can easily prevent the perception of it being difficult to access the staff including for patients staying in single rooms where they can be less disturbed by the challenging environment.

Limitations and Strengths

There are several limitations and strengths to this study. Firstly, given that the concept of SD has been introduced only recently in the literature (Hamze et al., 2015) we have used a broader range of keywords. On the one hand, this broader approach has ensured inclusiveness of all studies documenting experience of sleep quality and SD in line with the purpose of this meta-synthesis; in fact, only two studies (Ding et al., 2017; Tembo et al., 2013) were focused exclusively on the night-time and SD. Our focus was on SD and its determinants, not the full patients’ psychological experiences in the ICU. On the other hand, with the increased clarity of the concept of SD, further meta-syntheses should identify a more selective inclusion criteria, thus focusing only on ICU sleep disturbance issues as perceived by patients.

Secondly, grey literature or conference proceedings by hand-searching was not searched given that we have used only electronic databases. Therefore, pertinent studies can have been missed.

Thirdly, included studies were performed in different countries (e.g. Jordan, Belgium) and some of these were conducted in the language of the country, which is different from English. Therefore, the first translation performed (from native language of patients interviewed into English, for publication purposes) and the second translation, where all studies were read and reread by the authors (non-English native), could have affected the findings. Moreover, studies were performed in different cultural contexts and although this could have enriched the findings, not taking into account the cultural influences could also have threatened them. However, aiming at increasing validity in the process of data extraction and summarisation, a reflective dialogue evaluating congruity, legitimacy, and relevance (Ludvigseng et al., 2015) has been performed by the researchers.

Lastly, our aim was to identify the experience of patients regarding the SD or poor sleep quality antecedents; therefore, clinical factors threatening the quality of sleep (e.g. medications, Matthews, 2011) did not emerge, as not reported by patients. Furthermore, one study (Van Rompaey et al., 2015) was focused on patients with delirium episodes in ICU and it was not possible to understand from the narrative reported whether their descriptions of night-time experience was influenced by delirium or not.

Conclusions

Despite the increased relevance of SD and of poor sleep quality, their occurrence and consequences, few studies have been performed to date aimed at identifying the factors involved in these phenomena according to the experience of patients. Patients are threatened in their sleep mostly because of the (a) complex interactions with the environment; (b) their intensive emotions and feelings; and (c) the standard of care that they receive. Factors emerged that influence the quality of sleep, directly or indirectly, by interacting with each other; therefore, interventions designed to increase the quality of sleep should be multilevel, targeting different factors involved in SD.

Continuing to study the causes of SD by involving more patients in multiple ICUs, with different clinical conditions and ages, is strongly recommended; moreover, mixed-method study designs to identify the patient's experience collated with quantitative variables regarding their clinical condition/treatment is also strongly recommended. Furthermore, aiming to increase the validity of the findings with a broader time perspective, collecting data during the ICU stay, just after discharge and in the long-term, could offer a profound understanding of the phenomenon from its origins to its consequences.

Conflict of interest

No conflict of interest has been declared by the authors.

Funding statement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Ethical approval

Not applicable.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.iccn.2019.03.006.

References

Bettany-Saltikov, J., 2012. How to do a Systematic Literature Review in Nursing: a Step-by-Step Guide. McGraw-Hill Education, UK.

Bihari, S., McEvoy, R.D., Matheson, E., Kim, S., Woodman, R.J., Bersten, A.D., 2012. Factors affecting sleep quality of patients in intensive care unit. J. Clin. Sleep Medicine: JCSM 8, 301.

Charhaoui, K., Laurent, A., Bioy, A., Quenot, J.-P., 2015. Psychological experience of patients after 3 months after a stay in the intensive care unit: a descriptive and qualitative study. J. Crit. Care 30, 599–605.

Critical Appraisal Skills Programme, 2018. CASP (Qualitative Research) Checklist. Available online at: https://casp-uk.net/casp-tools-checklists/ (accessed 01/09/2018).

Ding, Q., Redeker, N.S., Pisani, M.A., Yaggi, H.K., Knauert, M.P., 2017. Factors influencing patients' sleep in the intensive care unit: perceptions of patients and clinical staff. Am. J. Crit. Care 26, 278–286.

Elliott, R., McKinley, S., Cistulli, P., Fien, M., 2013. Characterisation of sleep in intensive care using 24-hour polysomnography: an observational study. Crit. Care 17, R46.

Falk, A.C., Wallin, E.M., 2016. Quality of patient care in the critical care unit in relation to nurse patient ratio: a descriptive study. Intensive Crit. Care Nurs. 35, 74–79.

Freedman, N.S., Gazendam, J., Levan, L., Pack, A.I., Schwab, R.J., 2001. Abnormal sleep/wake cycles and the effect of environmental noise on sleep disruption in the intensive care unit. Am. J. Respir. Crit. Care Med. 163, 451–457.

Garrard, J., 2003. Health Sciences Literature Review Made Easy: The Matrix Method. Jones and Bartlett Learning.

Hamze, F.L., Souza, C.C.D., Chianca, T.C.M., 2015. The influence of care interventions on the continuity of sleep of intensive care unit patients. Rev. Lat. Am. Enfermagem 23, 789–796.

Johansson, L., Bergbom, I., Lindahl, B., 2012. Meanings of being critically ill in a sound-intensive ICU patient room – a phenomenological hermeneutical study. Open Nurs. J. 6, 108.

Kamdar, B.B., Needham, D.M., Collop, N.A., 2012. Sleep deprivation in critical illness: its role in physical and psychological recovery. J. Intensive Care Med. 27, 97–111.

Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., Gøtzsche, P.C., Ioannidis, J.P., Clarke, M., Devereaux, P.J., Kleijnen, J., Moher, D., 2009. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. PLoS Med. 6, e1000100.

Lindseth, A., Norberg, A., 2004. A phenomenological hermeneutical method for researching lived experience. Scand. J. Caring Sci. 18, 145–153.

Ludvigseng, M.S., Hall, E.O.C., Meyer, G., Fegran, L., Aagaard, H., Uhrenfeldt, L., 2015. Using Sandelowski and Barroso's metasynthesis method in advancing qualitative evidence. Qual. Health Res. 26, 320–329.

Mealer, M., Moss, M., 2016. Moral distress in ICU nurses. Intensive Care Med. 42, 1615–1617.

Matthews, E.E., 2011. Sleep disturbances and fatigue in critically ill patients. AACN Adv. Crit. Care 22, 204.

Nelson, J.E., Meier, D.E., Oei, E.J., Nierman, D.M., Senzel, R.S., Manfredi, P.L., Davis, S.M., Morrison, R.S., 2001. Self-reported symptom experience of critically ill cancer patients receiving intensive care. Crit. Care Med. 29, 277–282.

Onwuegbuzie, A.J., 2003. Effect sizes in qualitative research: a prolegomenon. Qual. Quant. 37, 393–409.

Orwelius, L., Nordlund, A., Nordlund, P., Edéll-Gustafsson, U., Sjöberg, F., 2008. Prevalence of sleep disturbances and long-term reduced health-related quality of life after critical care: a prospective multicentre cohort study. Crit. Care 12, R97.

Morse, J.M., 2015. Critical analysis of strategies for determining rigor in qualitative inquiry. Quality Health Res. 25, 1212–1222.

Patel, J., Baldwin, J., Bunting, P., Laha, S., 2014. The effect of a multicomponent multidisciplinary bundle of interventions on sleep and delirium in medical and surgical intensive care patients. Anaesthesia 69, 540–549.

Pisani, M.A., Friese, R.S., Gehlbach, B.K., Schwab, R.J., Weinhouse, G.L., Jones, S.F., 2015. Sleep in the intensive care unit. Am. J. Respir. Crit. Care Med. 191, 731–738.

Pulak, L.M., Jensen, L., 2016. Sleep in the intensive care unit: a review. J. Intensive Care Med. 31, 14–23.

Romero-Bermejo, F.J., 2014. Sleep quality in intensive care unit: are we doing our best for our patients? Indian J. Crit. Care Med. 18, 191.

Rossettini, G., Latini, T.M., Palese, A., Jack, S.M., Ristori, D., Gonzatto, S., Testa, M., 2018. Determinants of patient satisfaction in outpatient musculoskeletal physiotherapy: a systematic, qualitative meta-summary and meta-synthesis. Disabil. Rehabil. 14, 1–13.

Rotondi, A.J., Chelluri, L., Sirio, C., Mendelsohn, A., Schulz, R., Belle, S., Im, K., Donahoe, M., Pinsky, M.R., 2002. Patients' recollections of stressful experiences while receiving prolonged mechanical ventilation in an intensive care unit. Crit. Care Med. 30, 746–752.

Sandelowski, M., Barroso, J., 2007. Handbook for Synthesizing Qualitative Research. Springer Publishing Company, New York.

Satink, T., Cup, E.H., Ilott, I., Prins, J., de Swart, B.J., Nijhuis-van der Sanden, M.W., 2013. Patients' views on the impact of stroke on their roles and self: a thematic synthesis of qualitative studies. Arch. Phys. Med. Rehabil. 94, 1171–1183.

Spielman, A.J., Caruso, L.S., Glovinsky, P.B., 1987. A behavioural perspective on insomnia treatment. Psychiatr. Clin. North Am. 10, 541–553.

Tembo, A.C., Parker, V., Higgins, I., 2013. The experience of sleep deprivation in intensive care patients: findings from a larger hermeneutic phenomenological study. Intensive Crit. Care Nurs. 29, 310–316.

Ten Hoorn, S., Elbers, P.W., Girbes, A.R., Tuinman, P.R., 2016. Communicating with conscious and mechanically ventilated critically ill patients: a systematic review. Crit. Care 20, 333.

Van Rompaey, B., Van Hoof, A., van Bogaert, P., Timmermans, O., Dilles, T., 2015. The patient's perception of a delirium: a qualitative research in a Belgian intensive care unit. Intensive Crit. Care Nurs. 32, 66–74.

Vincent, J.L., 2013. Critical care-where have we been and where are we going? Crit. Care 17, S2.

Walsh, D., Down, S., 2005. Meta-synthesis method for qualitative research: a literature review. J. Adv. Nurs. 50, 204–211.

Weldring, T., Smith, S.M., 2013. Patient-reported outcomes (PROs) and patient-reported outcome measures (PROMs). Health Services Insights 6, 61–68.

Wong, F.Y.K., Arthur, D.G., 2000. Hong Kong patients' experiences of intensive care after surgery: nurses' and patients' views. Intensive Crit. Care Nurs. 16, 290–303.

Zeilani, R., Seymour, J.E., 2010. Muslim women's experience of suffering in Jordanian intensive care units: a narrative study. Intensive Crit. Care Nurs. 26, 175–184.