

How is the sleep of nurses affected by rotating shift work?

A literature review

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| <p>Abstract</p> <p>Nursing is a profession in which rotating shift work is common. Consecutive shifts and the rotation between evening, morning and night shifts have been studied to have an impact on the sleep of nurses. Sleep may be poorer, shorter and disturbed when working patternless shifts as the circadian rhythm of each individual is different. The study focuses on rotating shift work and its impacts on sleep.</p> <p>The aim of the study is to find out how rotating shift work affects sleep in nurses that work rotating shifts. The study's purpose is to provide further information about shift work that could be used in developing the occupational well-being of nurses. The study was implemented as a literature review. Articles used in the work have been gathered from online databases and journals from the area of the study.</p> <p>The results of the study indicate that certain shift patterns and rotations have a negative impact on the sleep of nurses who work these shifts. Rotating shift work has led to insufficient sleep, poor sleep and fatigue in nurses, hence possibly affecting work performance and health of nurses.</p> | | |
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| <p>Abstrakti</p> <p>Sairaanhoito on ammatti, jolle on ominaista vaihteleva työaika. Peräkkäisillä vuoroilla ja vaihtelevuudella aamu-, päivä- sekä iltavuorojen välillä on tutkittu olevan vaikutusta sairaanhoitajien uneen. Uni saattaa olla laadultaan huonompaa, lyhyempää tai keskeytyvää hoitajien työskennellessä ilman säännöllistä työrytmiä, sillä myös jokaisen henkilökohtainen sirkadiaaninen rytmi on yksilöllinen. Tämä tutkimus keskittyy vuorotyöhön ja sen vaikutukseen sairaanhoitajien unessa.</p> <p>Tutkimuksen tavoitteena on selvittää, kuinka vuorotyö vaikuttaa vuorotyössä työskentelevien sairaanhoitajien uneen. Katsauksen tarkoituksena on tarjota vuorotyöstä lisää informaatiota, jota voitaisiin hyödyntää sairaanhoitajien työhyvinvoinnin kehittämisessä. Tutkimus on toteutettu kirjallisuuskatsauksen muodossa. Katsauksessa käytetyt artikkelit on kerätty alan verkkotietokannoista ja -julkaisuista.</p> <p>Katsauksen tulokset osoittavat, että tietyillä vuororytmeillä ja niiden vaihdoksilla on negatiivinen vaikutus tällaisten vuororytmien mukaan työskentelevien sairaanhoitajien uneen. Vuorotyön on huomattu johtavan sairaanhoitajilla liian vähäiseen unen määrään, huonoon unenlaatuun ja uupumukseen, mistä voi olla seurauksena sairaanhoitajien työkyvyn ja terveyden heikkeneminen.</p> | | |
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1 Introduction

In an industrial society over 20% of workers are shift workers, and about 10% of them are diagnosed as having sleeping disorders (Admi, Epstein, Herer, Lavie & Tzischinsky 2008, 250). Sleepiness and fatigue combined with work can be the cause of errors, injuries, poor concentration and other fatalities. A frightening thought is that jobs such as firefighting, emergency medical services, law enforcement and security are mostly run as shift work. (National Sleep Foundation 2018.)

Most nurses work in environments of shift work which means that one is to adapt to changing hours of work (Bazyldo, Grochans, Jurczak, Rotter & Zabielska 2014, 11). Nursing involves both independent work and team work to provide care for individuals of all ages, families, groups and communities, sick or well and in all settings. It consists of health promotion, illness prevention, and care for the ill, disabled and dying (WHO 2018). It is part of a group of professions with specific features which include talents in the psychological and physical scope (Bazyldo, Grochans, Jurczak, Rotter & Zabielska 2014, 11). Nursing is seen as a wonderful career with many challenges and extraordinarily rewarding experiences. In a nurse's daily work, one encounters emotional and professional demands that are incomprehensible to others. These demands are mentally and physically a heavy responsibility on nurses particularly those under shift type of work. It causes for social life, daily activities and schedules to be uneven (Al-Baiz, Al-Hammad, Al-Otaibi & Raheel 2012.)

Shift work nurses work a pattern of days and nights, which consecutively change in length and direction (New Zealand Nurses Organisation 2012). This means that most nurses work consecutive days in a row, 8-12 hour shifts to get the work week finished (Allen, Moultrie & Owens 2017, 59).

These consecutive work shifts are studied to have an effect not just health wise but also performance wise. According to Adhami, Allen, Ayas, Dodek, Park, Rogers, Sirounis & Tholin (2014, 291), Peets (2012) states that sleep deprivation amongst health care professionals has a great effect on performance and may have negative effects on both patient and worker safety.

The aim of the study is to conduct a literature review to find out how rotating shift work affects sleep in nurses that work rotating shifts. The study's purpose is to provide further information about shift work that could be used in developing the occupational well-being of nurses.

2 Rotating shift work nurses and sleep

2.1 Rotating shift work

Rotating shift work takes place outside the regular 8-9am to 4-5pm working schedule pattern and can contain morning, evening and night shifts (National Sleep Foundation 2018). Rotating shift schedules change regularly and are planned ahead of time (Finlex 2018). Shifts can vary from being 8 hours to 12 hours and lack a regular continuous pattern (CCOHS 2017).

It is common for nurses to have shift work and especially rotating shift work. In shift work, nurses work between 10 to 12 hours, the shifts sometimes being morning, evening, or night shifts. In rotating shift work, the shifts change sometimes even daily, from one day being a morning shift and the next day being a night shift. The shifts lack a monotonous pattern and the changes are made often quickly. (New Zealand Nurses Organisation 2012.)

The lack of a monotonous pattern in shift work can be very unhealthy and it has a negative impact on the body's circadian rhythm. Therefore, many shift workers suffer from insomnia, excessive sleepiness and could also develop over time a sleep disorder called shift work disorder.

Lack of sleep can cause further problems such as impaired performance, safety and overall health. (National Sleep Foundation 2018.)

2.2 Sleep

Sleep is defined by the normal suspension of consciousness by specific brain waves. Sleep consumes a third of our lives. We solicit sleep when we are craving for it. Sleep is not a result of a simple decrease of brain activity but a series of precisely controlled brain states. A study shows that continuous deprivation of sleep can ultimately be fatal. (Augustine GJ, Fitzpatrick D, Purves D, et al. 2001.)

According to The American Sleep Association [ASA (2017)], sleep deprivation equals the inadequate amount of sleep compared to the total amount of sleep one should get per night. Sleep deprivation has many different effects on both the person's physical and mental health. Some of the symptoms include daytime sleepiness, accidents caused by not being able to concentrate enough, excessive hunger and changes in weight. In addition, sleep deprivation can have more serious effects on health, such as an increased probability to develop diabetes and the brain's cognitive functioning is also being affected by lack of sleep, causing difficulty in remembering and concentrating. (ASA 2017.) Irregular shifts can lead to a conflict within the body, advancing to risks of developing physical problems and deterioration of health in workers (Al-Baiz, Al-Hammad, Al-Otaibi & Raheel 2012). One of the problems in this case may be shift work disorder.

Shift work disorder is a sleep disorder. It happens when a person is not able to synchronize his or her internal clock with his or her work schedule, which may require staying awake and working when it is dark and sleeping during the day when it is light.

Shift work disorder is linked with risk of cancer, depression, heart disease, excessive sleepiness, accidents and decreased productivity. (Roth 2012).

2.3 Quality of sleep

Quality sleep consists of spending more time in bed sleeping than being awake, taking 30 minutes to fall asleep or less, waking up during the night only once or not even once and after falling asleep, staying awake only for 20 minutes or less. In addition, an adult should spend an average of 7-9 hours sleeping per night. (National Sleep Foundation 2017.) Quality sleep is very important for the overall health of humans, as it improves both physical and mental health and enhances the quality of life and security.

The Institute of General Medical Sciences [NIGMS (2017)], states that circadian rhythms are physical, mental, and behavioral changes that are connected to an individual's daily cycle. A biological clock is one's timing device that is made of certain molecules that interact in the cells of the body. The Circadian rhythm determines our sleep pattern and controls the melatonin hormone. When there is less light received in the eyes optical nerve the superchiasmatic nucleus located in the hypothalamus activates for the brain to make more melatonin causing for one to feel sleepy (NIGMS 2017.)

Workers who need to sleep during the day might experience a negative effect on the body's circadian rhythm. A nurse may experience sleeping disturbances when trying to sleep during day time. (Pryce 2016). This can occur as shorter amount of sleep and thus can lead to chronic sleep deprivation over time. However, there are some factors that can be considered when trying to improve day time sleeping.

These include making the sleeping environment dark, cool and quiet, avoiding alcohol or caffeine consumption before sleeping and maintaining good overall sleep habits. (National Sleep Foundation 2018.)

3 Aim, purpose and research question

The aim of the study is to conduct a literature review to find out how rotating shift work affects sleep in nurses that work rotating shifts. The study's purpose is to provide further information about shift work that could be used in developing occupational well-being of nurses.

The research question is:

How does rotating shift work affect sleep in nurses?

4 Method

4.1 Literature review

In a literature review articles are analyzed and summarized. It focuses on a specific topic and combines the ideas of different studies and relates to the research work being done (Mongan-Rallis 2004.)

A literature review consists of three different stages. The pre-stage, implementation, and reporting. In the pre-stage one defines the question of interest which is, "How does rotating shift work affect sleep in nurses?" and then begins a scoping research. In implementation, notes are taken on the steps of the search and studies are assessed and selected. The selected studies are then summarized into a format. In the reporting phase, results are reported, and discussions are held. Implementation and limitations of the review are discussed (Joanna Briggs Institute 2014.)

The importance of a literature review is to present the state of science and have an impact on practice and policy. It contributes to perspectives on a phenomenon, synthesizes information and minimizes unnecessary new studies. A literature review can be used in the development of a new theory (Joanna Briggs Institute 2014.) This literature review is significant as it brings awareness to nursing science and health care systems.

4.2 Selection process

The databases used during this research were CINAHL and Pubmed . A PICO's table (table 1) was used for inclusion and exclusion criteria. PICO's means Population, Intervention, Comparison of intervention and Outcome measures (Aromataris & Riitano 2014, 50).

| | |
|-----------------------|---|
| Population | Shift work nurses |
| Phenomena of Interest | Effect |
| Context | Rotating shift work on sleep |
| Types of Studies | English language, peer reviewed, published from 2007 to date. |

Figure 1. PICO's

The studies population is shiftwork nurses and the phenomena of interest is the effect in the context of rotating shift work on sleep. It included all studies into the research that had the following criteria: text available in English, peer reviewed and published 2007 to date. Anything that doesn't apply to these criterions are a part of the exclusion criteria.

A Prisma Flow Chart (figure 1) was used to divide the number of records identified, included and excluded and the reason for exclusion.

“The flow diagram depicts the flow of information through the different phases of a systematic review” (PRISMA 2015).

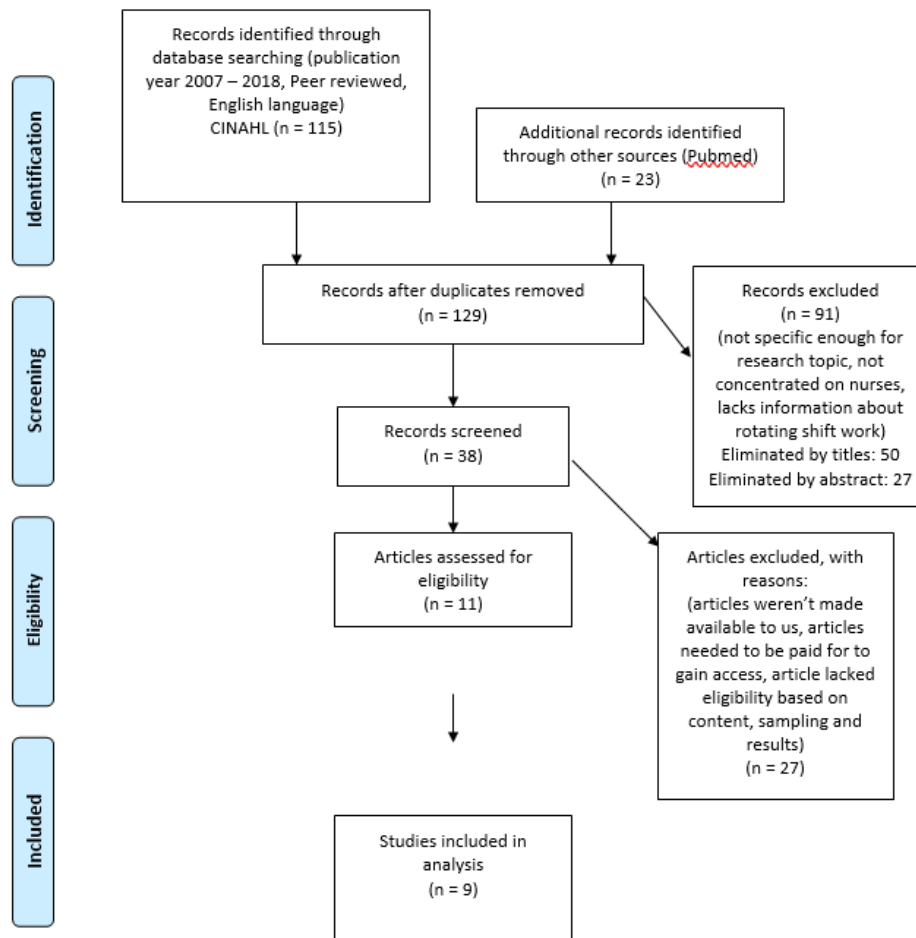


Figure 2. PRISMA Flow chart

The article search was performed together through the CINAHL and Pubmed database. We screened the articles and excluded 91 of them due to reasons such as the article not being specific enough, not concentrating on nurses and/or lacking information on rotating shift work.

The 11 eligible articles were then graded using the Hawker's checklist. The Hawker's checklist involves appraising the article's title and abstract, introduction and aims, method and data, sampling, data analysis, ethics and bias, results, transferability and implications and usefulness. Each section is graded from 1 to 4 in which 1 is very poor and 4 is good. The articles were read separately and graded out of a total of 36. Together we compared the results and selected 9 of the articles for further analysis (Hawker & Payne 2002.) Out of all articles, two were rated with a high number of 34, one with a number of 33,3, one as 32,3, one as 32, one as 31,6, one as 31,3, one as 31 and the poorest as 27,6. The average of these ratings was 31,3. The Hawker's table can be found in the appendix.

All the articles have been published within the last ten years and have been peer reviewed. Two of the articles were published in 2017, two in 2015, one in 2013, three in 2012 and one in 2008. Two of the articles were published both in Norway and in Taiwan, while the other publishing countries were Singapore, Nigeria, Canada, USA and India. Different research methods and instruments in these articles included different questionnaires, tests and indexes, an actigraphy, scales, diaries, checklists and surveys and different sampling methods. All these articles were quantitative research. The sampling sizes in these articles varied between 28 to 1462 people, and they were either just female nurses, both male and female nurses, specifically ICU nurses, registered nurses, enrolled nurses, nursing officers, advanced practice nurses and nursing specialists or specifically shift nurses.

4.3 Synthesis of data

The 9 articles chosen were synthesized through categorization. Each of us categorized the articles separately and then the results were compared together.

Categorization is when you look for themes in the articles and place them underneath certain categories and subcategories that are then later given names. The categorization was performed by searching for information in the articles that were applicable to our research question. The categories created by each were evaluated together and lastly the final categories and subcategories were created (Duriau, Pfarrer & Reger, 2007.)

| Categories | Quality of sleep impacted by shift rotation, pattern and length | Sleep and its relation to rotating shifts |
|----------------------|---|---|
| <i>Subcategories</i> | <i>Shift rotation and its effect on sleep</i> | <i>Sleep length and difficulties</i> |
| | <i>The effect of shift patterns and their monotony on sleep</i> | <i>Factors affecting daytime sleep</i> |
| | <i>Comparison of sleep length and quality in 8- and 12- hour shifts</i> | <i>Fatigue and sleep disturbance in shift nurses</i> |
| | | <i>The interconnection between shift work and sleep pattern</i> |

Figure 3. Categorization

5 Quality of sleep impacted by shift rotation, pattern and length

5.1 Shift rotation and its effect on sleep

Most nurses work in two- to three-shift rotation patterns, but more usually in three-shift rotations that include day, evening and night shifts. Some nurses can also be working only permanent night or day shifts. (Bjørvatn, Dale, Fiske, Hogstad-Erikstein, Pallesen & Waage 2012, 183; Bjørvatn, Flo, Grønli, Magerøy, Moen, Nordhus, Pallesen & Åkerstedt 2013, 243.)

Sleep problems were found to be linked to different work schedules and patterns. These problems included the ability to fall asleep and to wake up, awaking prematurely, experiencing feelings of tiredness and sleepiness after waking up, at work, on free time during working days and on days off or on vacations. Different shifts also had different effects on day-, evening-, night-shift and rest-day insomnia. Working a permanent shift was not linked to having a lower risk of having day shift insomnia compared to those working in two- or three-shift rotations. However, working permanent night shifts was found to decrease the risk for night shift insomnia compared to those working night shifts in three-shift rotation. On the other hand, those working permanent night shifts had a higher risk of having rest day insomnia compared to those working in two- or three-shift rotations. Evening shift insomnia was most common in those nurses that worked a two-shift rotation. (Bjørvatn et al. 2013, 238, 240-243.)

Studies indicate that nurses working night shifts tend to have more sleep problems and difficulties in daytime performance. Their overall sleep quality tends to be poorer and they have more difficulties in falling asleep and it tends to take longer. (Beebe, Chang, Kress, & Mattfeldt-Beman 2017, 554.)

Sleepiness and tiredness were found to be a major problem also while working night shifts as both permanent night shift workers and three-shift workers working night shifts reported feeling tired or sleepy 'often' or 'always' while at work (41,7% and 70%) (Bjørvatn et al. 2013, 240).

5.2 The effect of shift patterns and their monotony on sleep

Shift work is usually very irregular and lacks a continuous pattern. Therefore, many nurses experience different sleep and health problems. Overwork is also an issue that challenges many nurses. According to a study, overwork has become common for nurses which also results in poorer sleep quality and fatigue. When the standard work hours are exceeded it can negatively impact the quality of sleep. (Chen, Fan, Liao & Lin 2014, 610.)

A study stated that there are different lengths of shift rotation periods. These rotation periods vary from fast rotating shift patterns (for example from every 2 to 3 days) to longer rotating shift patterns (for example from every 3 to 4 weeks) that indicate the number of days one is working one specific shift before changing to another shift. According to the study in question, the disruption of one's biological clock could decrease when having a fast rotating shift pattern, while longer rotating shift patterns would allow one's biological clock to adapt to the change.

The study suggests that both of these rotation periods could benefit nurses when implemented according to the working circumstances. (Rathore, Shukla, Singh & Tiwari 2012, 4305.) However, adaptation to shift work for a longer period of time can help in coping with shift work and the changing schedules (Bjørvatn, Dale, Fiske, Hogstad-Erikstein, Pallesen & Waage 2012, 187).

5.3 Comparison of sleep length and quality in 8 - and 12 - hour shifts

All of the participated nurses in the researches worked either 8- or 12-hour shifts. The findings of these studies show that there is a significant difference in sleep quality and the amount of sleep received between these two shift rotations.

Major differences between 8- and 12-hour shift patterns were found in how they affected efficiency of sleep, sleepiness after awakening and after work and in napping. The results show that nurses working 12-hour shifts slept significantly less compared to those working 8-hour shifts. Nurses working both shift patterns got the least amount of sleep on day 4, however, 8-hour shift workers slept almost 2 hours more on day 4 than 12-hour shift workers. The average total amount of sleep between these two shift groups varied between 0.75 to 2.4 hours, when the average total amount of sleep for 12-hour workers varied between 2.75 to 13.4 hours and for 8-hour workers between 3.5 to 11 hours. The measured total sleep time in minutes showed major decline in sleep time by 20% for the 12-hour shift workers from the first day until the last day measured. For the 8-hour workers this amount was only 3%. (Mullen & Rhéaume 2017, 28.).

Sleep efficiency was significantly higher for nurses that worked 8-hour shifts (68% to 100%) than for those working 12-hour shifts (41% to 100%). Shift patterns also had a major impact on the amount of time it took for the nurses to fall asleep and those working shorter shifts fell asleep significantly sooner than those working longer shifts. In addition, nurses that worked in a 12-hour shift pattern experienced more sleepiness after work and after awakening. Lastly, 12-hour shift workers needed longer and more frequent naps and breaks during working hours than those that worked 8-hour shifts. (Mullen & Rhéaume 2017, 28-30.)

6 Sleep and its relation to rotating shifts

6.1 Sleeping length and difficulties

Sleep is more than getting a certain amount of hours, quality of sleep is more important than the quantity of sleep. (Chung, 2008.)

The Department of Nursing Chang Gung University of Science and Technology conducted a survey to be able to describe the current situation of nurses' shift work in Taiwan and how nurses' sleep quality is affected. The results show that reduced sleep quality among nurses led to fatigue. A likely explanation for these results is that it is common for nurses to work overtime, which results in higher levels of fatigue and naturally poor sleep quality. (Chen, Fan, Liao & Lin, 2014.)

Also, nurses on long-term night shifts have on average shorter sleep duration during day time than the average sleep duration during night time. (Chung, 2008.)

Furthermore, conducted studies have shown that the type of sleeping difficulties nurses suffer are difficulty to fall asleep again after nocturnal and early morning awakening. A possible explanation is that nurses are not being refreshed by sleep which is associated with mental tiredness, which were measured as significant in the study.

In the point of view of sleep difficulties, nurses who had insufficient sleep suffered highly more from falling asleep, falling asleep again after nocturnal awakening and early morning awakening. During the daytime, nurses with insufficient sleep suffered highly more regarding, waking up in the morning, not feeling refreshed by sleep, mental tiredness and exhaustion. (Chung, 2008) Other studies concluded similar results. Noticeable sleeping disturbances were insufficient, poor quality of sleep which resulted from trouble falling asleep, waking during sleep, and waking up early. (Rathore Shukla, Stingh & Tiwari, 2012.)

6.2 Factors affecting daytime sleep

Shift work is negatively linked with sleeping issues. (Bjorvatn, Dale, Fiske, Hogstad-Erikstein, Pallesen & Waage, 2012.)

Sleep quality has a negative impact on an individual who sleeps during the day time as they tend to wake up more often and easily. (Chung, 2008.)

Risk factors include during the daytime excessive and inescapable light and heat which can often alter a nurse's sleep. In addition, noises that mainly happen during the daytime such as the sounds of children's play, phone calls and housework. (Rathore, Shukla, Stingh & Tiwari, 2012.)

6.3 Fatigue and sleep disturbance in shift nurses

Fatigue is common among workers in healthcare settings which results from sleep loss and impairments. Nurses shifts are long with continuous working hours, which reduced nurses' chances to sleep with a minimal recuperation time. Also shift work contributes to nurses physical, cognitive impairments and emotional functioning. (Rathore, Shukla, Stingh & Tiwari, 2012.)

Studies have shown that sleep disturbance is three-to-eight times higher among shift nurses than in the general population. (Chen, Huang, Lee, Lee & Meg Tseng 2015.) A study conducted by the University of Bergen in Norway has concluded that 70 % of intensive care nurses had poor sleep. Similar results were reported in a study conducted in the US where 142 critical care nurses suffered from poor sleep. (Bjorvatn, Dale, Fiske, Hogstad-Erikstein, Pallesen & Waage, 2012.)

More specifically, nurses working during night shift slept an average of 5.5 hours between shifts. Naturally, nurses got sleepier after each consecutive shift. (Mullen & Rhéaume, 2017.)

6.4 The interconnection between shift work and sleep pattern

There is a clear correlation between shift work and sleep pattern. Plenty of researches have concluded that shift work can cause disruption of sleep pattern. For instance, researches have revealed that nurses who complained about fatigue were working rotating shifts. Naturally, the results were higher during night shift, followed by the evening and then the morning shift.

Also, it is important to be aware of the fact that most of the nurses struggled with getting enough sleep during the day. Nurses reported having high sleep disturbances in between successive shift like morning and afternoon shifts. (Rathore, Shukla, Singh & Tiwari, 2012.) Although, from a study conducted in Obafemi Awolowo University Teaching Hospital Complex, 91.8% of the nurses responded also that shift work has negatively affected their normal sleep pattern. (Adereti, Afolabi, Olagunju & Olaogun, 2015.) However, it is argued today that just when sleep patterns start to adjust, it is already time to rotate to a different shift. (Rathore, Shukla, Singh & Tiwari, 2012.)

7 Ethical considerations, validity and reliability

The key principle for writing a scientific research is conducting it in a responsible manner which is called “The responsible conduct of research”. The Finnish Advisory Board on Research Integrity describes the key element of conducting a responsible research as research integrity that indicates the importance of involving all the researchers to conduct the study by following principles of honesty and integrity.

The research integrity in writing this thesis can be fulfilled by careful and accurate conducting, reporting and analysing of the research, following scientific reporting instructions, proper scientifically standardised planning and conducting of the research and by respecting and crediting other researches through proper citing. (Finnish Advisory Board on Research Integrity 2012.)

This thesis has been conducted following the research integrity and thesis writing instructions provided by JAMK University of Applied Sciences. All of the authors were educated and aware of the ethical principles of writing a literature review and knew about fabrication, falsification, plagiarism and misappropriation all of which would violate the research integrity. (Finnish Advisory Board on Research Integrity 2012; JAMK University of Applied Sciences 2019.) Therefore, certain measures were taken to ensure that these acts of violation wouldn't occur.

All data was stored carefully electronically, and all authors had their copies of the data. Data that ended up being deleted was all gathered together into one file. The research process was supervised by two thesis supervisors. The authors worked as a team throughout the entire research process but performed some tasks individually, such as extracting the research data and then comparing the results together thus decreasing the chance for selection bias. However, the article selection process was limited to using only certain databases that were available for the students of JAMK and using only articles with full text that were free of charge, therefore increasing the risk for selection bias. In addition, the fact of most of the researchers conducting the literature review in a language that was not their mother tongue might have affected the reliability of the research results. Validity of the research results was ensured by selecting only articles that had specific search limitations, such as peer reviewed and recent studies with a year span of 2007 to 2018.

Lastly, to avoid plagiarism, this literature review was sent to Urkund to get analysed. This system evaluates the research and scopes it for possible plagiarism thus ensuring that the research integrity has not been violated. (JAMK University of Applied Sciences 2019.)

8 Limitations

Our literature review had several limitations. Firstly, the definition and perception of the quality of sleep differs from one culture to another as there is no strict definition of what the quality of sleep is. Secondly, some of the research articles didn't include male nurse and some had only research conducted in specific wards such as intensive care. Thirdly, work experience was a limitation, since nurses with more experience tended to adapt more easily to rotating shift work than nurses with less work experience. Finally, sleep quality was only assessed with tools such as questionnaires and other measuring tools which didn't include sleep trackers.

Some articles and studies used in this literature review were excluded, as the inclusion criteria of the chosen articles were limited to a ten-year scale. Some of the articles were only accessible through payment, leading to them being left out of the study. The use of articles that were written only in English also limited the information that could have been obtained in other languages. The above-mentioned limitations led to the exclusion of articles that could have provided eligible information.

9 Discussion

Rotating shift work has an overall negative impact on sleep, especially when shift lengths are longer, shift patterns change quickly and when shift are repetitively nights.

In countries where 12hr shifts are common it is usual for nurses to experience sleepiness and fatigue after work and after sleeping. A lack of time to allow to recuperate from the previous shift is also seen with longer shifts. However, in most cases 12hr shift work involved more rest days which allowed for nurses to regain lost sleep. (Mullen & Rhéaume 2017.) Length was not the only factor that had impact on sleep but also the amount of rotations had an effect. If there were too many rotations in a short period of time, it had a larger impact on the sleep of shift nurses than if the rotation remained monotonous for a longer period (Rathore, Shukla, Singh & Tiwari 2012). If rotation of shifts remained in a repetitive pattern it allowed for adaptation and so didn't affect sleep negatively (Bjørvatn, Dale, Fiske, Hogstad-Erikstein, Pallesen & Waage 2012). Night shifts showed to cause more fatigue and poor sleep due to daytime sleeping and its disturbances (Beebe, Chang, Kress & Mattfeldt-Beman 2017). We also noticed that sleep was affected differently depending on the individual nurse. Older and more experienced nurses tended to have better sleep in rotating shift work than younger less experienced nurses due to having more time to adapt to the type of work (Bjørvatn, Dale, Fiske, Hogstad-Erikstein, Pallesen & Waage 2012).

Napping was recommended as a solution for decreasing fatigue and sleepiness during work shifts, especially in longer shifts and nights shifts (Mullen & Rhéaume 2017). Educating nurses about self-health promotion and helping them recognize symptoms of fatigue and insomnia early enough to treat it were also suggestions made to help promote the health and quality of sleep of nurses in the future (Beebe, Chang, Kress & Mattfeldt-Beman 2017). Schedules could also be adapted to nurses' preferences since each individual has a different social schedule and circadian rhythm. It would be important for the workers responsible for scheduling to be taught how to schedule properly and how to plan better schedule patterns that benefit the sleep quality of their workers. (Rathore, Shukla, Singh & Tiwari 2012.)

10 Conclusion

Rotating shift work has a negative impact on the sleep of nurses, however, it depends on the pattern and duration of the shift and the experience and adaptability of the nurse. Further studies should be done to measure the quality of sleep and how nurses could adapt to rotating shift work. The decrease in the amount of fatigue and loss of sleep could overall improve the occupational well-being of nurses.

11 Appendix

| Authors, (Year), Country | Purpose and Aims of the Study | Research Methods or Instrument | Sample (n) | Main results | Points from evaluation Hawker & all. |
|--|--|--|--|--|--------------------------------------|
| Rathore, H., Shukla, K., Singh, S. & Tiwari, G. (2012) India | -To explore problems related to shift work faced by female nurses -To study the impact of shift work on female nurses in terms of sleep, fatigue, health and well being and social and domestic situation | - The Standard Shift Work Index (SSI) - questionnaire | - 60 female nurses aged between 30 – 60 years -Further categories formed: -> 30 nurses aged 30-45 years -> 30 nurses aged 45-60 | - Shift work does affect the sleep pattern of an individual. It is argued that just as sleep pattern adjustment starts to occur, it is time to rotate to the next shift. In conclusion acute and chronic sleep loss, whether partial or complete, substantially impairs physical, cognitive, and emotional functioning in human beings. | 27,6 |
| Beebe, D., Chang, J., Kress, K. & Mattfeldt, Beman, M. (2017) USA | -To determine whether night shift workers have a poorer diet quality and sleep quality when compared with day shift nurses | - The National Cancer Institute (NCI) - questionnaire -The Pittsburgh Sleep Quality Index (PSQI) - questionnaire | - 275 nurses working either day or night shift at two Midwestern community hospital in St Louis | - They did not find statistically significant differences in sleep quality between day and night nurses. Although the results for sleep in our study were not statistically significant, those working the night shift trended towards poor sleep quality. The day shift worker also had poor sleep scores. This study also found that those working nights were more apt to suffer from daytime dysfunction and had more issues with sleep latency when compared with day shift, which is consistent with previous literature. | 34 |
| Bjorvatn, B., Dale, S., Fiske, E., Hogstad, E., Eriksstein, R., Pallesen, S. & Waage, S. (2012) Norway | -To investigate sleep, sleepiness, fatigue, subjective health complaints (i.e. musculoskeletal, gastrointestinal), anxiety and depression in a sample of ICU nurses | -The Pittsburgh Sleep Quality Index (PSQI) - questionnaire -Karolinska Sleep Questionnaire (KSQ) -Epworth Sleepiness Scale (ESS) -Fatigue Questionnaire (FQ) -Subjective Health Complaint Inventory (SHC) -Hospital Anxiety and Depression Scale (HADS) | -267 nurses working in two different ICU's | - Shift-related insomnia does not represent a diagnostic cut-off, but a way of assessing how severely the work shifts affect sleep and waketime functioning. A nurse may report being severely affected by night work. Nonetheless, if the quantity of night shifts per month is low, the nurse may not experience being burdened by the work schedule in everyday life. Night shift insomnia would not necessarily correspond to either general insomnia or shift work disorder. -Although the same symptoms are reported for day and night shifts alike, different mechanisms may be at play. For example, there was a generally high prevalence of 'tiredness/sleepiness during the free period on work days' across the different work schedules and shifts. The free period in relation to night shifts is usually located before the work starts. Sleepiness/tiredness in relation to this free period may be due to sleep inertia and possibly also to sleep deprivation. Conversely, the free period in relation to day shifts is usually located after work. Here, tiredness/sleepiness may be due to a high homeostatic sleep pressure, general fatigue from a busy day and possibly truncated night sleep due to an early shift start. | 34 |
| Adereti, S., Afolabi, E., Qlagunju, O. & Qlagun, A. (NDA) Nigeria | -To assess the influence of shift work on nurses' health related quality of life -To assess the influence of shift work on nurses' | -Semi-structured questionnaire | -183 nurses | - Virtually all the nurses (91.8%) responded that shift work is associated with alteration in normal sleeping pattern and a similar study reflected that rotating shift work affects the amount of sleep which was attributed to be a major factor responsible for medical error. The study concluded that shift work has negative influence on the health-related quality life, family health and well-being among nurses running shift work in Obafemi Awolowo University. | 31 |

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|---|--|--|---|---|------|
| | family health and well-being -To identify the common challenges encountered by nurses running shift | | | | |
| Mullen, J. & Rhéaume, A. (2017) Canada | -To compare sleep parameters and their effects on cognitive outcomes in nurses working different shift patterns | -Actigraphy -Sleep diary -After work survey | -28 registered nurses | - This pilot study indicates that shift work and long hours have a negative impact on nurses' sleep patterns. Although they did not find a significant relationship between sleep deficiency and cognitive mistakes, they did find that nurses working 12- hr rotations had more difficulties with sleep and sleepiness. | 31,6 |
| Chen, M.-Y., Fan, J.-Y., Liao, W.-C. & Lin, S.-H. (2012) Taiwan | -To describe the current state of nurses' shift work in Taiwan and how it affects nurses' stress, sleep quality and self-perceived health status | -The Taiwan Nurse Stress Checklist -The Chinese Version of the Pittsburgh Sleep Quality Index (CPSQI) -The General Health Status Checklist | -266 nurses | - There were no significant differences in job stress, sleep quality or self-perceived health according to demographic information or shift work status. In terms of job stress, the respondents' competence had the highest effect on stress levels. The highest level of reported job stress was from self-perceived fatigue. Thus, personal response and competence, as well as sleep quality, served as predictors of self-perceived health status. | 32,3 |
| Bjorvatn, B., Flo, E., Grønli, J., Magerøy, N., Moen, B., | -To investigate the prevalence of discrete insomnia | -The survey of shift work, sleep and health (SUSSH) - questionnaire | -1462 nurses | - The age of the nurses was positively associated with complaints about poor sleep, sleepiness and fatigue. In contrast, long experience with shift work was associated with fewer complaints. | 32 |
| Nordhus, I., Pallesen, S. & Åkerstedt, T. (2013) Norway | symptoms in different shifts in the following work schedules: -> permanent day, permanent night, two-shift rotation and three-shift rotation | -The Bergen Shift Work Sleep Questionnaire (BSWSQ) | | This suggests that coping with shift work was higher after being exposed to shift work for some time. Our findings suggest the need for studies on strategies to reduce sleep problems, sleepiness, fatigue and mental complaints in nurses. | |
| Chen, H. C., Huang, L. H., Lee, C. Y., Lee, H. C. & Tseng, M. C. (2015) Taiwan | -To explore the relationships between the sleep quality of shift nurses and the variables of chronotype, emotional disturbance, and insomnia vulnerability | -The Pittsburgh Sleep Quality Index (PSQI) - questionnaire -The Smith Morningness-Eveningness questionnaire (MEQ) -The Ford Insomnia Response to Stress Test (FIRST) -The five-item Brief Symptom Rating Scale (BSRS-5) | -398 shift nurses | - This study reported a high prevalence of sleep disturbance among shift nurses in Taiwan. The evening chronotype, high levels of emotional disturbance, and insomnia vulnerability each correlated to poor sleep quality. | 31,3 |
| Moon, F. C. (2008) Singapore | -To explore nurses' perceived sleep quality and examine factors | -Karolinska Sleep Questionnaire (KSQ) | -163 (enrolled nurses, registered nurses, nursing | - Our findings showed that more than 70% of shift-working nurses had insufficient sleep and that their strain and symptom levels were higher. | 33,3 |
| | that contribute to insufficient sleep quality | -Strain and Symptoms Questionnaire (SSQ) | officers, advanced practice nurses & nursing specialists) | Older age, perceived poor sleep quality, gastrointestinal symptoms and higher strain and symptom levels were risk factors that contributed to insufficient sleep. | |

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