GAVIN PUBLISHERS

OPEN ACCESS

International Journal of Nursing and Health Care Research

Al-Masaeed M, et al. Int J Nurs Health Care Res 04: 1214.

DOI: 10.29011/2688-9501.101214

Research Article

Examining Nursing Fatigue Levels and Antecedents: An Integrative Literature Review

Mahmoud Al-Masaeed*, Anthony Paul O'Brien, Irniza Binti Rasdi, Muhammad Alqudah

College of Health, Medicine and Wellbeing, University of Newcastle, Callaghan, Newcastle, Australia

Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor, Malaysia.

***Corresponding author:** Mahmoud Al-Masaeed, Researcher, RN and PhD Candidate, School of Nursing and Midwifery, College of Health, Medicine and Wellbeing, University of Newcastle, Callaghan, Newcastle 2308 Australia, and Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor, Malaysia.

Citation: Al-Masaeed M, O'Brien AP, Rasdi IB, Alqudah M (2021) Examining Nursing Fatigue Levels and Antecedents: An Integrative Literature Review. Int J Nurs Health Care Res 04: 1214. DOI: 10.29011/2688-9501.101214

Received Date: 14 December, 2020; **Accepted Date:** 11 January, 2021; **Published Date:** 15 January, 2021

Abstract

The existing literature demonstrates that work related fatigue can impede the delivery of quality nursing care. There is a need to document and develop fatigue mitigation strategies to protect nursing and patient safety. There is therefore a need to explore and investigate the different types of nursing fatigue, their antecedent factors, and the ideal fatigue management strategies. The focus on nursing fatigue is on their level and prevalence of lethargy and tiredness both on shift and while off shift. The study rationale was to devise strategies and avenues through which fatigue cannot only be mitigated but also proactively addressed. In developing the study, secondary data was used. This was through examining peer-reviewed articles. These were 630 form SCOPUS, 970 from CINAHL), and 247 MEDLINE.After inclusion and exclusion criteria were applied, only 36 of the articles were retained. Of these 36 articles, A majority were quantitative with the rest being either qualitative or adopting a mixed methodology design. Besides additional findings, the study demonstrated that some of the antecedents to nursing fatigue involve work structure and shift patterns, the nurses' gender, culture, and personal attributes. There are three types of fatigue chronic, acute, and inter-shift. The occurrence and levels of fatigue for the three types was reported as varying from moderate to high. Regarding mitigation, there are three levels, namely the organization, team leader, and individual nurses where intervention is recommended. All stakeholders should contribute in managing and coping with nursing fatigue.

Tweetable Abstract

Nursing fatigue rise exposes the nurses, their patients, and the public to increased health and safety risks.

Contribution of the Paper

What is Already Known about the Topic?

- Nurses fatigue index impacts on their professional working
- Nurse's fatigue has an impact on patients care quality

What the Paper Adds

- The paper demonstrates the need to mitigate nursing fatigue as a tool for promoting patients and public safety.
- Demonstration of the need to create awareness among nurses as personal and individual level initiatives are core in coping with nursing fatigue.

Keywords: Fatigue AND (risk* OR prevent* OR cop* OR manag* OR strategy*) AND nurs*

Introduction

Although largely appreciated as a hazard and a challenge to performing work at a satisfactory level, nursing fatigue alleviation and resolution strategy remain an understudied nursing research area.The term fatigue has been widely applied in the healthcare industry to nursing and other health professions in reference to work-based exhaustion [1-3]. In this paper fatigue is defined as

a state of extreme tiredness, exhaustion, sleepiness, and lack of energy resulting from insufficient sleep, or from an extended period of stress or/and anxiety [4,5]. Work-related fatigue is known to prevent a person from normal functioning, usually as a result of prolonged periods of physical and/or mental exertion. Furthermore, nursing fatigue has been characterized as a workplace hazard affecting the safety and health of workers, with a flow-on-effect of inadvertently affecting patient safety and care satisfaction [6-9]. Fatigue is also known to negatively impact on the quality of care provided by nurses [10].Fatigue contributes to an increased risk of errors, a decline in short-term and working memory, a reduced ability to learn [11,12], a negative impact on divergent thinking, innovation, and insight [13], increased risk-taking behavior; and, impaired mood and communication skills [9]. Fatigued nurses are also reported to be more likely to report clinical decision regret, which occurs when their behaviors do not align with professional nursing practice standards, or expectations [14]. Because of the clinical practice, personal and professional issues associated with fatigue, it has been identified as an important area of study in nursing. Scholars and nursing professionals assert that developing and evaluating strategies to mitigate against the effects of fatigue in the workplace [15].

In the context of nursing fatigue, fatigue risk management explains how people respond to the different types of fatigue they experience during working hours and how this is managed. This explanation can be extended to the direct interaction with patients during patient care, or in other nursing non-direct patient engagements; such as writing progress notes, or attending handovers [16]. Fatigue risk management varies across organizations and no one type of program may fit all worksites because the attributes of fatigue are linked to the specific workload undertaken. Workplace safety departments that have a risk management program for fatigue generally address workplace design and the environment; administrative controls, like scheduling, workload, and staffing; monitoring of fatigue and worker attentiveness [17]. Fatigue management efforts can be included as part of a Safety Management System (SMS) including an explicit and comprehensive process for measuring, mitigating, and managing the fatigue [18]. The organization, leadership and individual nurses play a vital role in mitigation strategies to limit and reduce nursing fatigue [19].

Aim

The aim of this integrative review of the research literature is to explore the current nurses fatigue levels and their antecedents. As a contribution, the review will identify effective fatigue prevention strategies.

Methods

The authors also utilized Cooper's [20] methods for synthesizing the review: (i) identify the problem, (ii) searching the literature, (iii) collecting information from studies,(iv) evaluating the quality of studies, (v) analyzing and interpreting findings regarding fatigue and risk management; and, presenting results. Following this procedure, the fatigue issue was formulated based on the authors observations in clinical practice, personal communications, knowledge of the international dialogue about this topic, and in the review of risk management policies related to nurse fatigue. The second step in Cooper's method, searching the literature, was conducted through a search of original research focusing on nursing fatigue. Three databases were used to search for relevant literature, namely SCOPUS, MEDLINE, and CINAHL, respectively. The keywords that were used were truncations of fatigue AND (risk* OR prevent* OR cope* OR manag* OR strategy*) AND nurs*.A total of 1847 articles were found. Removing duplications left 1418 papers. Inclusion and exclusion criteria were applied to the articles. For the inclusion, databases were searched for full text, English language articles published from 2015 to 2020. On the next step the author excluded the papers that did not focus on nursing fatigue and risk management, or were written in languages other than English. The final step was a quality appraisal of the articles using the GRADE model. The model examines the relevance of articles based on their internal consistency, perceived accuracy, and the risk of bias by the researchers. The rating ranges from low to High, with low indicating a high unreliability levels. A minimum quality index of moderate (+++) was required for a study to be considered feasible in the analysis [21]. Based on the inclusion and exclusion criteria, 36 papers remained for data analysis. Additionally, overview and the GRADE rating of the articles that were included in the final review.

Sample

According to the studies which were included in this literature review,the sample sizes ranged from 10 nurses [22] to 3,679 nurses [23]. Sample includes nurses from medical-surgical, Intensive Care Unit (ICU), Operation room/Theatre, surgical ICU, pediatric ward, emergency department, neonatal ICU, mental health, and Cardiac Care Unit (CCU) sittings. Fourteen studies were conducted in the United States of America (USA) three in Iran, two studies in each of (Lebanon, Turkey, New Zealand, and Canada), and one study in each of (China, Jordan, Australia, Austria, Singapore, Sweden, Finland, Japan, Taiwan, Brazil, and Brunei).Majority of the participants in the 36 studies reviewed were female nurses.

Instruments and Measures

Work related fatigue in the reviewed papers was addressed by a diversity of instruments, with most of the studies using the Occupational Fatigue Exhaustion Recovery scale (OFER-15) instrument[12,22,24-34]. Other tools used and applied to address fatigue among nurses included: The Systems Engineering Initiative for Patient Safety (SEIPS) model [19],Piper Fatigue

Scale (PFS) [35,36], Multidimensional Fatigue Inventory (MFI) [37], Change Fatigue Measurement Scale (CFMS) [38],8-item asthenia-fatigue sub scale [39], Brief Fatigue Inventory (BFI) [40], Fatigue Severity Scale (FSS) [41,42], Swedish Occupational Fatigue Inventory (SOFI) [22,43], and Checklist Individual Strength Questionnaire (CIS) [44]. The tools generally measured fatigue on the dimensions of physical, mental, chronic, acute, and psychological, respectively. The analysed studies in the integrated literature review were all based on the adoption and use of recognised fatigue assessment tools. Thus, although the findings varied based on changing contexts and study dimensions, the underlying principles remained the same for the adopted tools. This was a methodology strategy allowing for uniformity and agreement in principle for all the included studies in the review.

Results

Of the studies reviewed thirty-six focused on work-related fatigue and risk management among nurses. These studies included, 26 quantitative, 5 qualitative and 5 mixed method studies. Quantitative study design included cross-sectional (n = 21), field study (n =1), longitudinal studies (n =2), and randomized control trial (n =1). The qualitative studies reviewed contained the following data collection methods: semi structured interview (n =2), and focus group interview and intervention (n =2). The third category was the mixed methodology studies that were cross sectional in nature (2). A review and critique of the relevant literature revealed seven main headings for analysis, namely: sample, instrument and measures, work related fatigue prevalence, type of work-related fatigue, factors associated with fatigue, work related fatigue consequences, and risk management.

Type of Work-Related Fatigue

The literature reviewed described three types of work-related fatigue. They were acute, inter-shift (Recovery), and chronic fatigue. Although not all the studies adopted OFER 15, they collectively identified the five types of fatigue among nurses. Acute fatigue is where the nurse experiences a lack of energy due to duties with extra demands and when their shift ends, these extra demands cause fatigue. Inter-shift (Recovery) work-related fatigue, is more evident where nurses start a new shift carrying the stress and burden of the previous shift without feeling completely refreshed. Chronic fatigue is an outcome of increased acute fatigue and consistent insufficientrecovery periods occurring during work shifts and even on rest days[12,22,24-34].

In a qualitative study among eleven registered nurses in the USA, the focus was on the types of fatigue experienced by nurses. The results indicated that three manifestations of fatigue were identified: mental (Cognitive) emotional Compassion), and physical fatigue [45]. Mental fatigue can be defined aslack of mental energy, or mental tiredness that is perceived by the nurses or individual. Emotional fatigue is a state of feeling emotionally worn-out and drained as a result of either individual or workplace-based fatigue, or a combination of both. Physical fatigue is an extreme feeling of tiredness, or exhaustion of an individual's body parts and the inability of some muscles to maintain optimal physical performance [36,43,45,46].

Work Related Fatigue Prevalence

Across the 36 studies, the level of fatigue ranged from low to very high among nurses assessed using a variety research instruments. Thirteen studies used the (OFFER15) tool which measures fatigue according to chronic, acute and inter-shift levels. Two studies used the SOFI, which measures fatigue through 5 dimensions which includes lack of energy, physical exertion, physical discomfort, lack of motivation and sleepiness.For example, a cross sectional study conducted in Iran by Yarmohammadi, et al. [43]used the SOFI and found that of the 112 nurses sampled, 67.9% suffered from low and moderate fatigue, 23.2% suffered from high fatigue, and 8.9% suffered from a very high fatigue. Sagherian, et al. [29] conducted a descriptive cross- sectional study in Lebanon among 77 registered nurses working in ICU and Medical-Surgical wards. The study revealed that, 70% of nurses experienced moderate-to-high levels of chronic fatigue, 76% of nurses reported high levels of acute fatigue, and for 39% of nurses, the level of inter-shift recovery was low to moderate during the past few months. A cross sectional study byBlouin, et al.[25] in the USA, with 1023 nurses working in different wards, the majority were female (89%), used the Occupational Fatigue Exhaustion Recovery scale (OFER15) to measure the level of fatigue. The findings indicated that 60% of the nurses reported chronic fatigue from a low to moderate level, 68.4% of nurses experienced acute fatigue from a moderate to high level, with 29.6% of the sample reporting intershift fatigue from moderate to high [25].

According to Yu, et al. [34]from a study in New Zealand of 67 ICU nurses working 12 hour shifts in two hospitals the OFER15 scale, found that85% of the nurses experienced low to moderate chronic fatigue; 53% of them had low to moderate acute fatigue levels; 68% reported low to moderate inter-shift fatigue. In addition, a quantitative study among 201 nurses working in the Emergency Department (ED) and Critical Care (CC) in Brunei demonstrated that the highest prevalence of work-related fatigue was chronic fatigue (30.3%), low inter-shift recovery (22.9%), and acute fatigue (19.9%) [24]. Finally, Liu, et al. [28] investigated the fatigue levels among 162 new nurses who had worked for more than 1 month, but not for more than 12 months from two medical centers and three regional hospitals in southern Taiwan. The levels were classified to chronic fatigue, acute fatigue, and inter-shift recovery was 58.19%, 57.24%, and 47.88% respectively.

Factors Associated with Fatigue

Shifts Period and Structure

Numerous studies demonstrated that the number of working hours per shift, and the accumulative collective number of shifts,

have a direct impact on an individual's nursing fatigue levels [23,25,28,32,35,44].Blouin, et al.[25], for example indicates that the 12-hour shift has a higher prevalence of nurses' fatigue than an 8-hour shift.A quantitative study in the USA [32] of 79 female nurses in a pediatric ward explored the difference between fatigue in a 8-h day shift, 12-h day shift, 8-h evening shift and 12-h night shift for fatigue (Chronic and Acute), and inter-shift recovery. The study found that there was a difference across shifts between inter-shift recovery for 8-h shift recovery, compared to 12-h shift recovery. Also, there was less inter shift recovery for the 8-h shift nurses[32]. In a very similar result, a quantitative study by Dara, et al. [35]of 51 surgical ICU nurses in Singapore found that the nurses who work more than 10 hours per shift and more than 50 hours per week on consecutive shifts with short recovery time scored higher levels of fatigue. Long shift work, overtime work and rotating shift work not only increase the work load, but also reduce sleep, rest time, and adversely impact on relationships with others. The factors above are considered to be the main causes of occupational fatigue [35,40,43].

Moreover, two previous studies illustrated that the number of shifts worked and the number of days off per nurse had a direct impact on their fatigue levels[25,35]. Equally, while still focusing on the shift structure, a cross sectional study among 70 nurses in the USA [42] illustrated that there was a higher fatigue index among the night-shift nurses, than among the day shift nurses. This study also found that the workload is often higher at night shift due to increased cases of staff not sleeping well in the daytime. These factors contribute to a greater risk of medical errors and need for more concentration. Similarly, two studies conducted in Austria and New Zealand indicated that the night-shift nurses were more likely to have a prolonged fatigue period, which means they need a longer recovery period than the day shift nurses need [34,47]. In summary, the findings indicate that the shift related causes of fatigue are the shift period and the shift structure. The long working hour shifts increase the fatigue risk. Furthermore, overtime shifts, shift workloads and minimal rotations increase fatigue.

Gender

Gender has also been reported as work-related fatigue factor. By Yarmohammadi, et al.[43] for example surveyed 112 nurses (49 male & 63 female), and concluded that the level of fatigue among male nurses is higher than the female nurse, but offered no explanation as to why. In contrast, some studies have reported that women experience fatigue more than men. This is linked to the assertions that women have a higher need and demand for sleep than men. This increases their inter-shift fatigue levels for women when they have shorter rest periods from one shift to the other [27,40,48], but again, there is no explanation given. Yet other studies show that there is no significant difference on level of fatigue and gender [29,49]. None of these studies shows a correlation of gender to any other factors, or offer an explanation about how gender influences fatigue.

Age

A range of studies have reported that the level of fatigue was directly related to the nurses' chronological age. Some studies demonstrate that older nurses have a higher fatigue risk than their younger nurses [33,34,40]. Younan, et al. [33]in a Lebanon study, surveyed 2,852 Registered nurses from 39 hospitals, using the Occupational Fatigue Exhaustion Recovery scale (OFER15) to measure the level of fatigue. This study found that older nurses working night shift reported higher fatigue than their younger colleagues [33,34]. On the contrary, other studies have shown that the younger nurses experience fatigue more than the older nurses. For example, a four-year longitudinal study in Finland of 3,679 nurses, found that among several factors, including health and marital status, the most significant fatigue factor was age, and in this study the younger nurses reported being more fatigued than the older nurses[23]. Similarly, other studies have shown that both acute and persistent fatigue were significantly higher among younger nurses compared to older nurses[25,50]. However, none of these studies explain the nature of the relationship between age and fatigue.

Workplace Environment

The physical and cultural environment are positively correlated to the work performance of nursing staff. In a qualitative study of 22 RNs in the USA [19], the nurses described the physical environment such as unit layout, break room layout, and patient room layout contributed to fatigue, or as a barrier or facilitator to mitigate the fatigue. Similarly, a quantitative study of 1000 RNs in the USA reported that the physical environment (e.g. room layout, noise, temperature, lighting, and supply location table) contributed to physical and mental fatigue [51]. A mixed method study conducted in the USA to explore float nurses' perceptions of levels and sources of fatigue across units, found that the physical environment was one of several factors leading to nursing fatigue [22].

Most of the studies in this review agreed that the cultural environment in the workplace plays a role in fatigue, and can be both contextual and individual. Although different cultures and contexts across nations would vary, the analysis focused on the workplace context culture. The existing nurses' culture, based on their personal attributes and way of doing things impacts upon their fatigue levels [48,52]. One such an example is the 'super nurse' culture [52]. The super nurse culture is a belief and a perception among nurses that they do not need to address fatigue dn that they are strong enough to overcome their fatigue naturally without adopting any particular or approved strategies. The super nurse culture was found to be a combination of sub-themes and cultures like extraordinary powers used for good, but without sidekick and Kryptonite respectively impacted on the unit cultures adopted

and their willingness to address fatigue, as well as the prevalence of fatigue levels among the unit and institutional nurses[52]. Furthermore, the units with open communication and transparency cultures recorded lower fatigue prevalence levels [22].

Consequences of Work-Related Fatigue

Work-related fatigue has direct and indirect consequences that need to be addressed in the context of nursing performance and patient health outcomes. The three main themes derived from the literature in this section are related to the quality of care provided by nurses, job satisfaction experienced by nurses and subsequent turnover, and, nurses' mental and physical health.

Job Satisfaction and Turnover

An additional consequence of nursing fatigue is the decline in the nurse's intent to stay, and, as such, there is an increase in staff turnover. A study in Taiwan by Steege, et al. [31] found a direct link between the fatigue index among nurses and their willingness to leave their employment. This study focused on the behavior of new entrant nurses. However, the consequence is not only among the new entrant nurses.AsYounan,et al.[33]found, fatigue has an impact on a high turnover for both experienced and the less experienced nurses. Three other studies [26,39,52] confirmed that the prevailing work exhaustion index included nurses for the first time at work (acute fatigue) and nurses experiencing fatigue over a long period of time (Chronic Fatigue). These three studies also confirm that fatigue had an impact on the nurse's work engagement level, low motivation and intent to leave the job.

Nurses Mental and Physical Risks

Fatigue has a direct impact on the individual nurses' physical and mental health. More evidence in the review articles has demonstrated that nurses experiencing fatigue at work are under mental and physical risk. For example the mental risks are a reduced alertness, longer reaction time, weakened memory, mental health disorder, impaired concentration, irritability, poor judgment,decreased task motivation, poorer psychometric coordination, physical symptom, emotional sensitive, and eventually information processing [30,46,49]. Physical risks are back and neck pains, and musculoskeletal pains and disorders such as the risk of physical disability and limited mobility in the long run period [24]. Epstein, et al.[46]found that there are many consequences of fatigue that are presented under cognitive fatigue (e.g. concentration, remembering and priorities problem), emotional Fatigue (e.g. more emotionally sensitive, more easily annoyed, unengaged, or not happy as usual), and physical fatigue (e.g. headache, dizziness, feeling cold, and physical tired).

Risk Management

Fatigue can potentially be alleviated through nursing risk management strategies but currently, there is no known single comprehensive approach or intervention appliedto manage or reduce fatigue in nursing [31]. However, in the entire analysis, and across the different studies it is clear that the main approaches to managing and mitigating the fatigue risks can be clustered into three groups: the organizational level, leadership level, and individual nurses level strategies.

Organizational Level Coping Strategies

A majority of the studies denote that the hospitals, healthcare facilities, and the units' culture have a responsibility to help fighting and controlling the fatigue. These are coping and mitigation strategies developed by the organizational level. A qualitative study of 22 RNs in the USA explored factors and strategies to reduce fatigue, and individual barriers for coping in hospital work systems [19]. The study result found that the organizational coping strategies included the unit-level management, upper-level management, teamwork, scheduling, training, and staffing [19]. Similarly, a quantitative study conducted in Australia of 353 frontline nurses by showed that training for the environment or hospital changes was an organizational coping strategy [38]. This helps equip the nurses with skills and an understanding of handling and functioning in a changing hospital and workplace environment.

Several studies make recommendations. For example, organization management should maintain the relationship between the staff member and the leaders to reduce fatigue [25,30,52]. Hospitals should develop fatigue risk management systems and guidelines, which includes: continuous staff education and training of personalized fatigue recovery; promotion of healthy work culture; fatigue reducing lifestyle habits; and safe practice environment [25,32]. Hospitals should consider adequate nurses staffing according to patient acuity and dependency in a unit's work[53]. steege, et al. [54] while referencing the IOM report recommended that the working hours should be reduced to 60 hours per 7 days and not more than 12 hours per day (24 hours).

A cross-sectional study of 1075 full time nurses in Japan by Watanabe, et al.[53] recommended that the hospitals have full responsibility to reduce fatigue among nurses through reduction of overtime work, consideration of the nurse to patient ratio, and limiting the working hours per week. Finally, in three studies, the participants said that hospitals should create a policy for regular breaks and napping during night shifts [12,27,52]. In addition, a mixed method study was conducted by Steege, et al. [55] among the managers and executive nurses. The result showed that 19% of the participants reported that there is no policy for shift schedule, and 96% of the participants reported that there is no hospital policy regarding the transportation of nurses from work to home after the end of their shifts in case they experienced fatigue [55].

Leadership Based Strategies

Several studies observed that the leaders at the strategic

direction and policy level and middle level managers and supervisors interacting with the nurses, play a major role to reduce fatigue level and maintain coping strategies in the workplace. Steege, et al. [30] found that executives and nursing managers should cooperate and draw a strategy for reducing fatigue among nursing staff.For example, leaders and managers can optimize the shift hours, shifts length and frequency; balance the assignment between the staff; schedules the shifts regarding to staff preferences; utilize principles of circadian rhythms in shifts scheduling; and address the increasing absenteeism among nurses [22,31,42]. Moreover, some decisions, such as decreasing the number of staff on the shift, come from unit managers and executives, and these decisions negatively affect the nurses' fatigue. The leaders have a responsibility of crating training and development opportunities for their followers/respective nurses within a department[44,49].

Individual Nurses Strategies

According to the previous literatures, there are many of individual coping strategies used by nurses to mitigate the fatigue. For example, exercise activity is one of the strategies to mitigate fatigue [29,43]. A field trial study of 46 female nurses conducted in Iran by Afrasiabifar, et al. [37] indicated that nurses who were actively involved in a core-stability exercise program were able to reduce mental and physical fatigue. Furthermore, a randomized controlled trial of 56 female nurses in Turkey found that the progressive muscle relaxation combined with music appears to be effective in decreasing stress and fatigue [41]. Additionally, mixed methods study of 61 nurses in USA conducted byHill, et al.[26] found that the individual nurses have a responsibility of setting up actionable and practical professional goals (Task) during the shift. Nurses have different individual coping strategies to mitigate fatigue such as prioritizing sleep hours before starting work and taking power naps during night shifts, participating in activities like swimming and jogging to decrease the level of fatigue [29,43,46,47].

Discussion

Work Related Fatigue Antecedents

This review verifies that many factors such as shift structure and length of time, age, gender and environmental cultures contribute to nursing fatigue. In terms of shift structure, long shifts, few inter-shift rest periods, and night shifts are associated with a high-level of fatigue among nurses. This finding is consistent with the result from two studies which found that nurses who are working more than 8 hours, or working on night shift are likely to report higher levels offatigue [56,57]. In terms of age, three studies found that work related fatigue was significantly higher among young nurses compared to older nurses. This finding is inconsistent with the study conducted by [58] who found that elderly nurses suffered and were unable to cope with work related fatigue. This brings to the light the need to address the fatigue antecedents as a tool for not only minimizing, but also coping and eliminating fatigue as much as possible.

Adequate rest and recuperation are essential to mitigate against work related fatigue. This goal is achievable through implementing unit procedures that limit involuntary overtime, on-call status, and the practice of calling non-scheduled nurses from the same unit to meet staffing needs. These negative practices, common to many units and organizations, contribute to nurses' fatigue and exhaustion [59,60]. Additionally, social support from family members, supervisors, and colleagues has a positive influence on work-related fatigue [61-63]. The findings in this review suggest that supportive work environments (e.g., nursing empowerment, clarity of procedures, collegial relationships with other departments) may provide a protective mechanism from fatigue. Identification of fatigue inducing factors is needed to advance the development of interventions to redesign the workplace, develop fatigue risk management programmes and improve nurse work and patient safety.

Nurses' Health and Absenteeism

Nurses' fatigue has been documented in the literature as contributing to negative nurses' healthand poor job performance [64]. According to Jones, et al. [65] work-related fatigue has been associated with higher rates of medical errors by nurses and injury to nurses in the workplace. Fatigued nurses may also threaten the society outside workplace, if they cause car accidents and home injuries due to tiredness [10]. Additionally, fatigue negatively affects the social life, and physical health [66,67]. According to Austin, et al. [39], Hill, et al. [26]and Steege, et al.[52], one of the mainconsequences of fatigue is absenteeism. Absenteeism associated with fatigue may cause nurses to leave their jobs or the profession. Thus, Supervisory personnel are encouraged to attend to the causes of increased absenteeism among nursing staff.

Nurse Responsibility Superiority in Mitigating Fatigue

The review found that fatigue can be mitigated by considering strategies at organisational, leadership, and individual level. The organizational level has a responsibility to ensure safe nurses through the provision of sufficient economic and human resources within the work environment to assist in the reduction of long hours and heavy workloads [19]. However, hospitals should provide Fatigue education programs, which include information about fatigue risks, circadian rhythm and healthy diet. Education programs should not only identify the risks of fatigue, but also explain the contributing factors and how to prevent and mitigate fatigue. One study identified that nurse managers play a vital role in creating and modeling strategies to alleviate the fatigue among nurses [55]. Individual coping strategies are also very important. for example, stable sleep patterns and exercise help to reduce

fatigue [29,43,68]. However, there is scarcity of research that explores the individual coping strategies used by nurses.

Limitations and Strengths

The strength in this review is the quality of the literature. This review exclusively relied on peer-reviewed journals meaning that the reliability and quality of the journals was up to expected standards. Furthermore, a systemic approach was used to evaluate and rate the quality of articles related to nurse fatigue. Additionally, all articles were published not more than half a decade ago. The diversity of the articles that spanned different countries and jurisdictions makes the findings dependable and applicable across those jurisdictions. However, a weakness in this review was the limitation in the number of articles that explored the coping strategy among nurses in Arab countries. A potential limitation of this integrated review is that it was limited to articles written in English. Another limitation is that most of the studies were cross sectional design, which does not give the same saturated result as a mixed method study.

Conclusion

The literature reviewed describes three types of work-related fatigue. They are acute fatigue, inter-shift (recovery) fatigue, and chronic fatigue. There are several factors that cause nurses' fatigue whether the factors are work-related or not. Shifts structure, workplace environment, gender and age are known to be work related fatigue factors. Work-related fatigue has many negative consequences, both direct and indirect, for nurses' performance and patients' health outcomes.

The development of fatigue can potentially be alleviated through three levels. The organizational and leadership level should create fatigue mitigation strategies, and provide training programs for nurses. The leaders should also encourage nurses to actively participate and take advantage of the fatigue mitigation programs. This should extend to create an awareness of the roles that the nurses can play at their individual levels such as creating an exercise program and ensuring stable and pattern-based sleep strategies. Educational programs and training are crucial to minimize fatigue. Moreover, working more than 12 hours in a 24-hour period, and more than 60 hours in a seven-day period will increase the fatigue. Most research suggests the following strategies: provision of adequate staffing to enable nurses to take breaks; taking regular breaks and enough meal; taking naps during night shifts; obtaining sufficient sleep before beginning a shift; and complying with hospital policies and procedures relating to fatigue. Finally, understanding the type of fatigue and exploring the antecedents is essential.

Conflict of Interest

None

Funding Sources

No external funding

References

1. Afkhami S, Dabiri M, Alavi SH, Björk T, Salminen A (2019) Fatigue characteristics of steels manufactured by selective laser melting. International Journal of Fatigue 122: 72-83.
2. Bolino MC, Hsiung HH, Harvey J, LePine JA (2015) "Well, I'm tired of tryin'!" Organizational citizenship behavior and citizenship fatigue. Journal of Applied Psychology 100: 56-74.
3. Little VL (2013) Exploring compassion fatigue in long-term nursing workers and its influence on resident's quality of life. Northcentral University.
4. CCOHS (2017) OSH Answer Fact sheet: Fatigue.
5. Olds DM, Clarke SP (2010) The effect of work hours on adverse events and errors in health care. Journal of Safety Research 41: 153-162.
6. Cherry B, Pecenka-Johnson K, Martin E (2017) Fatigue: A Nurse's Responsibility to Self & Patients. Texas Nursing 91: 10-11.
7. Kahol K, Leyba MJ, Deka M, Deka V, Mayes S, et al. (2008) Effect of fatigue on psychomotor and cognitive skills. The American Journal of Surgery 195: 195-204.
8. Relias (2015) Nurse fatigue a 'huge' threat to patient safety, but can be addressed. Case Management Advisor 26: 58-59.
9. Wong K (2017) Fighting the effects of nurse fatigue. American Nurse Today 12: 40-41.
10. Farzianpour F, Nosrati SA, Foroushani AR, Hasanpour F, Jelodar ZK, et al. (2016) Relationship between shift work and personality traits of nurses and their coping strategies. Global Journal of Health Science 8: 166-174.
11. Bruner K, Onchonga V, Savage M, Stevens T (2015) Nurse Fatigue: Dangerous for Nurses and Patients. Kentucky Nurse 63: 13.
12. LeGal P, Rhéaume A, Mullen J (2019) The long□term effects of psychological demands on chronic fatigue. Journal of Nursing Management 27: 1673-1681.
13. Stankus JA, Clutter P, Mancuso P (2017) The Healthy Nurse: Finding the Balance. Issues and Trends in Nursing 267-269.
14. Arslanian-Engoren C, Scott LD (2014) Clinical decision regret among critical care nurses: A qualitative analysis. Heart & Lung 43: 416-419.
15. Scott LD, Hofmeister N, Rogness N, Rogers AE (2010) An interventional approach for patient and nurse safety: A fatigue countermeasures feasibility study. Nursing Research 59: 250-258.
16. Patterson PD, Higgins JS, Van-Dongen HP, Buysse DJ, Thackery RW, et al. (2018) Evidence-based guidelines for fatigue risk management in emergency medical services. Prehospital Emergency Care 22: 89-101.
17. Aas RW (2011) Workplace-based sick leave prevention and return to work. Exploratory studies. Instförkliniskneurovetenskap/Dept of Clinical Neuroscience.
18. Gander P, Hartley L, Powell D, Cabon P, Hitchcock E, et al. (2011) Fatigue risk management: Organizational factors at the regulatory and industry/company level. Accident Analysis & Prevention 43: 573-590.

19. Steege LM, Dykstra JG (2016) A macroergonomic perspective on fatigue and coping in the hospital nurse work system. Applied Ergonomics 54: 19-26.

20. Cooper H (2015) Research synthesis and meta-analysis: A step-by-step approach (Volume 2). Sage publications.

21. Balshem H, Helfand M, Schünemann HJ, Oxman AD, Kunz R, et al. (2011) GRADE guidelines: 3. Rating the quality of evidence. Journal of Clinical Epidemiology 64: 401-406.

22. Dykstra JG, Sendelbach D, Steege LM (2016) Fatigue in float nurses: Patient, nurse, task, and environmental factors across unit work systems. Proceedings of the Human Factors and Ergonomics Society Annual Meeting 60: 623-627.

23. Harma M, Karhula K, Puttonen S, Ropponen A, Koskinen A, et al. (2019) Shift work with and without night work as a risk factor for fatigue and changes in sleep length: A cohort study with linkage to records on daily working hours. Journal of Sleep Research 28: e12658.

24. Abdul-Rahman H, Abdul-Mumin K, Naing L (2017) Psychosocial Work Stressors, Work Fatigue, and Musculoskeletal Disorders: Comparison between Emergency and Critical Care Nurses in Brunei Public Hospitals [Article]. Asian Nursing Research 11: 13-18.

25. Blouin AS, Smith-Miller CA, Harden J, Li Y (2016) Caregiver Fatigue: Implications for Patient and Staff Safety, Part 1. Journal of Nursing Administration 46: 329-335.

26. Hill T, Cherry B, LeClair-Smith C, Williams T (2020) A Unique Strategy to Address Nurse Leader Fatigue. Journal of Nursing Administration 50: 66-71.

27. Ismail KM, Malak MZ, Alamer RM (2019) Psychosocial correlates of work□related fatigue among Jordanian emergency department nurses. Perspectives in Psychiatric Care 55: 486-493.

28. Liu Y, Wu LM, Chou PL, Chen MH, Yang LC, et al. (2016) The Influence of Work-Related Fatigue, Work Conditions, and Personal Characteristics on Intent to Leave Among New Nurses. Journal of Nursing Scholarship 48: 66-73.

29. Sagherian K, Clinton ME, Abu-Saad-Huijer H, Geiger-Brown J (2017) Fatigue, Work Schedules, and Perceived Performance in Bedside Care Nurses. Workplace Health and Safety 65: 304-312.

30. Steege LM, Pinekenstein BJ, Arsenault Knudsen É, Rainbow JG (2017) Exploring nurse leader fatigue: A mixed methods study [Article]. Journal of Nursing Management 25: 276-286.

31. Steege LM, Pinekenstein BJ, Rainbow JG, Arsenault-Knudsen É (2017a) Addressing Occupational Fatigue in Nurses: Current State of Fatigue Risk Management in Hospitals, Part 1.Journal of Nursing Administration 47: 426-433.

32. Ungard W, Kroger-Jarvis M, Davis LS (2019) The Impact of Shift Length on Mood and Fatigue in Pediatric Registered Nurses. Journal of Pediatric Nursing 47: 167-170.

33. Younan L, Clinton M, Fares S, Jardali FE, Samaha H (2019) The relationship between work□related musculoskeletal disorders, chronic occupational fatigue, and work organization: A multi□hospital cross□ sectional study. Journal of Advanced Nursing (John Wiley & Sons, Inc.) 75: 1667-1677.

34. Yu F, Somerville D, King A (2019) Exploring the impact of 12-hour shifts on nurse fatigue in intensive care units. Applied Nursing Research 50: 151191.

35. Dara S, Tan J, Taezoon P, TiekWhai LIM (2016) Fatigue Risk in Nurses Performing Rotating Shift Work in an Intensive Care Unit in Singapore: Analysis of Work Rosters. Singapore Nursing Journal 43: 2-10.

36. Akansel N, Akansel M, Yanik H (2019) Association of Organisational Stress with Fatigue in Operating Room Nurses. International Journal of Caring Sciences 12: 627-638.

37. Afrasiabifar A, Mosavi A, Mohammadian-Behbahani M, Hoseinichenar N (2018) The effectiveness of core stability exercises on nurse fatigue. Journal of Nursing & Midwifery Sciences 5: 9-14.

38. Camilleri J, Cope V, Murray M (2019) Change fatigue: The frontline nursing experience of large□scale organisational change and the influence of teamwork. Journal of Nursing Management (John Wiley & Sons, Inc.) 27: 655-660.

39. Austin S, Fernet C, Trépanier SG, Lavoie□Tremblay M (2020) Fatigue in new registered nurses: A 12□month cross□lagged analysis of its association with work motivation, engagement, sickness absence and turnover intention. Journal of Nursing Management (John Wiley & Sons, Inc.) 28: 606-614.

40. Neville K, Velmer G, Brown S, Robol N (2017) A Pilot Study to Examine the Relationship Between Napping and Fatigue in Nurses Practicing on the Night Shift. Journal of Nursing Administration 47: 581-586.

41. Ozgundondu B, GokMetin Z (2019) Effects of progressive muscle relaxation combined with music on stress, fatigue, and coping styles among intensive care nurses. Intensive and Critical Care Nursing 54: 54-63.

42. Surani S, Hesselbacher S, Guntupalli B, Surani S, Subramanian S (2015) Sleep Quality and Vigilance Differ Among Inpatient Nurses Based on the Unit Setting and Shift Worked. Journal of Patient Safety 11: 215-220.

43. Yarmohammadi H, Poursadeghiyan M, Rahmani N, Yarmohammadi S, Omidiandost A, et al. (2018) Work-Related Fatigue and the Effective Factors in the Iranian Nurses. Archives of Hygiene Sciences 7: 32-38.

44. Knupp AM, Patterson ES, Ford JL, Zurmehly J, Patrick T (2018) Associations Among Nurse Fatigue, Individual Nurse Factors, and Aspects of the Nursing Practice Environment. Journal of Nursing Administration 48: 642-648.

45. Wingler D, Keys Y (2019) Understanding the impact of the physical health care environment on nurse fatigue. Journal of Nursing Management 27: 1712-1721.

46. Epstein M, Soderstrom M, Jirwe M, Tucker P, Dahlgren A (2020) Sleep and fatigue in newly graduated nurses-Experiences and strategies for handling shiftwork. Journal of Clinical Nursing 29: 184-194.

47. Haluza D, Schmidt VM, Blasche G (2019) Time course of recovery after two successive night shifts: A diary study among Austrian nurses. Journal of Nursing Management 27: 190-196.

48. Gander P, O'Keeffe K, Santos-Fernandez E, Huntington A, Walker L, et al. (2019) Fatigue and nurses' work patterns: An online questionnaire survey. International Journal of Nursing Studies 98: 67-74.

49. Li M, Shu Q, Huang H, Bo W, Wang L, et al. (2020) Associations of occupational stress, workplace violence, and organizational support on chronic fatigue syndrome among nurses. Journal of Advanced Nursing 76: 1151-1161.

50. Da-Silva TPD, De-Araújo WN, Stival MM, De-Toledo AM, Burke TN, et al. (2018) Musculoskeletal discomfort, work ability and fatigue in nursing professionals working in a hospital environment. Revista da Escola de Enfermagem 52: e03332.

51. Steege LM, Drake DA, Olivas M, Mazza G (2015) Evaluation of physically and mentally fatiguing tasks and sources of fatigue as reported by registered nurses. Journal of Nursing Management 23: 179-189.

52. Steege LM, Rainbow JG (2017) Fatigue in hospital nurses 'Supernurse' culture is a barrier to addressing problems: A qualitative interview study [Article]. International Journal of Nursing Studies 67: 20-28.

53. Watanabe M, Yamauchi K (2019) Subtypes of overtime work and nurses' fatigue, mental status, and work engagement: A latent class analysis of Japanese hospital nurses. Journal of Advanced Nursing 75: 2122-2132.

54. Steege LM, Pinekenstein B (2016) Addressing occupational fatigue in nurses: A risk management model for nurse executives. The Journal of Nursing Administration 46: 193-200.

55. Steege LM, Pinekenstein BJ, Rainbow JG, Arsenault-Knudsen É (2017b) Addressing Occupational Fatigue in Nurses: Current State of Fatigue Risk Management in Hospitals, Part 2. Journal of Nursing Administration 47: 484-490.

56. Chen J, Davis KG, Daraiseh NM, Pan W, Davis LS (2014) Fatigue and recovery in 12□hour dayshift hospital nurses. Journal of Nursing Management 22: 593-603.

57. Yuan SC, Chou MC, Chen CJ, Lin YJ, CHEN MC, et al. (2011) Influences of shift work on fatigue among nurses. Journal of Nursing Management 19: 339-345.

58. Raftopoulos V, Charalambous A, Talias M (2012) The factors associated with the burnout syndrome and fatigue in Cypriot nurses: a census report. BMC Public Health 12: 457.

59. MacKusick CI, Minick P (2010) why are nurses leaving? Findings from an initial qualitative study on nursing attrition. MEDSURG Nursing 19:335-340.

60. Trinkoff AM, Le R, Geiger-Brown J, Lipscomb J (2007) Work schedule, needle use, and needlestick injuries among registered nurses. Infection Control & Hospital Epidemiology 28: 156-164.

61. Adriaenssens J, De-Gucht V, Van-Derdoef M, Maes S (2011) Exploring the burden of emergency care: predictors of stress□health outcomes in emergency nurses. Journal of Advanced Nursing 67: 1317-1328.

62. Dean GE, Scott LD, Rogers AE (2006) Infants at risk: When nurse fatigue jeopardizes quality care. Advances in Neonatal Care 6: 120-126.

63. McGettrick KS, O'Neill MA (2006) Critical care nurses–Perceptions of 12□h shifts. Nursing in Critical Care 11: 188-197.

64. Hunsaker S, Chen HC, Maughan D, Heaston S (2015) Factors that influence the development of compassion fatigue, burnout, and compassion satisfaction in emergency department nurses. Journal of Nursing Scholarship 47: 186-194.

65. Jones G, Hocine M, Salomon J, Dab W, Temime L (2015) Demographic and occupational predictors of stress and fatigue in French intensive-care registered nurses and nurses' aides: A cross-sectional study. International Journal of Nursing Studies 52: 250-259.

66. Brett L, Traynor V, Stapley P (2016) Effects of physical exercise on health and well-being of individuals living with a dementia in nursing homes: A systematic review. Journal of the American Medical Directors Association 17: 104-116.

67. Donoso LMB, Demerouti E, Hernandez EG, Moreno-Jimenez B, Cobo IC (2015) Positive benefits of caring on nurses' motivation and well-being: A diary study about the role of emotional regulation abilities at work. International Journal of Nursing Studies 52: 804-816.

68. Giarelli E, Denigris J, Fisher K, Maley M, Nolan E (2016) Perceived Quality of Work Life and Risk for Compassion Fatigue among Oncology Nurses: A Mixed-Methods Study. Oncology nursing forum 43: E121-E131.