What is the Impact of Shift Work on The Psychological Functioning and Resilience of Nurses? An Integrative Review

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ABSTRACT

Aim. To synthesise existing research to determine if nurses who work shifts have poorer psychological functioning and resilience than nurses who do not work shifts.

Background. Research exploring the impact of shift work on the psychological functioning and resilience of nurses is limited compared to research investigating the impact of shifts on physical outcomes.

Design. Integrative literature review

Data Sources. Relevant databases were searched from January 1995-August 2016 using the combination of keywords: nurse, shift work, rotating roster, night shift, resilient, hardiness, coping, wellbeing, burnout, mental health, occupational stress, compassion fatigue, compassion satisfaction, stress, anxiety, depression.

Review Methods. Two authors independently performed integrative review processes proposed by Whittemore and Knafl and a quality assessment using the Mixed Methods Appraisal Tool by Pluye *et al*.

Results. A total of 37 articles were included in the review (32 quantitative, 4 qualitative, 1 mixed methods). Approximately half of the studies directly compared nurse shift workers with non-shift workers. Findings were grouped according to the following main outcomes: 1) General Psychological Wellbeing/Quality of Life, 2) Job satisfaction/Burnout, 3) Depression, Anxiety and Stress, and 4) Resilience/Coping. We did not find definitive evidence that shift work is associated with poorer psychological functioning in nurses. Overall, the findings suggest that the impact of shift work on nurse psychological functioning is dependent on a number of contextual and individual factors.

Conclusion. More studies are required which directly compare the psychological outcomes and resilience of nurse shift workers with non-shift workers.

Keywords: nursing, shift work, compassion fatigue, compassion satisfaction, anxiety, stress, depression, psychological outcomes, burnout, wellbeing, resilience

SUMMARY STATEMENT:

- Why is this research or review needed?

- Shift work is necessary in nursing but it may affect nurses' physical and mental health and their ability to provide high quality patient care
- There is currently little knowledge regarding the specific impact of working shifts on nurse psychological functioning and resilience.
- This information is needed to assist nurse managers and policy makers regarding potential strategies to mitigate the risk associated with shift work.

- What are the key findings?

- A few studies reported negative psychological outcomes associated with shift work while other studies did not find evidence of negative psychological impacts.
- The studies have used many different/inconsistent outcome measures. Only approximately half of the studies directly compared nurse shift workers with non-shift worker counterparts.
- There is a need for more investigation to directly compare nurse shift workers with non-shift workers, while considering different contextual (e.g. work setting) and individual factors (e.g. level of resilience).

- How should the findings be used to influence policy/practice/research/education?

- More research is needed to clarify the association between specific variables associated with poor response to shift work
- Understanding these variables can assist managers/policy makers to support nurse shift workers in order to prevent possible negative psychological outcomes.

INTRODUCTION

The International Council of Nurses acknowledged in 2007 that shift work is necessary in the nursing profession; however, there is also significant concern about the negative impact of working shifts on nurses' physical and mental health, and their ability to provide high quality patient care (International Council of Nurses, 2007). Nurse shift workers not only have to cope with the effects of shift work on family life (West et al., 2009), but also its effects on social and leisure activities (Faseleh et al., 2013). Work and family commitments usually cannot be fulfilled simultaneously. Therefore, working shifts commonly conflicts with valued time for family activities as well as restricting domestic commitments, particularly for female shift workers who may also be responsible for child-rearing or other caring roles (Hsu and Kernohan, 2006, West et al., 2009). Internationally, it is predicted that there will be a shortage of nurses by 2025 (Health Workforce Australia 2025, 2012). Understanding the factors that impact upon nurse retention is therefore critical. Nursing is well-recognised as a stressful occupation and a large body of research has investigated the impact of nursing on psychological functioning (Cameron and Brownie, 2010, Manzano García and Carlos, 2012, Mealer et al., 2012, McDonald et al., 2013). However, far less work has been conducted that focuses exclusively on understanding the impact of shift work on psychological outcomes.

BACKGROUND

Nurses are continually exposed to both acute and chronic workplace stressors which can lead to the development of psychological syndromes and disorders such as depression, anxiety, anger, irritability and burnout (Israel et al., 1989, Mealer et al., 2012). Many factors are known to contribute to this stress such as workload, hours worked, work environment, relationships between co-workers, ineffective management, patients/clients and their families, doubts about treatment, coping with death, lack of preparation time, discrimination and shift work (Colligan and Higgins, 2006, McVicar, 2003, Ma et al., 2014). These psychological and physical factors have been linked to decreased job satisfaction and retention problems among nurses (Donley, 2005, Letvak and Buck, 2008).

The adverse effects of occupational stressors on nurses with respect to nurse turnover, productivity, costs and the effect on quality of care are well known (Donley, 2005, Letvak and Buck, 2008). In light of these effects, governments have enacted various strategies to alleviate the global shortage of qualified nurses (Nevidjon and Erickson, 2001). In the US and Australia, these strategies have included assisting nurses with the cost of their pre-registration qualification by providing government subsidies (Commonwealth of Australia, 2012), increasing the recruitment of nursing students into programs by providing funding to educational institutions (American Association of Colleges of Nursing, 2015), and proposing task substitution, which is defined as allocating clinical responsibilities to lesser trained health professionals with or without supervision (Buchan and Dal Poz, 2002, Yong, 2006). However, while attracting more people into nursing programs is important, so too is retaining nurses within their current positions (Health Workforce Australia 2025, 2012). An important factor in the retention of nurses in the workforce is job satisfaction and this includes an understanding of the maintenance of both the psychological and physical wellbeing of nurses. Therefore, it is essential to clearly understand how nurses cope with work related stressors in the health care environment of the 21st Century and how they can maintain a healthier

psychological profile and be resilient in the work environment. There is some evidence indicating that the majority of nurses who face work related stress have a higher intention to resign from their position or reduce their working hours (Maville and Huerta, 2013, Tei-Tominaga, 2013), which has an economic cost to their employers and the health care system (Mealer et al., 2012). It has been suggested however, that nurses who are resilient show successful adaptation and an active coping style in response to stressors, and are therefore more likely to remain in the workforce for longer (Charney, 2004, Grafton et al., 2010, Turner, 2014).

Resilience is defined as a learnable, multidimensional ability of a person which enables him or her to function at a high level when facing an acute or chronic threat to their wellbeing (Rutter, 1987). Several studies have explored the link between nurse resilience and psychological outcomes such as stress, anxiety, depression, compassion fatigue and compassion satisfaction (Glasberg et al., 2007, Jackson et al., 2007, Ma et al., 2009, Gillespie et al., 2009, Cameron and Brownie, 2010, Gustafsson et al., 2010, Grafton et al., 2010, Matos et al., 2010, Kornhaber and Wilson, 2011, Manzano García and Carlos, 2012, Mealer et al., 2012, Sawatzky and Enns, 2012, Hegney et al., 2014, Hinderer et al., 2014). However, far less work has been conducted regarding these variables as they relate specifically to nurses who work shifts. As such, there is currently very little understanding of the impact of shift work on the resilience and psychological wellbeing of nurses. Concerns about nursing shortages and retention, and previous studies into job satisfaction in the nursing workforce (Eley et al., 2007, Eley et al., 2010, Tuckett et al., 2011), highlight the need to investigate how shift work may influence nurse resilience and related psychological functioning.

THE REVIEW

Aims

The aim of this integrative review was to synthesise and evaluate the evidence regarding the impact of shift work on the psychological functioning and resilience of nurses. Specifically, this review addressed the following question:

Do nurses who work shifts have poorer psychological functioning and lower resilience than nurses who do not work shifts?

Addressing this question will provide evidence that may be useful to assist policy makers to better understand the risk profile of their shift workers and manage the risk associated with shift work.

Design

An integrative review of the literature was undertaken, adhering to the reporting guidelines for mixed studies reviews (Whittemore and Knafl, 2005). The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist was followed (Moher et al., 2009). The review is registered on the International Prospective Register of Systematic Reviews (PROSPERO) (Number CRD42015017369).

Search methods

This review included articles related to the impact of shift work on the psychological functioning and resilience of nurses. Articles that focused solely on the physical outcomes of shift work on nurses were excluded due to the presence of recent reviews on this topic (Niu et al., 2011) and the impacts of shift work on nurses' health (Matheson et al., 2014). Similarly, articles that focused on the relationship between nurse work hours/overtime and nurse and patient outcomes (Bae and Fabry, 2014) were excluded. The articles for this systematic review were identified by searching the following electronic databases: CINAHL plus, PubMed, Medline (Ovid), Embase and Google scholar, as well as grey literature such as Australian Nursing Federation, Queensland Nurses Union and Australian Health Practitioner

Regulation Agency. Articles published from January 1995 to August 2016 were included in this review. The search terms included variations of the following key words: nurs*, shift work, rotating roster, night shift*, resilien*, hardiness, cop*, wellbeing, burnout, mental health, occupational stress, compassion fatigue, compassion satisfaction, stress, anxiety, depression.

Studies reporting on the psychological functioning and/or resilience of nurses were included, if the sample:

a) comprised employed professional nurses (Registered or international equivalent), and
b) worked any irregular and rotating shift schedule, including morning, evening, and night shifts, regardless of the day of the week that a nurse worked. This definition excludes nurses who permanently work only morning shifts (Australian Commonwealth Government, 2011). Studies that were not published in English, considered only midwives or included both nurses and midwives but did not report their data separately, or were published earlier than the year 1995 were excluded. The former criterion was due to the difference between the scope of practice of nurses and midwives. The latter criterion was also due to the mid-1990s being considered pivotal in nurses' professional education (Keogh, 1997, Bennett, Andersson, 1999). Since 1984, Australian nurses, for the first time, were given the opportunity to have tertiary education, instead of traditional hospital based training (Smith, 1999). Following that, nurses universally were motivated to attain a university degree (Lusk et al., 2001). Having a lower educational qualification can be a risk factor for experiencing symptoms of burnout among nurses (Hegney et al., 2014). As a result of the difference between the two generations of nurses, and by virtue of the date limiters, the cohort of exclusively hospital trained nurses was excluded.

Search outcomes

The initial search resulted in 275 articles of which 139 were excluded because they did not meet the inclusion criteria for this review. The 136 articles were screened using their title for the presence of a study on nurses working shifts as defined and its association with psychological functioning and resilience. From those 136 articles, the abstracts of 15 articles were reviewed, as it was difficult to apply the inclusion criteria to their title. A total of 95 articles were selected and underwent critical appraisal. Of these 95 articles, 58 were excluded, as: they were primarily concerned with the physical impact of shift work (20 articles), did not measure shift work (3 articles), were not conducted among shift worker nurses (29 articles), were review articles (2 articles), and did not include employed nurses (4 articles). Figure 1 provides the PRISMA diagram related to this integrative review.

Quality appraisal

Two authors (M.T., C.R.) independently reviewed the quality of the 37 studies using an assessing system for mixed methods research and mixed studies reviews (SMSR) (Pluye et al., 2009). The detailed breakdown of each reviewer's scores is presented in supplementary materials. [See supplementary Tables 5-7]. For each criterion, the presence/absence of the criterion was scored 1 and 0, respectively. Quantitative observational studies were assessed according to their appropriate sampling ($n \geq 100$ considered as appropriate), justification of measurements, and control of confounders. Qualitative studies were evaluated for appropriate qualitative objective and method, description of the context, participants, and justification of participant selection, as well as description of qualitative data collection and analysis, and researcher reflexivity. The mixed method study was assessed for justification of the mixed methods design, combination of qualitative and quantitative data collection-analysis techniques, and integration of qualitative and quantitative results. There were minimal subjective differences regarding assessment of the articles which was discussed by the

authors to reach an agreement. The comparison of the two sets of quality assessments demonstrated a substantial degree of agreement between coders; Cohen's kappa= 0.75, indicating a good reliability (Cohen, 1960). Overall, the studies included in this review received moderate to high quality ratings.

Data extraction and synthesis

To assist with the synthesis of studies the same two authors (MT, CR) independently grouped the studies according to the main outcome variables they reported, namely; 1) General Psychological Wellbeing/Quality of Life, 2) Job satisfaction/Burnout, 3) Depression, Anxiety and Stress, and 4) Resilience/Coping. There were no discrepancies between authors as to the grouping of the articles into these four categories. Further, each study was classified according to whether it directly compared shift workers with non-shift workers (Category A studies) or if it only compared or examined relationships between variables among different types of shift workers (Category B studies). A similar synthesis was conducted for qualitative studies by examining the themes identified in each of the studies and grouping them according to the main outcome variables of this review. The synthesis of the final 37 qualitative and quantitative studies was then combined and the data were extracted and inserted into a four separate tables according to the main outcome variable: study setting, design, sample, measures, and analytical methods [see Tables 1-4]. Additional key findings of the studies were included in additional tables [see supplementary Table 8-11]. Figure 2 illustrates the method used for synthesising articles.

RESULTS

Overview of Studies

Of the final 37 studies included in this review, 32 were quantitative, 4 were qualitative and one was a mixed-methods study. Overall, 5 of the articles used a longitudinal study design, and the remainder used a cross sectional study design. Ten articles reported gender-specific results considering only female nurses. The quality of studies was excellent with 76% receiving a rating of 100%. The samples sizes ranged from 13 to 25924 and the majority of studies were conducted in Europe (n=12, 32.43%), followed by Asia (n=11, 29.73%), Australia/NZ (n= 6, 16.22%), the U.S/Canada (n=4, 10.81%), and the Middle East (n=4, 10.81%).

Outcomes

General Psychological Wellbeing/Quality of Life: This outcome category broadly captures overall psychological functioning in terms of wellbeing and quality of life. Three qualitative studies (West et al., 2009, Powell, 2013, Faseleh et al., 2013) and five quantitative studies (Camerino et al., 2010, Estryn-Béhar and Beatrice, 2012, Šimunić and Gregov, 2012, Lin et al., 2012, Sorić et al., 2013) obtained information related to this outcome. The quantitative measures included: a single item measure of wellbeing (Estryn-Béhar and Beatrice, 2012), the Scale of the Negative Effects of Work Time (Ahasan et al., 2002), Conflict Between Work and Family Rating Scale (Netemeyer et al., 1996), Chinese Health Questionnaire 12-item (Cheng and Williams, 1986) and the World Health Organisation Quality of Life Questionnaire brief version (WHOQOL-BREF) (World Health Organisation, 1996).

The qualitative studies by West *et al*. (2009) and Faseleh *et al.* (2013) both found themes relating to family disruption and stress associated with working shifts. Nurses reported having to restructure their lives to minimise disruption to family. The qualitative study by Powell (2013) with 14 nurses found that shift work was associated with fatigue and a sense of isolation. In terms of quantitative studies, Sorić *et al.* (2013) compared the quality of life of

shift workers and non-shift workers using the WHOQOL-BREF and found shift workers had poorer quality of life scores than non-shift workers. A number of studies compared wellbeing and quality of life scores across different patterns of shifts. Estryn-Béhar and Beatrice (2012) found on a single item measure of wellbeing, that one-third of nurses working 12hr days, nurses working 10hr night shifts and nurses working alternating shifts, reported dissatisfaction with work time and low wellbeing. Nurses working part time and 12hr day shifts or 8hr night shifts had less work/family conflict. Šimunić and Gregov (2012) used the Conflict between Work and Family Rating Scale and Scale of the Negative Effects of Work time and found less conflict between work and family among nurses working only morning shifts than those who worked forward rotation 12hr, 8hr, and backward rotation and irregular 8hr shifts. Similarly, Lin *et al.* (2012) found rotating shifts were associated with worse general mental health compared to day shifts.

The current evidence suggests that shift work is associated with poor quality of life and low psychological wellbeing among nurses but that this is dependent on the type of shifts worked and other circumstances such as whether the nurse works full or part-time. Only five study in this group directly compared outcomes for nurses working shifts against nurses not working shifts, more of these direct comparisons are required to strengthen the findings regarding the impact of shift work on quality of life and wellbeing. Overall, the methodological quality of these studies was 93.75 with four out of five quantitative studies also providing information on the precision of their findings. [See estimate of percision supplementary Table 12].

Job Satisfaction/Burnout: This outcome category captures psychological functioning specifically as it relates to perception of the work environment. The measures used to assess job satisfaction and burnout included: the Hoppock Scale 5-item General Job Satisfaction Scale (Nichols et al., 1978); the 6-item job satisfaction scale (Agho et al., 1992), the

Job/Work Environment Nursing Satisfaction Survey (Halfer and Graf, 2006), the Standard Shift Work Index Questionnaire (Barton J et al., 1995), semantic differential items for measuring job, family, and life satisfaction (Gregov, 1994), Index of Work Satisfaction (Stamps, 1997), and for burnout, the 22-item Maslach Burnout Inventory (Maslach and Jackson, 1981), Copenhagen Burnout Inventory (Kristensen et al., 2005), and the 27-item job stress questionnaire from the Korean Occupational Stress Scale (Chang et al., 2005).

Wisetborisut *et al*. (2014) found burnout scores were higher in shift workers compared to non-shift workers. In this study, shift workers who had 6-8 sleeping hours per day and at least 8 days off per month had fewer burnout symptoms. Shahriari *et al*. (2014) found higher levels of burnout in fixed compared to rotating shift workers and this finding was irrespective of whether the shifts were morning or night. In contrast, Jamal and Baba (1997) found no difference between nurses working various shifts on burnout but found that nurses working night shifts had lower ratings of job satisfaction than their non-night shift counterparts. However, this finding was not supported in two other studies that found no difference between shift types on job satisfaction (Hoffman and Scott, 2003, Ruggiero, 2005). Ha (2015) used Q Methodology with 39 nurses working rotating shifts and found three main findings; 1) Working rotating shifts is frustrating, 2) Working rotating shifts is satisfactory, and 3) Working rotating shifts is problematic but necessary. In a longitudinal study by Cheng *et al*. (2015) nurses who worked 12 hour shifts reported significantly higher job satisfaction than nurses working 8 hour shifts. In contrast, Šimunić and Gregov (2012) found 12 hour shifts to be associated with lower cognitive-affective job satisfaction compared to nurses working morning shifts. Teclaw and Osatuke (2014) found that overall job satisfaction was lower in off-shift workers (eg: evening and night shifts) compared to day workers. A recent study by Rodwell and Fernando (2016) found that shift work alone was not associated with lower job

satisfaction but that job satisfaction was most dependent on work context and other lifestyle factors as opposed to just shift type.

Only five studies in this category directly compared shift workers with non-shift workers and found higher rates of burnout in the shift-working group. The majority of the studies compared various types of shift work and found mixed results regarding the impact on job satisfaction and burnout. Overall, the methodological quality of these studies was 84.90 with only three of them providing information on the precision of their findings. [See estimate of percision supplementary Table 12].

Depression, Anxiety and Stress: This outcome captures the effect of shift work on psychological states such as depression, anxiety and stress. The measures used to assess these variables included: The Nursing Stress Scale (Gray-Toft and Anderson, 1981), Beck Depression Inventory-II (Beck et al., 1996), Centre for Epidemiological Studies Depression Scale (Radloff, 1977); Patient Health Questionnaire-9 (Kroenke and Spitzer, 2002), Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983), Taiwan Nurse Stress Checklist (Tsai and Crockett, 1993). State-Trait Anxiety Inventory (Spielberger, 1983), Profile of Mood States (McNair et al., 1971), 12-item version of the General Health Questionnaire (Iwata et al., 1988, Goldberg, 1972).

The study by Hea Young *et al.* (2015) found that nurses who worked shifts had higher odds of increased severity of depressive symptoms than those nurses who did not work shifts. In a prospective longitudinal study, Berthelsen *et al*. (2015) examined the impact of different shift types on depression and found that night shifts and rotating shifts were not associated with increased chances of ‘caseness’ of anxiety or depression after 12 months of follow-up. This result was supported by Ruggiero (2005) who found no difference between shift type and level of depression. A correlational study by Jung and Lee (2015) found that nurse shift

workers, who had high levels of alertness early in the day (high levels of morningness) and were younger in age, had lower levels of depression. Morningness-eveningness reflects ones' diurnal preferences, those who have high scores on morningness have their peak of alertness earlier in the day compared to those with low scores (Roberts and Kyllonen, 1999).

In another longitudinal study, Saksvik-Lehouillier *et al*. (2012) found the relationship between shift work tolerance and depression was best explained by level of nurse hardiness. Hardiness is a general resilience factor influencing how one copes with stress and illness (Storemark et al., 2013). The ability to work shifts without experiencing any negative consequences is referred to as "Shift Work Tolerance" (Andlauer et al., 1978). Similarly, Natvik *et al*. (2011) used regression analysis to determine predictors of depression in nurse shift workers and concluded that the impact of shift work is complex and interrelated with other factors such as morningness, languidity and hardiness.

In terms of stress and anxiety, Faseleh *et al*. (2013)interviewed night shift workers who reported being highly stressed at work. Lin *et al.* (2014) did not find a difference in job stress according to the type of shift worked , but in a later study by the same authors they found that rotating shifts were associated with effort-reward imbalance (Lin et al., 2015). In the study by Hoffman and Scott (2003) nurses working 12 hour shifts reported greater levels of stress than those working 8 hour shifts. However, in direct contrast to this study, Cheng *et al.* (2015) found nurses working 12 hour shifts reported less job stress than nurses working 8 hour shifts. One study found fixed shift nurses had higher anxiety and social dysfunction compared to rotating shift nurses (Ardekani et al., 2008). Korompeli *et al*. (2014) utilised the Standard Shift Work Index and found female nurses working rotating shifts had higher cognitive and somatic anxiety compared to their morning shift counterparts. Finally, the study by Samaha *et al.* (2007) found anxiety was associated with chronic fatigue in shift workers.

A methodological strength of the studies conducted in this category is that two were longitudinal in design, measuring nurse depression, anxiety and stress over time. However, these studies were conducted among nurse shift workers and so do not provide a direct comparison to non-shift workers. Only six studies compared shift workers with non-shift workers. Among the studies investigating the impact of different types of shifts on depression, anxiety and stress, the findings are inconsistent. Overall, the methodological quality of these studies was 93.75 with three out of sixteen quantitative studies providing information on the precision of their findings. [See estimate of percision supplementary Table 12].

Resilience and Coping: This outcome captures how well nurses are coping and their level of individual psychological resilience, both which are known to be strongly related to psychological wellbeing. Resilience and coping are closely related constructs and so were assessed together. The constructs were measured with the following scales: the 24-item coping questionnaire (Spelten et al., 1993), the Dispositional Resilience (Hardiness) Scale Revised (Hystad et al., 2010), the 15-item Short Hardiness Scale (Barton, 1995), and the Dispositional Resilience (Hardiness) Scale –Revised (Hystad et al., 2010).

A mixed-method study by Clendon and Walker (2013) examined coping and shift work. They found single participants reported that shift work suited them; while it had a somewhat negative impact on their social and family relationships. Flexible working hours and the ability to do jobs during normal working hours were the positive aspects of shift work highlighted and participants who worked part time appeared to be coping better with shift work. Participants also used coping mechanisms to help manage the impact of shift work on their health, social and family functioning. These coping techniques included choosing lifestyle-friendly shifts, and allocating specific times for sleeping, eating and exercising. They

recommended employers could assist with self-rostering and facilitate the work place to have a space for night shift workers to sleep prior to going home after night shifts (Clendon and Walker, 2013). Overall, they found that nurses had very different opinions about working shifts with some reporting negative aspects and others reporting that they have adapted to cope with shifts in a way that they found worked well. The study by Samaha *et al.* (2007) found that maladaptive coping (drinking alcohol, letting emotions out, and avoiding the situation) was associated with chronic fatigue in shift workers. Pisarski *et al.* (1998) found a complex relationship between coping and social support in shift workers with disengagement coping (a type of emotion-focused coping) being negatively associated with poorer mental health. Several studies have found that hardiness is associated with better tolerance to shift work (Saksvik-Lehouillier et al., 2012, Storemark et al., 2013, Saksvik-Lehouillier et al., 2013, Saksvik-Lehouillier et al., 2016). This is consistent with the qualitative work of Powell (2013) who found that nurses reported relying on their own levels of resilience to overcome the stress and isolation associated with shift work. Overall, studies that directly investigated psychological resilience among nurse shift workers are limited. However, they show that both the use of coping strategies as well as individual level of resilience (hardiness) appears to play an important role in determining nurse psychological functioning in response to working shifts. Only three studies compared shift workers with non-shift workers. The methodological quality of these studies was 98.16with one out of seven quantitative studies providing information on the precision of their findings. [See estimate of percision supplementary Table 12].

DISCUSSION

This review synthesised and evaluated studies that investigated the impact of shift work on the psychological functioning and resilience of nurses. Specifically, we sought to answer the

question: Do nurses who work shifts have poorer psychological functioning and lower resilience than those who do not work shifts? The existing evidence indicates that there is currently no clear answer to this question. Whilst some studies did report negative psychological outcomes for nurses working shifts, this was not a consistent finding across all studies.

Comparing the results of studies is also made more complex by the variety of different measures used to assess the various psychological outcomes. In addition, approximately half of the studies examined outcomes across different types of shifts as opposed to making clear comparisons between shift and non-shift workers. The vast majority of the studies are cross-sectional and therefore a number of them only report significant associations between outcomes such as burnout and depression in shift workers. This limits conclusions as to causality of shift work on psychological outcomes.

While recognising there are some inconsistences in the results, overall, the findings of this review suggest a number of negative psychological outcomes are associated with working shifts. Some of the studies revealed that shift work limited social life, and was associated with work/family conflict (Clendon and Walker, 2013, Faseleh et al., 2013), low levels of wellbeing (Estryn-Béhar and Beatrice, 2012), poor mental health (Lin et al., 2012), low levels of job satisfaction, high levels of burnout (Wisetborisut et al., 2014) and high rates of neuroticism (Korompeli et al., 2014).

Despite these findings, this review highlights the critical importance of studying context when attempting to understand the impact of shift work on nurses. The current evidence suggests that shift work may not have the same negative impacts on all nurses but that how nurses respond to shift work is much dependent on other factors. Some of the factors that emerged in these studies included; how much sleep the nurse was getting, how many days off they had

per month, whether they worked part-time or full-time, the gender of the nurse, their level of morningness-eveningness and their level of resilience. Whilst resilience/hardiness was found to predict how well the nurses tolerated working shifts, it is surprising that only six studies used a resilience scale as their measurement tool to investigate the impact of shift work on nurse resilience (Natvik et al., 2011, Flo et al., 2012, Saksvik-Lehouillier et al., 2012, Storemark et al., 2013, Saksvik-Lehouillier et al., 2013, Saksvik-Lehouillier et al., 2016).

There is a clear need for more longitudinal and between-groups studies in order to determine the impact of shift work on the psychological functioning and resilience of nurses. Overall, the methodological quality of the studies was excellent. However, only 33 % provided important information regarding the precision of the results in terms of confidence intervals. More consistent use of outcome measurement tools would facilitate the comparison of study outcomes. Additionally, given the importance of context, studies also need to be conducted among nurses working in a variety of nursing contexts, not only in acute hospitals but also in aged care facilities, home care and community settings. Such research that accounts for individual as well as contextual factors in determining nurses' wellbeing (Cusack et al., 2016) is essential to understand how to build and maintain resilience in nurses who work shifts. The findings will inform policy makers in order to promote health in the workforce. This may lead to increased recruitment and retention of nurses alleviating the economic burden associated with shortage of nurses, and improve poor quality of patient care associated with higher rates of those negative psychological outcomes.

CONCLUSION

This integrative review aimed to critically evaluate the evidence regarding the impact of shift work on the psychological functioning and resilience of nurses. The majority of studies were correlational comparing different patterns of shift work schedules and utilised inconsistent

outcome measures. Based on the current evidence, we cannot definitively conclude that nurses who work shifts have poorer psychological functioning than those who do not. Instead, the current evidence suggests that for some nurses, shift work is associated with negative psychological outcomes and these outcomes appear highly dependent on contextual and individual factors. Moreover, to clearly understand the impact of shift work on nurse psychological functioning it is imperative that future studies employ more between-groups, longitudinal designs.

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Figure 1: PRISMA diagram related to this integrative review

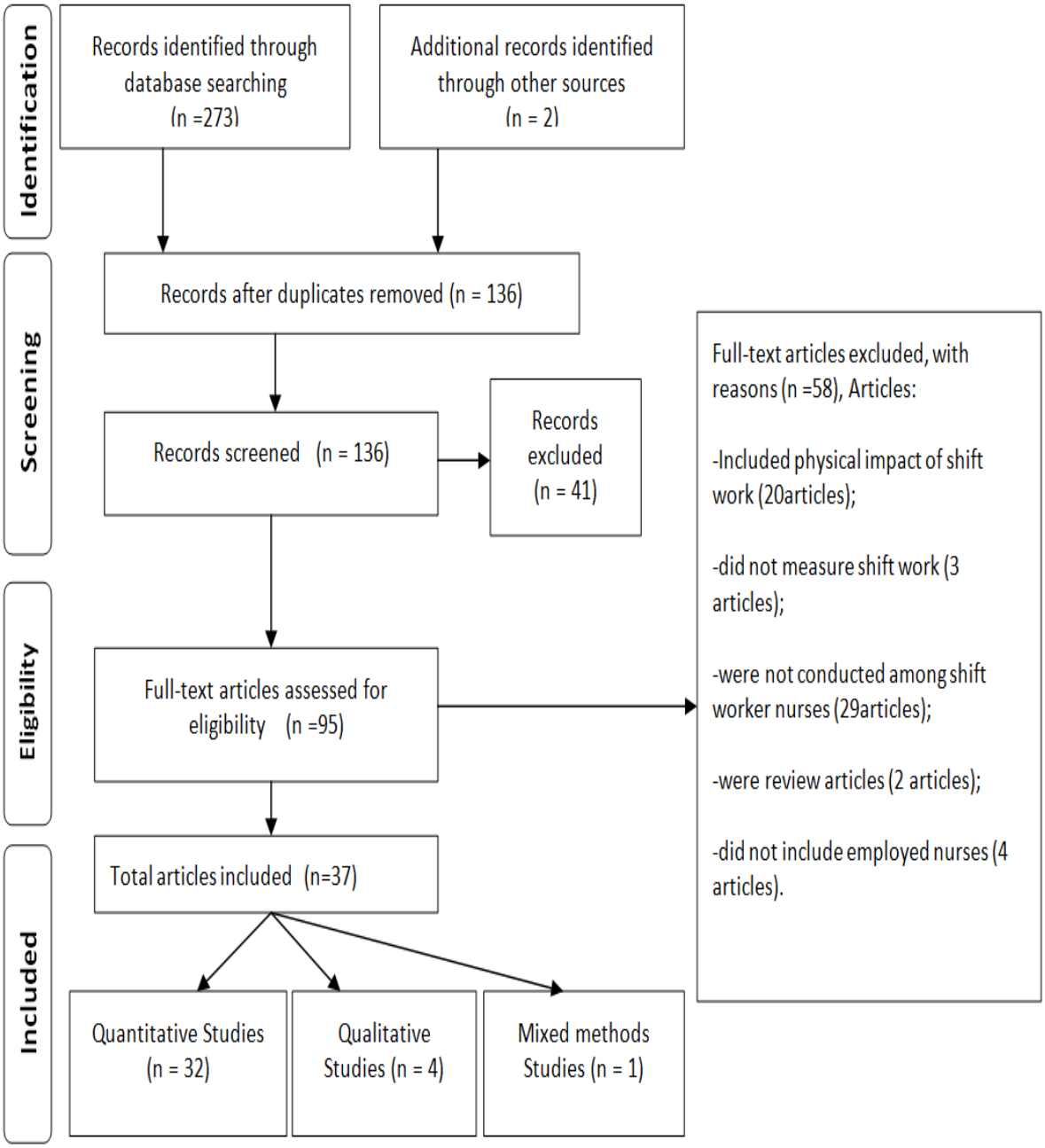
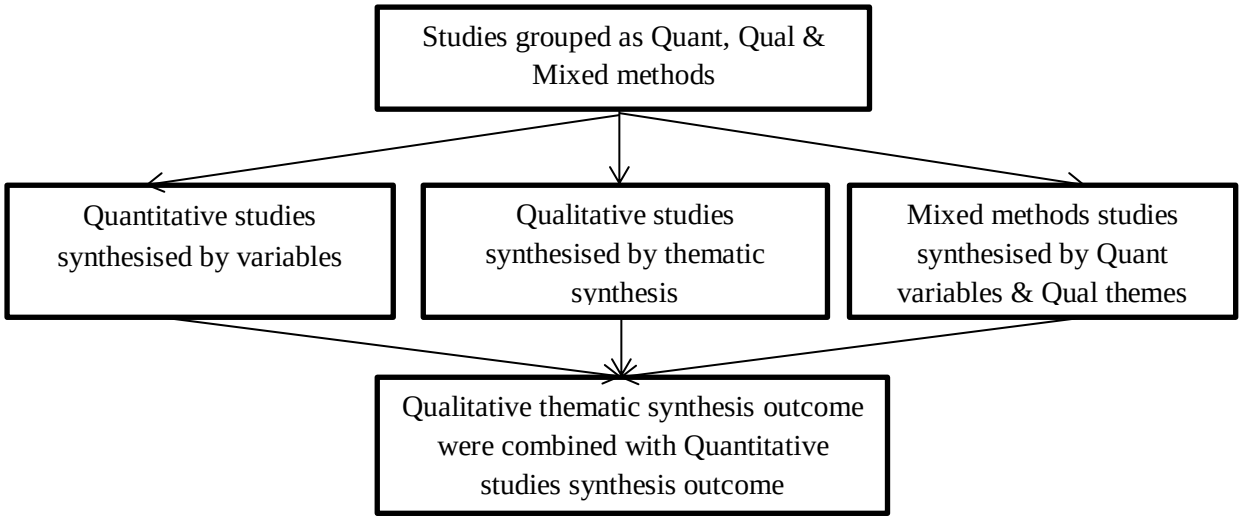


Figure 2: study design for synthesising articles



Author(s) country, CAT	Setting or context	Design & sample	Measures	Analytical methods
(Camerino et al., 2010), Italy **A**	Health care institutions	Quant, Cross sectional, Female nurses, n=664 **SW[1]:** Regular D[2], irregular D[2], shift work without N[3], shift work with N[3]	NEES[4];WAI[5], CBI[6], Copenhagen psychological questionnaire, Demand-Control questionnaire, Occupations Health and Safety Prevention Index	Data mining techniques, Random Forests & Bayesian Networks, Hierarchical liner regression models
(Estryn-Béhar and Beatrice, 2012), Ten European countries **A**	Hospitals, nursing homes, home care	Quant, cross sectional, nurse, n= 25924 **SW[1]:**D[2] (8hr,10hr, 12hr), N[3] (8hr,10hr,12hr),Pt[8], Alt[9]	Work/family conflict 5 item scale, WAI[4], Copenhagen Psychosocial Questionnaire, Intrinsic effort scale, their own questionnaire	Pearson's Chi square test, binary logistic regressions
(Faseleh Jahromi et al., 2013), Iran **B**	Two university hospitals	Qual, nurses, n=20 **SW[1]:**N[3], R[10]	Focus group interview (40-80min)	Content comparative & qualitative content analysis
(Lin et al., 2012), Taiwan **A**	Two medical centres and five regional/district hospitals	Quant, cross sectional, female nurses, n=407 **SW[1]:** R[10]: D[2] (8am-4pm), E[11] (4pm-12pm or from 2pm-10pm), N[3](12pm-8am)	PSQI[12],CHQ[13]	Chi-Square, ANOVA, univariate analysis, multivariate model's, ANCOVA tests, linear & logistic regression models, paired t test
(Powell, 2013), Australia **B**	Medical or surgical units of 3 regional hospitals	Qual, , female ENs or RNs with 3-year experience, n=14 **SW[1]:** N[3]	Semi-structural interviews	Thematic content analysis
(Šimunić and Gregov, 2012), Croatia **A**	One general hospital and one clinical hospital centre	Quant, cross sectional, Nurses, n=128 **SW[1]:** Fast R[10](rotated every 2 days): forward R[10] (M[14] – A[15]-N[3] –day off), backward R[10] (N[3]-M[14]- A[15]-day off), forward R[10] (D[2],-N[3]-day off)	Psychological Demands of Work Scale, Negative effects of Work time Scale, modified Conflict between work & family role scale, Semantic differential items, Affective component of job satisfaction, Affective component of satisfaction with the family, Affective component of life satisfaction	Chi square test
(Sorić et al., 2013), Croatia **A**	Seven hospitals	Quant, cross Sectional, Clinical nurses, n=1124 **SW[1]:** Do you work in shifts?Y/N	WAI[5]; WHOQoL[16]	Mann-Whitney U test, Chi-square test, binary logistic regression models
(West et al., 2009), Australia **B**	Clinical setting from urban & rural areas	Qual, , Female RNs, n=13 **SW[1]:** no definition	Individual 45 mins interview	Interpretation & phenomenological transformation

Table 1: Studies examining the effects of shift work on general wellbeing and quality of life 1-SW:shift worked;2-D: day shifts;3-N: night shifts;4- NEES: Nurses' Early Exit Study;5- WAI: Work Ability Index;6-CBI: Copenhagen Burnout Inventor;7-BO: burnout;8-Pt: part time; 9-Alt: Altering shifts;10- R: rotating shifts; 11-E: evening shifts; 12-PSQI: Pittsburgh Sleep Quality Index; 13-CHQ: Chines Health Questionnaire; 14- M: morning shifts;15- A: afternoon;16- WHOQoL: the World Health Organisation Quality of Life Questionnaire brief version;17- QoL: Quality of Life.

Author(s) country, CAT	Setting or context	Design & sample	Measures	Analytical methods
(Deori, 2012), India **B**	Acute care unit of a hospital,	Quant, prospective study, nurses, n=219 **SW[1]:** N[3]	Questionnaire developed by Sizeni Madide (2003)	Excel 2002 (not clear data analysis)
(Cheng et al., 2015), Taiwan **B**	Teaching hospital, non-academic teaching hospital	Quant, descriptive, correlational and longitudinal, new graduate employed nurses, n: 206 **SW[1]**: 8hrs shift, 12hrs sift, both 8 & 12 hrs	Work Environment Nursing Satisfaction, Clinical Stress Scale	Pearson correlation, Generalised estimating equations
(Hoffman & Scott, 2003), USA **B**	Members of Michigan Nurses Association	Quant, cross sectional , female RN, n=208 **SW[1]:** 8hrs shifts, 12hrs shifts, combination of 8-,10-,12-hrs shifts	DQ[5]; NSS[4]; IWS[6]	Two –tailed t-test procedures, Pearson product
(Ha, 2015), Korea **B**	General hospitals	Qual, Q-methodology, Clinical nurses, n=39 **SW[1]:** R[7]	11-point bipolar scale	Factor analysis using pc-QUANL program
(Jamal & Baba, 1997), Canada **A**	A psychiatric hospital	Quant, cross sectional, nurses, n=175 **SW[1]:** D[2], E[8], N[3], R[7]	MBI[9], HS[10], Job diagnostic survey; how many days have they been absent from the job in the last 2 months?	One-way ANOVA, t-test, two-way ANOVA
(Ruggiero, 2005), USA **B**	Members of American Association of Critical Care Nurses	Quant, cross sectional, Critical care nurses, N=247 **SW[1]**: D[2] (included E[8] 3pm-11pm), R[7], N[3]	GJSS[11], PSQI[12], BDI-II[13],SSIGBIS[14]	One-way ANOVA, Pearson product Moment correlation, Coefficient, hierarchical multiple regression
(Rodwell &Fernando, 2016), Australia **B**	General acute hospital, maternity hospital, aged care	Quant, cross sectional, nurses, n: 446 **SW[1]**: D[2], E[8], N[3]	Job satisfaction scale, GHQ[15]-12, Kessler-10, Centre for Epidemiological Studies Depression Scale, Early/late Preferences Scale, Negative Affect Schedule scale	Correlation, Multiple Linear Regression analysis
(Shahriari et al., 2014), Iran **A**	Critical care units (ICU, CCU,ER) in 6 hospitals	Quant, retrospective cohort design, Nurse, n= 170 **SW[1]**: R[7] (combination of morning, E[8] and N[3]); F[16] (only morning, only E[8], only N[3])	MBI[9]	Independent t test, logistic regression
(Šimunić and Gregov, 2012), Croatia **A**	One general hospital and one clinical hospital centre	Quant, cross sectional, Nurses, n=128 **SW[1]:** Fast R[7](rotated every 2 days): forward R[7] (M[21] –A[22]-N[3] –day off), backward R[7] (N[3]-M[21]- A[22]-day off), forward R[7] (D[2],-N[3]-day off)	Psychological Demands of Work Scale, Negative effects of Work time Scale, modified Conflict between work & family role scale, Semantic differential items, Affective component of job satisfaction, Affective component of satisfaction with the family, Affective component of life satisfaction	Chi square test

Author(s) country, CAT	Setting or context	Design & sample	Measures	Analytical methods
(Teclaw and Osatuke, 2014), USA **A**	Veterans Health Administration (VHA) employees from 141 facilities	Quant, cross sectional, exploratory of observational data (years:2008,2010,2012), nurses, n= 14057 **SW[1]:** D[2](7am-6pm), N[3] (7pm-6am), weekend shifts	Job satisfaction (12items), agreement with specific description of work climate (31 items)	Graphical display, logistic regression, ordinal logistic regression, proportion odds version of cumulative, logiest model
(Wisetborisut et al., 2014), Thailand **A**	One hospital	Quant, cross sectional, Healthcare workers, n=2772 **SW[1]:** E[8](16:00-0:00), N[3] (0:00-08:00), Non-sw[1]	DQ[5]; MBI[9]	Chi-square tests, likelihood ratio test, multiple logistic regression

Table 2: Studies examining the effects of shift work on job satisfaction and burnout 1-SW:shift worked;2-D: day shifts;3-N: night shifts; 4-NSS: Nursing Stress Scale; 5-DQ: Demographic questionnaire; 6- IWS: Index of Work Satisfaction;7- R: rotating shifts;8-E: evening shifts;9-MBI: Maslach Burnout Inventory;10- HS: Hoppock Scale;11-GJSS: General Job Satisfaction Scale;12- PSQI: Pittsburgh Sleep Quality Index;13-BDI-II: Beck Depression Inventory-ll; 14-SSIGBIS: Standard Shift work Index General Biographical Information Section; 15- GHQ: General Health Questionnaire;16- F: fixed shifts;17- EE: emotional exhaustion;18-PA: personal accomplishment;19- BO: burnout;20- DP: depersonalisation;21- M: morning shifts;22- A: afternoon

Author(s) country, CAT	Setting or context	Design & sample	Measures	Analytical methods
(Ardekani et al., 2008), Iran **A**	Twelve General hospitals	Quant, cross sectional, nurses, n= 1195 **SW**[1]: R[4], F[5] (day time)	GHQ[2]	Two sample t-test
(Brethelsen et al. 2015), Norway **A**	Registered members of Norwegian Nurse Organisation	Quant, repeated measures design, nurses, n= 2059 **SW**[1]**:** Only D[2], Only E[6], D[2] & E[6], Only N[3], R[4], Both D[2]& N[3]	General Nordic Questionnaire, Swedish Demand-Control-Support Questionnaire, HADS[7]	Bivariate binary logistic regression
(Cheng et al., 2015), Taiwan **B**	Teaching hospital, non-academic teaching hospital	Quant, descriptive, correlational and longitudinal, new graduate employed nurses, n: 206 **SW**[1]: 8hrs shift, 12hrs sift, both 8 & 12 hrs	Work Environment Nursing Satisfaction, Clinical Stress Scale	Pearson correlation, Generalised estimating equations
(Faseleh Jahromi et al., 2013), Iran **B**	Two university hospitals	Qual, nurses, n=20 **SW**[1]**:**N[3], R[4]	Focus group interview (40-80min)	Content comparative & qualitative content analysis
(Farzinpour et al. 2016), Iran **B**	Six non-governmental hospital	Quant, random selection, cross sectional, nurses, n=305 **SW**[1]**:**Fixed morning, fixed E[6], fixed N[3]	SSI[8], Eysenck Personality Questionnaire (EPQ)	Pearson correlation coefficient, t-test, ANCOVA, Mann-Whitney test, Kruskal-Wallis test
(Hea et al. 2015), Korea **A**	Korea Nurse Health Study	Quant, cross sectional, female nurses, n=9789 **SW**[1]**:** SW? Yes, No	(PHQ-9)[9]	Descriptive, Spearman's correlation and multivariable ordinal logistic regression
(Hoffman & Scott, 2003), USA **B**	Members of Michigan Nurses Association	Quant, cross sectional , female RN, n=208 **SW**[1]**:** 8hrs shifts, 12hrs shifts, combination of 8-,10-,12-hrs shifts	DQ[10]; NSS[11]; IWS[12]	Two –tailed t-test procedures, Pearson product
(Jung & lee, 2015), Korea **B**	One hospital	Quant, Cross sectional, nurses , n=660 **SW**[1]**:** R[4] (D[2]: 7am-15pm, E[6]: 15pm-23pm, N[3]: 23pm-7am)	DS[13], MSPSS[14], BMI[15], smoking status, questions about working condition, ISI[16], PHQ[17]	Hierarchical multiple regression, Durbin-Watson test
(Korompeli et al., 2014), Greece **B**	Three public general hospitals,	Quant, Cross sectional, Nurses & nurses assistants **,** n=365 **SW**[1]**:** M[19], R[4]	SSI[20] included: sleep questionnaire, general health satisfaction, chronic fatigue, physical health questionnaire, (measuring cardiovascular & gastrointestinal disorders), general health questionnaire, cognitive somatic anxiety questionnaire	Multiple liner regression

Author(s) country, CAT	Setting or context	Design & sample	Measures	Analytical methods
(Lin et al., 2014), Taiwan **B**	Four hospitals	Quant, cross sectional, Nurses, n=266 **SW[1]:** Regular shift, clockwise rotation, counter-clockwise rotation, rapid rotation	DQ[10], NSC[21], PSQI[22],GHSC[23]	Independent t-test, one way ANOVA, Scheffe's method of post hoc tests, Pearson's r, Hierarchical regression
(Lin et al. ,2015), Taiwan **A**	Two medical centres & five regional /district hospitals, Nurses from Kaohsiung City & County Nurses Associations	Quant, Cross sectional ,female nurses, n=654 **SW[1]**: D[2], non-N[3], R[4]	Effort Reward Imbalance (ERI) model	Chi-square test, Logistic regression analysis
(Natvik et al., 2011), Norway **B**	Members of the Norwegian Nurses Organisation	Quant, cross sectional, nurses, n= 1505 **SW[1]:** 3 R[4] (D[2] & E[6] & N[3]), 2 R[4] (D[2] & E[6])	DQ[10], WS[24], BIS[25], HADS[26],ESS[27], DS[13], Rcti[28], Short hardiness scale	Hierarchical multiple regression
(Ruggiero, 2005), USA **B**	Members of American Association of Critical Care Nurses	Quant, cross sectional, Critical care nurses, N=247 **SW[1]**: D[2] (included E[6] 3pm-11pm), R[4], N[3]	GJSS[29], PSQI[30], BDI-II[31],SSIGBIS[32]	One-way ANOVA, Pearson product Moment correlation, Coefficient, hierarchical multiple regression
(Suzuki et al., 2004), Japan **A**	Eight General hospitals	Quant , cross sectional, nurses, n=4407 **SW[1]:** N[3]/split/ irregular shifts (sw[1], non-sw[1])	GHQ[33], questions on mental health, sleep, occupational accidents, the shift work system; DQ[10]	Chi-square test, Student t test, univariate analysis, multiple logistic regression
(Samaha et al., 2007), Australia **B**	Three eldercare facilities	Quant, cross sectional, nurses, n= 111 **SW[1]:** Regular shifts, irregular shifts, flexible shifts,	DQ[10], Checklist Individual Scale, t-STAI[34], PMS[35], Locus of Control & Behaviour Scale, Lifestyle Appraisal Questionnaire, PQSI[36]	Pearson's correlations, multiple regression, ANOVA
(Saksvik-Lehouillier et al., 2012), Norway **B**	Members of the Norwegian Nurses Association	Quant, longitudinal, Cohort ,female nurses, n=642 **SW[1]**: Rotating 3 shifts: D[2], E[6], N[3]	DQ[10];DRS[37]; DS[13];CTI[38], ESS[27], FQ[39], HADS[26]; Asking about number of N[3] worked last year, having children, SWT[18], percentage of full time position	Hierarchical regression
(Storemark et al., 2013), Norway **A**	Norwegian Nurse Organisation's members	Quant, prospective stratified sample, longitudinal study, nurses, n=2048 **SW[1]**: D[2], E[6], N[3]	AUDIT-C[40]; DS[13,] DRS[37]; rCTI[28]; BSWSQ[41].	Hierarchical multiple regression

Table 3: Studies examining the effects of shift work on depression, anxiety and stress 1-SW:shift worked;2-D: day shifts;3-N: night shifts; 4- R: rotating shifts; 5-F: fixed shifts; 6-E: evening shifts;7- HADS: Hospital Anxiety and Depression Scale;8- SSI: Standard Shift Work Index;9- PHQ: Patient health questionnaire;10- DQ: Demographic questionnaire;11- NSS: Nursing Stress Scale;12- IWS: Index of Work Satisfaction;13- DS: Diurnal Scale;14- MSPSS: Multidimensional Scale of Perceived Social Support;15- BMI: Body Mass Index; 16- ISI: Insomnia Severity Index;17- PHQ: Patient health questionnaire;18- SWT: Shift Work Tolerance;19- M: morning shifts;20- SSI: Standard Shift Work Index;21- NSC: Nurse Stress Checklist;22- PSQI: Pittsburgh Sleep Quality Index;23- GHSC: Chines Health Questionnaire;24- WS: Work Schedule;25- BIS: Bergen Insomnia Scale;26- HADS: Hospital Anxiety and Depression Scale;27- ESS: Epworth Sleepiness Scale; 28- rCTI: Revised Circadian Type Inventory;29- GJSS: General Job Satisfaction Scale;30-PSQI: Pittsburgh Sleep Quality Index; 31- BDI-II: Beck Depression Inventory-ll;32- SSIGBIS: Standard Shift work Index General Biographical Information Section;33- GHQ: General Health Questionnaire;34- t-STAI. t-version of State-Trait Anxiety Inventory; 35- PMS: Profile of Mood States; 36- PQSI: Pittsburgh Quality of Sleep Index;37- DRS: Dispositional Resilience (Hardiness) Scale;38- CTI: Circadian Type Inventory;39- FQ: Global Sleep Assessment Questionnaire;40- AUDITC: the Alcohol Use Disorders Identification Test-Consumption;41- BSWSQ: The Bergen Shift Work Sleep Questionnaire;

Author(s) country, CAT	Setting or context	Design & sample	Measures	Analytical methods
(Clendon and Walker, 2013), New Zealand **A**	Hospitals & primary health care positions (members of the New Zealand Nurse Organization)	Online survey, Quant & Qual analysis, Cohort, Nurses, n= 3273 **SW**[1]: Mixed of N[3] & D[2], D[2]only, permanent N[3]	DQ[5] included: qualification & nursing experience, nursing employment (setting, field, & shift patterns), intentions to changing employment or retirement, asking about experience of working as late career nurses, validated health score	Thematic analysis, two-tailed t-test
(Flo et al., 2012), Norway **A**	Norwegian Nurse Organisation's members	Quant, random selection, cross sectional, nurses, n=1968 **SW**[1]**:** D[2] only, N[3] only, 2 shifts rotation, 3 shifts rotation, other schedule with N[3]	DQ[5];BIS[6];ESS[7];HADS[8];GSAQ[9]; FQ[10]; DRS[1]-15-R; DS[12]; rCTI[13]; AUDIT-C[14]; Caffeine consumption; Use of sleep medications & bright light treatment	Logistic regression analysis
(Pisarski et al., 1998), Australia **B**	Metropolitan general hospitals	Quant, cross sectional, female RNs, n=172 **SW**[1]**:** R[4] 8hr	GHQ[16], PHQ[17], 24 item coping questionnaire, 12 item scale by Caplan et al., asking about having control over shifts they work	Reflex procedure, square root transformation
(Powell, 2013), Australia **B**	Medical or surgical units of 3 regional hospitals	Qual, , female ENs or RNs with 3-year experience, n=14 **SW**[1]**:** N[3]	Semi-structural interviews	Thematic content analysis
(Samaha et al., 2007), Australia **B**	Three eldercare facilities	Quant, cross sectional, nurses, n= 111 **SW**[1]**:** Regular shifts, irregular shifts, flexible shifts	DQ[5], Checklist Individual Scale, t-STAI[18], PMS[19], Locus of Control & Behaviour Scale, Lifestyle Appraisal Questionnaire, PQSI[20]	Pearson's correlations, multiple regression, ANOVA
(Saksvik-Lehouillier et al., 2012), Norway **B**	Members of the Norwegian Nurses Association	Quant, longitudinal, Cohort ,female nurses, n=642 **SW**[1]: Rotating 3 shifts: D[2], E[21], N[3]	DQ[5];DRS[22]; DS[12];CTI[23], ESS[7], FQ[10], HADS[8]; Asking about number of N[3] worked last year, having children, SWT[24], percentage of full time position	Hierarchical regression
(Saksvik-Lehouillier et al., 2013), Norway **B**	Norwegian Nurses from first wave of a longitudinal study	Quant, cross Sectional data derived from a longitudinal study, newly graduate nurses & nurses, n=749 **SW**[1]**:** R[4]: D[2], E[21] & N[3]	DQ[5]; DRS[25]-15-R; DS[12,] CTI[23]; AUDIT-C[14]; BIS[6], Smoking behaviour, BMI, physical activity, ESS[7], FQ[10], HADS[8], Asking about sleep medication consumption.	ANCOVA, hierarchical regression
(Storemark et al., 2013), Norway **A**	Norwegian Nurse Organisation's members	Quant, prospective stratified sample, longitudinal study, nurses, n=2048 **SW**[1]: D[2], E[21], N[3]	AUDIT-C[14]; DS[12,] DRS[25]; rCTI[13]; BSWSQ[26].	Hierarchical multiple regression
(Saksvik et al., 2016), Norway **B**	Members of the Norwegian Nurses Association	Quant, Longitudinal, nurses, n= 1877 at baseline, n=1228 at 1-year follow up, n=659 at 2-year follow up. **SW**[1]**:** R[4], only N[3], other shift with N[3] & D[2]	DRS-15R[25], Questionnaire including: hardiness, SWT[24] (fatigue, sleepiness, anxiety, depression), fair leadership, social & role ambiguity.	Hierarchical multiple regression, ANOVA

Table 4: Studies examining the effects of shift work on resilience and coping 1-SW:shift worked;2-D: day shifts;3-N: night shifts; 4- R: rotating shifts; 5- DQ: Demographic questionnaire ; 6- BIS: Bergen Insomnia Scale; 7- ESS: Epworth Sleepiness Scale;8- HADS: Hospital Anxiety and Depression Scale;9- GSAQ: Global Sleep Assessment Questionnaire;10- FQ: Global Sleep Assessment Questionnaire;11- DRS: Dispositional Resilience (Hardiness) Scale;12- DS: Diurnal Scale;13-rCTI: Revised Circadian Type Inventory;14- AUDITC: the Alcohol Use Disorders Identification Test-Consumption;15-SWD: shift work disorder;16- GHQ: General Health Questionnaire;17- PHQ: Patient health questionnaire;18-t-STAI: t-version of State-Trait Anxiety Inventory;19- PMS: Profile of Mood States;20- PQSI: Pittsburgh Quality of Sleep Index;21- E: evening

shifts;22--DRS: Dispositional Resilience (Hardiness) Scale;23- CTI: Circadian Type Inventory;24- SWT: Shift Work Tolerance;25- DRS: Dispositional Resilience (Hardiness) Scale;26 -BSWSQ: The Bergen Shift Work Sleep Questionnaire