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Personal and work-related factors associated with nurse resilience: A systematic review

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ABSTRACT

Background: Nursing shortages have profoundly impacted hospitals and consequently increased financial expenditure, resulting in work overload, thus augmenting nurses' stress and burnout levels. Studies have found that resilience helps nurses reduce the effects of stress and burnout. However, the factors associated with nurse resilience are yet to be determined.
Objectives: This systematic review aims to identify the associated personal and work-related factors of nurse resilience.
Design: This systematic review has been registered in the international prospective register of systematic reviews (Registered Number: CRD 42018094080). Results are reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol.
Data sources: The systematic search was undertaken between March and April 2018 in five databases: CINAHL Plus, MEDLINE (Ovid), PsycINFO, EMBASE, and Scopus. The searched terms combined in each database were: resilience, hardiness, work, employ, occupation, job, and nursing.
Review methods: Full-text English articles published between 2000 and 2018 were included. Studies were also included if they involved: (1) nurses who provided direct patient care, (2) resilience and its associated factors, (3) an empirical quantitative study, and (4) a quality assessment grade of 'good' or 'fair'. Two authors carried out the study eligibility and quality assessment independently. A narrative synthesis was utilised following the Job Demands-Resources model to identify the factors of job demands and resources, which were associated with nurse resilience.
Results: A total of 38 articles met the criteria and were systematically reviewed and narratively synthesised. Various resilience scales utilised in these studies made it unfeasible to synthesise the evidence using a meta-analysis. Inconsistencies exist when examining personal and work-related factors. Job demands (stress, burnout, posttraumatic stress disorder, and workplace bullying) were negatively associated with resilience, while job resources (coping skills, self-efficacy, social support, job satisfaction, job retention, and general wellbeing) were positively related to resilience. Using a quality assessment tool, 23 studies were rated as 'Good', 15 were assessed as 'Fair', and 20 were found to have a risk of bias.
Conclusions: Understanding nurse resilience can proactively help nurses identify or prevent potential problems, thus fostering job resources and ultimately achieving personal and professional growth. Increased nurse resilience can help nurses reduce emotional exhaustion, increase work engagement, and enhance function when facing workplace challenges. This can assist nurses to establish strategies to deal with adversity and attenuate the effects of job demands. Further research is needed to explore nurse resilience and develop a consistent instrument for measuring resilience.

What is already known about the topic?

- Nurse resilience is an important construct that has received significant attention in literature.
- The personal and work-related factors associated with resilience among nurses have not been determined.

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- It is unclear how the personal and work-related factors affect nurses' resilience and what needs to be done to improve their resilience levels.

What this paper adds

- This is the first systematic review of nurse resilience. Resilience is a nurse's adaptability, capacity, and ability to solve problems and seek solutions. There is no consistent instrument for resilience measurement.
- Inconsistencies remain across studies as to whether personal factors are associated with resilience. Coping skills, self-efficacy, and social support are critical factors of job resources in improving nurse resilience, while stress, burnout, posttraumatic stress disorder, workplace bullying, fatigue, anxiety, and depression are essential factors of job demands that are negatively associated with resilience.
- Resilience and its positively associated factors (coping skills, self-efficacy, and social support) are the job resources acting as buffers to attenuate the influence of job demands, and encourage nurses to stay in the workforce.

1. Introduction

1.1. Rationale for the systematic review

A nursing shortage, as a current global fact and a future phenomenon, is adversely impacting health systems around the world. According to one population growth model, the present global deficit of 7.2 million skilled health professionals will increase to 12.9 million by 2035 (World Health Organization, 2014). Nurses and midwives currently account for 50% of the global health workforce and an additional nine million will be needed by 2030 (World Health Organization, 2018). High turnover, as a result of nursing shortages, is profoundly impacting hospital expenditure and worsening organisations' financial problems. A recent study, surveying 96,988 Registered Nurses in the United States, reported that the average cost of turnover for a bedside nurse ranged from $38,000 USD to $61,100 USD and on average this cost a hospital between $4.4 m USD and $7 m USD extra in 2017 (Nursing Solutions Inc., 2018). Prolonged nurse shortages and high turnover increase nurse workload, placing undue pressure on existing staff (Chan et al., 2013; Stechmiller, 2002). Ultimately this can lead to an increased likelihood of psychological problems, such as stress and burnout (da Costa and Pinto, 2017).

Evidence suggests that resilience could help sustain healthy psychological characteristics where nurses might otherwise experience high levels of stress or burnout. A quantitative study found that 87% of the 332 nurses studied exhibited symptoms of anxiety, depression, or posttraumatic stress disorder (Mealer et al., 2009). Another quantitative study identified that 80% of the 744 intensive care nurses studied had symptoms in at least one of the three dimensions: emotional exhaustion, depersonalisation, or lack of personal accomplishment (Mealer et al., 2012a,b). This study also showed that 22% of the nurses were highly resilient and they had lower profiles of posttraumatic stress disorder and burnout syndrome (Mealer et al., 2012a,b). A qualitative study interviewed 27 intensive care nurses and found links between nurse resilience and the ability to maintain healthy psychological characteristics as well as to utilise positive coping skills to deal with workplace challenges (Mealer et al., 2012a,b). Research to understand the role of resilience in helping nurses improve their ability to deal with work adversity is needed.

Nurse resilience has been described as a tool or skill that enables nurses to overcome workplace adversity (Young and Rushton, 2017), focus on building or enhancing capacity (Delgado et al., 2017), modify, balance, and control themselves in unfavourable environments (Jackson et al., 2007), or seek solutions to challenges (Sanderson and Brewer, 2017). In high pressure and high stress nursing specialties such as oncology, resilience has been described as an innate energy or life force to cope more effectively during difficult situations and fortify nurses bio-psychosocial spiritual wellbeing (Grafton et al., 2010). In the intensive care specialty, it has been defined as cognitive flexibility, coping ability and adaptability (Mealer et al., 2012a,b). Overall, resilience is a multifactorial and adaptive evolutionary process combining individual personal traits along with experience (Robertson et al., 2016). Despite the lack of consensus on a definition, nurse resilience is an important construct that has received significant attention in the literature. Understanding the factors associated with nurse resilience is important for the identification of strategies to attenuate the effects of nursing shortages.

1.2. Background information

Due to the multifaceted nature of nurse resilience, inconsistencies exist when exploring the associated factors in literature. Some studies considered that collegial networks, self-care, and motivation contributed to resilience (Mcdonald et al., 2016; Shimoinaba et al., 2015). However, it is unclear whether age, experience, education, or years in nursing contributed to nurse resilience (Hart et al., 2014). It is also ambiguous whether social resources (family, friends, or peer support), physical activity, personal beliefs, or work environment (lack of control and workload) are key factors associated with resilience (Robertson et al., 2016). The inconsistent findings raised the following question: What are the personal or work-related factors associated with nurse resilience?

1.3. Foreground information

This systematic review aims to identify the personal and/or work-related factors which influence resilience amongst nurses. The Job Demands-Resources model, developed by Bakker and Demerouti (2007), will be used to situate the aim of this systematic review and contextualise its findings. This model can be applied to various occupational settings, and focuses on identifying specific factors that are related to employees' wellbeing and work performance (Bakker and Demerouti, 2007). The model divides the factors into two categories: job demands and job resources (Bakker and Demerouti, 2007). Job demands include high work pressure, physical or emotional exhaustion, and workplace adversity, which affect employees' mental and physical status, leading to health problems (Bakker and Demerouti, 2007). Job resources involve work satisfaction, social support, autonomy, and performance feedback, which promote employees' work motivation, job involvement, and professional development, leading to enhanced wellbeing (Bakker and Demerouti, 2007).

This systematic review will identify the key factors in association with nurse wellbeing and work performance, which may influence nurses' resilience levels. It will also determine whether resilience and its associated factors are the job resources (or job demands) that could assist (or prevent) nurses achieving work goals and professional development. In addition, it will determine how these job resources act as buffers to attenuate the influence of job demands and decrease turnover rate by encouraging nurses to stay in the workforce.

2. Method

This systematic review has been registered in the international prospective register of systematic reviews, and the registered number is CRD 42018094080. Results are reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol.

2.1. Eligibility criteria

The study search eligibility criteria are listed in Table 1, following the 'population', 'exposure', 'outcomes', and 'types of study' format for observational studies (Bettany-Saltikov, 2012). The studies were selected if they included: (1) nurses who provided direct patient care, (2) healthcare settings, (3) resilience and associated individual factors, (4) quantitative methods, and (5) study quality was ranked as 'Good' or 'Fair' (Hawker et al., 2002).

The reporting eligibility criteria included 'English Language of Publication', 'Publication Year (2000–2018)', 'Peer Review', and 'Academic Journals'. Any 'non-English' articles', 'unable to obtain full text articles', and 'non-research' articles, such as conference papers, commissioned reports, and organisational reports, were excluded. Following the aim of this systematic review, the time frame between 2000 and 2018 was selected to limit the search results from the electronic databases to enable the discussion to remain in the current literature.

2.2. Search strategy

The systematic search was undertaken between March and April 2018 in five databases: CINAHL Plus, MEDLINE (Ovid), PsycINFO, EMBASE, and Scopus. Experienced librarians and the skilled wider research team collaborated to identify relevant databases, taking into account extant literature and undertaking test searches to determine sensitivity and specificity. The following search terms were utilised in each database: resilience, hardiness, work, employ, occupation, job, and nursing. The searched populations included general workers and nurses. A full description of search terms and strategies used in each database is shown in Table 2.

2.3. Study selection

Database search results were exported to RefWorks and duplicates were removed. The results were then screened (by title, abstract, and full text) and some articles excluded in compliance with the eligibility criteria. A template was developed for data extraction according to the format ('population', 'exposure', 'outcomes', and 'types of study') in order to standardise the systematic review process and improve the validity of the results (Bettany-Saltikov, 2012). The data in the template included study purpose, method, sample size, inclusion criteria, outcomes, and types of outcome measures. The lead author (Fiona Yu) and a co-author (Deborah Raphael) performed the search independently, and any discrepancies were resolved through the research team discussions.

Table 2
Search strategies.

Column terms Combined with	Population 1 AND	Population 2 AND	Exposure AND	Outcomes AND
OR	1 Nurs*	2 Work*		7 Resilien*
OR		3 Employ*		8 Hardiness
OR		4 Occupation*		
OR		5 Job*		
	1	6 Combine 2-5 using 'OR'		9 Combine 7-8 using 'OR'

Note: The final step combined steps 1 + 6+9 together using 'AND' to identify studies related to nurse resilience.

2.4. Analysis method

Due to substantial heterogeneity in study outcomes and exposure measures, a meta-analysis was inappropriate, and a narrative synthesis was utilised to analyse the collated studies. The narrative synthesis followed the Job Demands-Resources model (Bakker and Demerouti, 2007) to identify job demands and job resources in association with nurse resilience. The process included textual descriptions, similar data grouping, transforming data into a common rubric, and translating data using thematic or content analysis (Bettany-Saltikov, 2012). Additionally, translating the study findings into the primary themes, tabulating generated analytical ideas, or vote counting was used to aggregate results and draw conclusions.

2.5. Quality assessment

A tool, developed by Hawker and colleagues (Hawker et al., 2002), was selected to assess the quality of the included studies. The tool includes nine assessment questions and provides four descriptive answers for each question. The answers are classified using a Likert Scale with four being 'Good', three 'Fair', two 'Poor', and one as 'Very Poor'. The highest score of 36, divided by nine (questions), gives an average of four on the Likert Scale, indicating that the study is ranked as 'Good' (Raphael et al., 2016). Studies were included in this systematic review, if their overall quality score was rated as 'Good' or 'Fair'. Excluding the lower grades of

Table 1
Study search eligibility criteria.

Search Criteria		
	Inclusion criteria	Exclusion criteria
Population	Registered Nurses and Enrolled Nurses directly involved in patient care	Nurse managers, student nurses, nurse assistants, physicians, nurse specialists and health care personnel who are not directly involved in patient care
Exposure	Tertiary hospital settings, primary health care, rest homes, and the community	Non-health care settings
Outcomes	Resilience associated individual personal and work-related factors	Group resilience
Types of studies	Quantitative studies	Summaries, commentaries, review documents, case studies, qualitative studies, systematic reviews, integrative reviews, and literature reviews
Quality assessment	Quality assessment ranked as 'Good' or 'Fair' (Hawker et al., 2002)	Quality assessment ranked as 'Poor', or 'Very Poor' (Hawker et al., 2002)

Note: A quality assessment tool (Hawker et al., 2002) was used to assess the quality of the selected studies using a Likert Scale with four being 'Good', three 'Fair', two 'Poor' and one as 'Very Poor'.

studies did not change the overall conclusions, but selecting the higher ranked articles instead, provided the best evidence for effective interventions (Ogilvie et al., 2005). The lead author, Fiona Yu, and the co-author, Deborah Raphael, carried out the study eligibility and quality assessment independently, and any discrepancies between them were resolved through discussion with all the authors.

3. Results

3.1. Study selection

The study selection process is demonstrated in Fig. 1. The search yielded 1482 articles, 383 duplicates were extracted using RefWorks, and another 844 articles were excluded after the title and abstract screening, leaving a total of 255 articles. Full text screening excluded a further 173, resulting in 82 remaining articles. A further 44 articles were excluded, as they did not meet the eligibility criteria. Of these 44 articles, four were ranked below 'Fair' during the quality assessment, one discussed group resilience, and the remaining 39 involved qualitative methods, literature reviews, or professionals other than Registered or Enrolled Nurses. A total of 38 articles were finally selected for the systematic review. A total of 1444 articles were excluded from the study as it followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol: identification, screening, eligibility, and inclusion (Fig. 1). The specific reasons for excluding these articles were (1) they involved other professionals (other than nurses), (2) they discussed group resilience, (3) they did not use quantitative methods, and (4) their quality assessments were ranked 'Poor', or 'Very Poor' (Hawker et al., 2002).

3.2. Study characteristics

3.2.1. Study location and design

Table 3 (in Supplementary Data) shows that the 38 studies were conducted in 13 countries: Australia, Brazil, China, Iran, Israel, Norway, Portugal, Singapore, South Korea, Spain, Turkey, United Kingdom (UK), and United States of America (USA). Of the 38 articles, one was a two-wave survey (Lanz and Bruk-Lee, 2017), while another one was predictive non-experimental (Larrabee et al., 2010). Three were longitudinal (Laschinger et al., 2013; Saksvik-Lehouillier et al., 2012,2016) and the remaining 33 were cross-sectional studies.

3.2.2. Participants

The 38 studies involved 18,705 nurses engaged in direct patient care. The mean age of the nurses was unreported in 15 studies

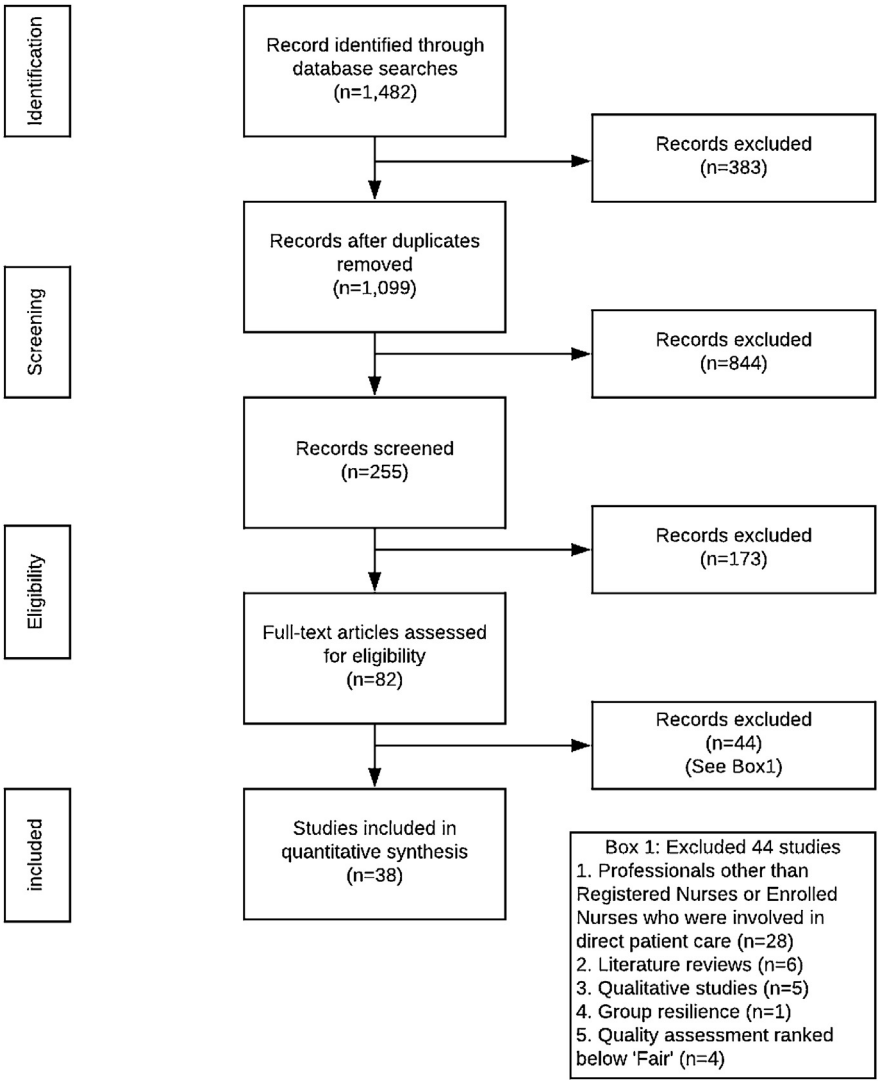

Fig. 1. A flow diagram for identification, screening and eligibility according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol.

(Table 3 in Supplementary Data). In the remaining 23 studies, the average age ranged from 22.5 (SD ± 1.7) years to 48.8 (SD ± 8.7) years. The participants in the study by Wang et al. (2017) had a considerably younger mean age (22.5 years), while the nurses in the study by Itzhaki et al. (2015) had an older mean age of participants (48.8 years).

3.2.3. Study measures

Table 3 (in Supplementary Data) shows that the studies used four existing scales to measure nurse resilience: the Connor Davidson Resilience Scale, the Resilience Scale, the Stress Resilience Profile, and the Dispositional Resilience (Hardiness) Scale Revised. The Connor Davidson Resilience Scale includes two versions: Connor Davidson Resilience Scale 10 and Connor Davidson Resilience Scale 25, while the Resilience Scale entails four variants: Resilience Scale 14, Resilience Scale 25, Resilience Scale 29, and Resilience Scale 33. Various types of resilience scales and different versions of one scale made the study results unfeasible to collate for a meta-analysis.

3.2.4. Outcomes

The primary outcome was that resilience had mediating effects on job demand factors in 28 studies. These job demand factors were burnout, stress, workplace bullying, anxiety/depression, posttraumatic stress disorder, and fatigue. Resilience was positively associated with the factors of job resources in 26 studies. These positive factors were coping skills, social support, self-efficacy, job satisfaction, job retention, and general wellbeing. Additionally, inconsistent conclusions existed between demographic factors and resilience in 14 studies. These outcomes will be discussed in detail in the sections of "Results of Individual Studies", and "Results Syntheses".

3.3. Quality assessment and risk of bias

The quality of the 38 studies was assessed, using the quality assessment tool of Hawker et al. (2002), as outlined in Table 3 in Supplementary Data. Overall, 23 studies were rated as 'Good', while 15 were assessed as 'Fair'. Table 3 shows the areas identified at high risk of bias in 20 articles. Primarily, five studies were found to have 'Missed stating the identified gap in the background', four failed to discuss the area of 'Ethics and bias', and eleven did not discuss the area of 'Transferability/generalisability'. Risk of bias was also found in the 'Findings/Results' Section of nine studies. For example, to achieve a 'Good' grade in the findings/results section, a study must meet the following standards: 'explicit', 'easy to understand', 'in a logical progression', 'results relate directly to aims', and 'sufficient data to support findings' (Hawker et al., 2002). On this basis, the findings in three studies (Abdollahi et al., 2014b; Carlotto et al., 2014; Ding et al., 2015) were not 'explicit', 'easy to understand', or 'in a logical progression', while in three other studies (Ren et al., 2018; Russo et al., 2018; Zheng et al., 2017) the results did not 'relate directly to aims', and another three studies (Hsieh et al., 2016a,b; Manzano Garcia and Ayala Calvo, 2012; Pannell et al., 2017) did not provide 'sufficient data to support findings'.

3.4. Results of individual studies

The resilience mean level and standard deviation from each study is shown in Table 5 (in Supplementary Data). Five studies did not report mean levels of resilience (Hsieh et al., 2017; Manzano Garcia and Ayala Calvo, 2012; Mealer et al., 2012a,b; Mealer et al., 2017a,b; Pannell et al., 2017). In the remaining 33 studies, aggregation of mean levels of resilience was not possible due to the various resilience measures used. The results for individual studies related to factors are discussed in the following paragraphs.

3.4.1. Demographic factors in individual studies

The identified demographic factors, in relation to resilience, included sex, age, marital status, dependents, education, nursing experience, income, job grade, cigarette use, alcohol use, exercise, and shift work. The results varied from study to study as to whether these demographic factors were statistically significantly associated with nurse resilience. Ang et al. (2018) identified that age (odds ratio = 1.88, 95% confidence interval = 1.42 to 2.48, $\rho < 0.05$), marital status (odds ratio = 1.93, 95% confidence interval = 1.50 to 2.48, $\rho < 0.001$), education (odds ratio = 1.93, 95% confidence interval = 1.36 to 2.74, $\rho < 0.001$), and job grade (odds ratio = 0.85, 95% confidence interval = 0.61 to 1.18, $\rho < 0.01$) were statistically significantly associated with resilience. In contrast, the study by Gillespie et al. (2007) stated that resilience was not associated with age (t-statistic = 0.83, $\rho = 0.41$), education (t-statistic=-0.32, $\rho = 0.75$), or nursing experience (t-statistic = 0.27, $\rho = 0.79$). Gillespie et al. (2009) re-analysed the study sample and further stated that education was not related to resilience (coefficient of determination $r^2 = 0.5$, $\rho > 0.05$). They also identified that though age ($\rho < 0.05$) and experience ($\rho < 0.001$) were statistically significantly associated with resilience, their coefficient of determination ($r^2 = 1.5$; $r^2 = 2.6$) showed that the association was very weak (Gillespie et al., 2009). Therefore, the study concluded that resilience was not necessarily reliant on age, experience, and education (Gillespie et al., 2009).

Guo et al. (2017) stated that education (t/F = 8.50, $\rho < 0.001$), income (t/F = 3.72, $\rho < 0.01$), cigarette use (t/F = 2.63, $\rho < 0.01$), and exercise (t/F=-5.82, $\rho < 0.001$) were statistically significant factors, while marital status (t/F = 1.17, $\rho = 0.31$), dependents (t/F = 0.16, $\rho = 0.87$), job grade (t/F = 1.39, $\rho = 0.24$), or alcohol use (t/F = 1.18, $\rho = 0.24$) were not related to resilience. Similarly, Hsieh et al. (2016a,b) found that age ($\beta = 0.18$, 95% confidence interval=−0.59 to 0.94, $\rho = 0.65$), marital status (β=−1.84, 95% confidence interval =−9.29 to 4.60, $\rho = 0.57$), education ($\beta = 3.89$, 95% confidence interval=−2.13 to 9.90, $\rho = 0.20$) or job grade ($\beta = 0.50$, 95% confidence interval=−0.31 to 1.31, $\rho = 0.22$) were unrelated to resilience. However, the study by Hsieh et al. (2017) found that education ($\beta = 0.125$, t = 2.38, $\rho < 0.05$) was the only statistically significant factor associated with resilience.

Ren et al. (2018) ascertained that resilience was linked to sex (t/F=−2.23, $\rho < 0.05$), education (t/F = 5.01, $\rho < 0.01$), job grade (t/F = 2.80, $\rho < 0.05$), or shift work (t/F=−2.73, $\rho < 0.01$), but not to age (t/F = 0.84, $\rho = 0.54$), marital status (t/F = 0.78, $\rho = 0.46$), or nursing experience (t/F = 1.23, $\rho = 0.30$). Similarly, Pannell et al. (2017) found that age ($\rho > 0.05$) or nursing experience ($\rho > 0.05$) were not statistically significant in relation to resilience. Contrastingly, Zheng et al. (2017) identified that age ($\rho < 0.05$) and nursing experience ($\rho < 0.005$) were statistically significant factors. In line with this, the studies of Mealer et al. (2012a,b) and Kutluturkan et al. (2016) concluded that age ($\rho < 0.05$; $\rho < 0.05$) and nursing experience ($\rho = 0.05$; $\rho < 0.05$) were statistically significant factors concerning resilience. Therefore, it can be seen that there are no consistent conclusions found in these included studies as to whether or not nurse resilience is associated with personal factors.

3.4.2. Work-related factors in individual studies

The identified negative factors (job demands) were stress, burnout, fatigue, anxiety, depression, posttraumatic stress disorder, and workplace bullying, whereas the positive factors (job resources) were job satisfaction, coping skills, social support, self-efficacy, job retention, and general wellbeing. Abdollahi et al. (2014a,b) and Hernandez et al. (2016) concluded that stress was negatively related to resilience (r=−0.46, $\rho < 0.01$; r=−0.65,

Table 3
Summary of the identified areas of risk of bias in the studies.

No. First author/Year	Introduction	Data analysis			Findings/Results	Ethics and bias	Transferabilit/generalisability	Implication/usefulness
	Missed stating the identified gap in the background	The number given in the text not corresponding to the number in the table	Graph or table missing	No explanation of data analysis	Unclear explanation of findings and results	No discussion of ethics and bias	No discussion of transferability and generalisability	No discussion of implications and usefulness
1.Abdollahi, 2014b					✓			
2.Carlotto, 2014					✓		✓	
3.Ding, 2015					✓		✓	
4. Hernandez, 2016							✓	✓
5.Hsieh et al., 2016a							✓	
6.Hsieh et al., 2016a	✓				✓		✓	
7.Hsieh, 2017	✓							
8.Judkins, 2005						✓	✓	
9.Kutluturkan, 2016							✓	
10.Laschinger, 2013	✓						✓	
11.Manzano Garcia, 2012					✓			
12.Mills, 2017	✓							✓
13.Pannell, 2017					✓	✓		
14.Ren, 2018					✓		✓	
15.Rushton, 2015						✓	✓	
16.Russo, 2018			✓	✓	✓	✓		
17.Saksvik-Lehouillier, 2012		✓						
18.Sauer, 2017	✓							✓
19.Wang, 2017							✓	
20.Zheng, 2017				✓	✓			

Note: √ indicates identified areas of risk of bias in the studies.

$\rho < 0.05$; r=-0.53, $\rho < 0.01$). Ding et al. (2015) concluded that burnout (r=−0.19, $\rho < 0.01$) also negatively correlated with resilience, while coping skills (r = 0.39, $\rho < 0.01$) and self-efficacy (r = 0.68, $\rho < 0.01$) were positively associated with resilience. The studies by Gillespie et al. (2007), Guo et al. (2017), Rushton et al. (2015), and Zhou et al. (2017) came to the same conclusion as Ding et al. (2015).

Interestingly, Gillespie et al. (2007) stressed that social support (β=-0.02, t=−0.42, $\rho = 0.68$) was not statistically significantly related to resilience. Contrastingly, the studies by Hsieh et al. (2016a,b), and Hsieh et al. (2017) emphasised that social support (β=−0.03, $\rho < 0.01$; β = 1.74 $\rho < 0.001$; β = 0.17, t = 2.77, $\rho < 0.01$) was statistically significantly associated with resilience. Similarly, the studies by Russo et al. (2018) and Wang et al. (2017) confirmed that social support (r = 0.21, r = 0.31, $\rho < 0.05$; β = 0.18, $\rho < 0.05$) was correlated with resilience.

Additionally, Mealer et al. (2012a,b) identified that resilience was negatively associated with burnout (odds ratio = 0.22, 95% confidence interval = 0.13 to 0.33, $\rho < 0.001$), anxiety/depression (odds ratio = 0.26, 95% confidence interval = 0.11 to 0.53, $\rho < 0.001$), and posttraumatic stress disorder (odds ratio = 0.27, 95% confidence interval = 0.13 to 0.52, $\rho < 0.001$). Mealer et al. (2017a,b) further identified that resilience had significant direct effects on the development of posttraumatic stress disorder (β=-0.45, odds ratio = 0.72, 95% confidence interval = 0.68 to 0.79, $\rho < 0.05$). Saksvik-Lehouillier et al. (2012, 2016) perceived that fatigue (β=−0.10 $\rho < 0.01$; β=−0.24, $\rho < 0.001$), anxiety (β=−0.09, $\rho < 0.01$; β=−0.32, $\rho < 0.001$), and depression (β=−0.11, $\rho < 0.01$; β=−0.39, $\rho < 0.001$) had a negative relationship with resilience. Another two studies (Rushton et al., 2015; Yu and Lee, 2018) also discerned that stress (r=−0.44, $\rho < 0.01$; r=−0.28, $\rho < 0.01$) and burnout (r=−0.31, $\rho < 0.01$; r=−0.28, $\rho < 0.001$) were negatively related to resilience. The results from individual studies indicate that resilience is negatively associated with the factors of job demands, while positively related to those of job resources.

3.5. Result syntheses

3.5.1. Measure syntheses

As with the definitions of resilience, different resilience scales were used in the selected studies. This substantial heterogeneity made it unfeasible to synthesise the evidence using a meta-analysis. Two versions of the Connor Davidson Resilience Scale (Connor Davidson Resilience Scale 10 and 25) were used in 19 studies, while four versions of the Resilience Scale (Resilience Scale-14, 25, 29, and 33) were utilised in eight studies (Table 5 in Supplementary Data). The overall participants' resilience mean levels were not comparable in the studies due to the different scale versions used.

Thirteen studies utilised the Connor Davidson Resilience Scale 25 and six used the Connor Davidson Resilience Scale 10. Table 4 summarises the statistical methods used, Cronbach's alpha, and the resilience mean levels from the 13 studies that utilised the Connor Davidson Resilience Scale 25. The statistical methods used mainly correlation analysis, t-test, and multiple regression models. The Cronbach's alpha ranged from 0.89 to 0.95, indicating a high internal consistency of the Connor Davidson Resilience Scale 25 in these studies, as a cut-off point of 0.7 is an acceptable level (Field, 2014).

The Connor Davidson Resilience Scale 25 is scored as low (scores $\leq$ 25th percentile), moderate (25th percentile < scores $\leq$ 50th percentile), high (50th percentile < scores $\leq$ 75th percentile), and higher (scores > 75th percentile) (Connor and Davidson, 2003). Of the thirteen studies, four identified that the participants had higher mean resilience levels (Gillespie et al., 2007, 2009; Hernandez et al., 2016; Russo et al., 2018), while six recognized that nurses had high mean levels (Cho and Kang, 2017; Gao et al., 2017; Guo et al., 2017, 2018; Ren et al., 2018; Rushton et al., 2015). The remaining three did not provide data on the mean resilience levels (Manzano Garcia and Ayala Calvo, 2012; Mealer et al., 2012a, b; Mealer, Jones et al., 2017).

3.5.2. Demographic factor syntheses

Table 5 shows that 14 studies discussed whether or not resilience was associated with demographic factors. These identified demographic factors were: sex, age, marital status, dependents, education, nursing experience, income, job grade, cigarette use, alcohol use, exercise, and shift work. By narratively synthesising the 14 studies, inconsistencies were found as to whether these factors were associated with resilience. For instance, one study revealed that marital status was statistically significant in correlation with resilience (Ang et al., 2018), while four determined that it was not a significant factor (Guo et al., 2017; Hsieh et al., 2016a,b; Hsieh et al., 2017; Ren et al., 2018). Seven studies identified that education was a significant factor related to resilience (Ang et al., 2018; Brown et al., 2018; Guo et al., 2017; Hsieh et al., 2017; Kutluturkan et al., 2016; Mealer, Jones et al., 2017; Ren et al., 2018), while four found no links between education and resilience (Gillespie et al., 2007, 2009; Hsieh, Hung et al., 2016; Mealer et al., 2012a,b). Therefore, it cannot be concluded that all these identified demographic factors are associated with nurse resilience.

Table 4
Summary of the studies that used the Connor Davidson Resilience Scale 25.

No. Author, year	Statistical Methods	Cronbach's alpha)	Sample Size (N)	Resilience mean level (±SD)
1.Cho, 2017	Pearson correlation, hierarchical multiple regressions	0.92	179	59.56 (±12.32)
2.Gao, 2017	Hierarchical multiple regressions	0.95	363	55.24 (±18.29)
3.Gillespie, 2007	Bivariate, regression analysis	0.90	772	75.90 (±11.00)
4.Gillespie, 2009	Principle component analysis (PCA); Pearson's product-moment correlations	0.90	735	75.90 (±11.00)
5.Guo, 2017	Analysis of variance (ANOVA), t-test, multiple linear regression	0.92	1061	63.77 (±12.80)
6.Guo, 2018	Pearson correlation, multiple linear regression	0.92	1061	63.77 (±12.80)
7.Hernandez, 2016	Multivariate analysis of variance (MANOVA)	Not provided	141	77.00 (±12.03)
8.Manzano-García, 2012	Correlations, regression analysis	0.89	200	Not provided
9.Mealer, Jones, Newman, 2012	t-test, a chi^2 analysis, Fisher exact test, ANOVA, multi-variated logistic regression	0.92	744	Not provided
10.Mealer, Jones, 2017	Bivariate correlations, M-plus: a mediation model	0.92	744	Not provided
11.Ren, 2018	t-test, correlations, multiple regression	0.91	1356	59.99(±13.59)
12.Rushton, 2015	Pearson correlation, linear regression	Not provided	114	74.3 (±11.0)
13.Russo, 2018	Pearson correlation	Not provided	353	81.53 (±10.80)

Note: The Connor Davidson Resilience Scale 25 is scored as low (scores $\leq$ 25th percentile), moderate (25th percentile < scores $\leq$ 50th percentile), high (50th percentile < scores $\leq$ 75th percentile) and higher (scores > 75th percentile) (Connor and Davidson, 2003).

Table 5
Summary of the demographic and work-related factors associated with nurse resilience.

Factors	Significantly associated with resilience	Not significantly associated with resilience	Negatively associated with resilience	Positively associated with resilience
Demographic factors				
Sex	29	25		
Age	3, 20, 25, 37	10, 11, 17, 28, 29		
Marital status	3	12, 16, 17, 29		
Dependents	25, 26	3, 12		
Education	3, 4, 12, 17, 20, 26, 29	10, 11, 16, 25		
Nursing experience	20, 25, 26, 37	3, 4, 10, 11, 28, 29, 30		
Income	12			
Job grade	3, 29	12, 16,		
Cigarette use	12			
Alcohol use		12		
Exercise	12	25		
Shift work		29		
Work-related factors				
Job Demands				
Stress			1, 2, 14, 19, 22, 29, 30, 36	
Burnout			5, 7, 9, 13, 20, 21, 24, 25, 30, 36	
Fatigue			32, 33	
Anxiety/depression			25, 32, 33	
Posttraumatic stress disorder			6, 25 26	
Workplace bullying			23, 34	
Job Resources				
Job satisfaction				4, 19, 22, 37
Coping skills				7, 10, 12, 29, 31, 38
Social support		10		15, 16, 17, 31, 35
Self-efficacy				7, 10, 12, 29, 38
Job retention				21, 27, 36
General wellbeing				8, 9, 18

Note: Numbers in the table (above) reference the following numbered articles: 1.Abdollahi (2014a) 2.Abdollahi (2014b) 3.Ang (2018) 4.Brown (2018) 5.Carlotto (2014) 6.Cho (2017) 7.Ding (2015) 8.Gao (2017) 9.García-Izquierdo (2018) 10.Gillespie (2007) 11.Gillespie (2009) 12.Guo (2017) 13.Guo (2018) 14. Hernandez (2016) 15.Hsieh, Chen (2016) 16.Hsieh, Hung (2016) 17. Hsieh (2017) 18.Itzhaki (2015) 19.Judkins (2005) 20.Kutluturkan (2016) 21.Lanz (2017) 22.Larrabee (2010) 23.Laschinger (2013) 24.Manzano-García (2012) 25.Mealer, Jones, Newman (2012) 26.Mealer, Jones (2017) 27.Mills (2017) 28.Pannell (2017) 29.Ren (2018) 30.Rushton (2015) 31.Russo (2018) 32.Saksvik-Lehouillier (2012) 33.Saksvik-Lehouillier (2016) 34.Sauer (2017) 35.Wang (2017) 36.Yu (2018) 37.Zheng (2017) 38.Zhou (2017).

3.5.3. Work-related factor syntheses

Table 5 demonstrates that the factors of job demands, negatively associated with resilience, included stress, burnout, fatigue, anxiety, depression, posttraumatic stress disorder, and workplace bullying. Eight studies found that the higher the nurses' stress levels were, the lower their resilience levels became (Abdollahi et al., 2014a,b; Hernandez et al., 2016; Judkins and Rind, 2005; Larrabee et al., 2010; Ren et al., 2018; Rushton et al., 2015; Yu and Lee, 2018). Ten identified that nurses with high resilience levels exhibited less burnout (Carlotto et al., 2014; Ding et al., 2015; Garcia-Izquierdo et al., 2018; Guo et al., 2018; Kutluturkan et al., 2016; Lanz and Bruk-Lee, 2017; Manzano Garcia and Ayala Calvo, 2012; Mealer et al., 2012a,b; Rushton et al., 2015; Yu and Lee, 2018).

Two longitudinal studies concluded that resilience reduced nurse fatigue, thus increasing nurses' shift work tolerance thresholds (Saksvik-Lehouillier et al., 2012, 2016), while three determined that a strong inverse association existed between anxiety/depression and resilience (Mealer et al., 2012a,b; Saksvik-Lehouillier et al., 2012, 2016). Another three studies summarised that intensive care nurses were regarded as a high risk group for posttraumatic stress disorder and enhanced resilience could reduce its effects (Cho and Kang, 2017; Mealer et al., 2012a,b; Mealer et al., 2017a,b). Two perceived that increased resilience levels could help nurses face adversity, mitigating the effects of workplace bullying (Laschinger et al., 2013; Sauer and McCoy, 2017).

Table 5 also shows that the factors of job resources, positively associated with nurse resilience, included job satisfaction, coping skills, social support, self-efficacy, job retention, and general wellbeing. Four studies found that the more resilient nurses had greater job satisfaction, compared to those having lower resilience levels (Brown et al., 2018; Judkins and Rind, 2005; Larrabee et al., 2010; Zheng et al., 2017). Six concluded that active coping skills improved nurse resilience (Ding et al., 2015; Gillespie et al., 2007; Guo et al., 2017; Ren et al., 2018; Russo et al., 2018; Zhou et al., 2017). Five inferred that a rich social support system enhanced nurse resilience (Hsieh, Chen et al., 2016; Hsieh, Hung et al., 2016; Hsieh et al., 2017; Russo et al., 2018; Wang et al., 2017), but one announced that there was no relationship between social support and resilience (Gillespie et al., 2007). In addition, five studies judged that self-efficacy was a statistically significant factor to increase resilience (Ding et al., 2015; Gillespie et al., 2007; Guo et al., 2017; Ren et al., 2018; Zhou et al., 2017). Three concluded that resilience increased job retention (Lanz and Bruk-Lee, 2017; Mills et al., 2017; Yu and Lee, 2018). Another three believed that the more resilient the nurses were, the better their general wellbeing (Gao et al., 2017; Garcia-Izquierdo et al., 2018; Itzhaki et al., 2015). Overall, the synthesised results show that nurse resilience is negatively associated with job demands and positively related to job resources.

4. Conclusions

This systematic review has synthesised evidence on nurse resilience and the associated factors. It identified that resilience plays a mediating role in attenuating the effects of job demands (work stress, burnout, posttraumatic stress disorder, fatigue,

anxiety, and depression). It also revealed that job resources (coping skills, self-efficacy, and social support) could foster building resilience, help in recruiting and retaining nurses within the workforce and promote a positive organisational work culture. Additionally, the review suggested that developing institutional strategies would help nurses become and remain resilient within their healthcare environment. Further research is needed to explore nurse resilience and develop a consistent instrument to identify the associated factors within various clinical setting.

5. Discussion

5.1. Summary of evidence

The purpose of this systematic review was to identify the personal and work-related factors associated with resilience. Based on the evidence collated from the 38 included articles, this systematic review analysed resilience and its associated factors within the categories of job demands and job resources for improving resilience. Systematic analysis of nurse resilience has so far attracted a lack of attention, so this is the first systematic review of nurse resilience. Applying the Job Demands-Resources model (Bakker and Demerouti, 2007) in nursing practice, a better understanding of resilience would be a job resource that could empower nurses to unlock their potential and achieve positive outcomes when facing challenges at work. It may enhance work engagement that leads to increased job satisfaction and retention of nurses, thus creating a healthy nursing workforce (Moloney et al., 2018).

This systematic review has identified inconsistencies across studies as to whether personal factors are associated with resilience. The identified personal factors included sex, age, marital status, dependents, education, nursing experience, job grade, and exercise. For example, Gillespie et al. (2007) concluded that age, education, and nursing experience were not associated with nurse resilience. In contrast, Ren et al. (2018) argued that sex and education were related to resilience, while Mealer et al. (2012a,b) perceived that education and nursing experience were associated factors. The finding from this review is supported by an integrative review of Hart et al. (2014), who identified the discrepancies of resilience among different demographic factors. This indicates that further research is necessary to explore the relationships between demographic factors and nurse resilience. The results may assist managers to identify personal resilience characteristics to provide better support for improving nurse resilience.

Drawing from the Job Demands-Resources model (Bakker and Demerouti, 2007), the systematic review has identified that resilience could help mitigate the effects of job demands that include stress, burnout, fatigue, anxiety, depression, posttraumatic stress disorder, and workplace bullying. When nurses experience high job demands, resilience is perceived as a mediator between happiness and stress (Abdollahi et al., 2014a), a protector against burnout (Kutluturkan et al., 2016), and a buffer to prevent nurses from developing burnout syndrome (Arrogante and Aparicio-Zaldivar, 2017). Resilience is also recognised as an ameliorator that could attenuate the effects of posttraumatic stress disorder, anxiety, and depression (Mealer et al., 2012a,b). In addition, resilience is regarded as an aid that could enhance nurses' inner strength to deal with workplace bullying (Hsieh, Chen et al., 2016). The findings from this systematic review reflect that resilience is a nurse's adaptability to reduce their vulnerability to workplace adversity, thus diminishing the negative effects of job demands. The conclusion corresponds with that from a literature review by Jackson et al. (2007), who believed that resilience is the ability of an individual to be able to see the positive aspects and potential benefits in a stressful situation. The conclusion is also in accordance with another literature review by Grafton et al. (2010). They discerned that resilience is an innate resource that can be developed through interventions, such as education and environmental support, to reduce the effects of workplace difficulties.

Aligning with key components of the Job Demands-Resources model (Bakker and Demerouti, 2007), the present systematic review has also concluded that coping skills and self-efficacy, as vital job resources, are positively associated with resilience. This has provided clear evidence that resilience has a mediating effect on the relationship between job resources and job demands. Nurses who have positive coping skills and a strong sense of self-efficacy exhibit lower levels of emotional exhaustion, which in turn can raise resilience levels (Ding et al., 2015). Resilience that arises out of a belief in one's own self-efficacy and the necessary coping skills can be utilised to help nurses deal with challenging situations (Gillespie et al., 2007). This indicates that a high degree of self-efficacy and efficient coping mechanisms may lead nurses to experiencing lower work pressure, better emotional adaption, and less burnout (Guo et al., 2017). This also indicates that resilience is a nurse's capacity to transform the self-destructive forces into a proactive outlook on life (Zhou et al., 2017). The conclusion from the present systematic review is consistent with the finding from an integrative review by Delgado et al. (2017), who uncovered that resilience is an overarching process that enables nurses to increase their capacity.

Furthermore, this present systematic review has identified that social support, job satisfaction, job retention, and general wellbeing, as essential job resources, are positively associated with resilience. These job resources, involving social and organisational factors, are also regarded as buffers against job demands (Bakker and Demerouti, 2007). Social support can provide individuals with more resources, thus reducing the development of depressive tendencies, encouraging nurses to have a positive attitude towards life, and enhancing their resilience (Hsieh, Chen et al., 2016; Hsieh, Hung et al., 2016; Hsieh et al., 2017). The more resilient the nurses are, the greater their job satisfaction (Brown et al., 2018; Judkins and Rind, 2005; Zheng et al., 2017), and the better their general wellbeing (Gao et al., 2017). Therefore, resilience influences nurses' health, job involvement and turnover intention (Mills et al., 2017; Yu and Lee, 2018). The finding from the present review is in line with a meta-analysis involving 87,634 participants, which concluded that health wellbeing was related to work performance, increased overall job satisfaction, and healthy outcomes (Ford et al., 2011). The finding is also in agreement with the integrative review by Hart et al. (2014), who reported that good social support and resources could help nurses reduce emotional exhaustion and burnout, thus preventing turnover by encouraging them to stay in the profession.

Finally, the review has found there is no consistent instrument for resilience measurement. Some studies used the Connor Davidson Resilience Scale, while others utilised the different versions of the Resilience Scale. This precluded comparison of participants' resilience levels across all the included studies. Accordingly, future research should focus on developing a new instrument or consistent scale with one of the existing measurements to encompass all personal and work-related factors. This may improve generalisations of the results, reduce the selection bias, and enhance study quality. Comparably, another systematic review, involving 6174 primary healthcare professionals, identified that existing resilience measures varied from study to study (Robertson et al., 2016). Therefore, these factors should be taken into consideration when developing a new instrument.

5.2. Limitations

Several methodological limitations exist in this systematic review. Firstly, some studies did not provide detailed information, such as mean age, clinical setting, or resilience mean levels. The missing information made it difficult to identify the study characteristics and their representativeness of the nursing populations. It also has limited ability in detecting the unique findings and generalise them to other clinical areas. Secondly, restricting the searches to 'English Language of Publication', 'Publication Year (2000–2018)', 'Peer Review', 'Academic Journals', and 'nursing area' may have excluded some useful studies from the search results. Thirdly, the 38 studies primarily used a cross-sectional survey; thus causality cannot be inferred. The multidimensional characteristics of resilience and multiple instruments used for resilience measurement limited the researchers' ability to synthesise and compare the findings across the included studies.

5.3. Implications for research and practice

Resilience as an innate energy or life force can empower nurses to positively adapt to stressful situations and use the experiences as a learning process (Grafton et al., 2010). Understanding resilience can increase a nurse's ability to effectively cope with work stress and act proactively in identifying and preventing potential problems. It may also enhance self-awareness to achieve personal and professional growth, develop inner strength, and strike a balance between risk and protective factors (Shimoinaba et al., 2015). Thus, it is important for future research to develop a definitive definition that would enable nurses to better understand resilience to help increase their inner power.

Coping skills, self-efficacy and social support are essential job resources for nurses to build resilience and increase their inner energy to buffer job demands. Several ways to increase nurses' coping skills, self-efficacy, and social support are to design evaluation programs, make facilitators available, and develop the relevant workshops. Weekly sessions of workplace group interventions could be implemented using mindfulness-based strategies that include meditation, mild yoga movement, and music. These interventions can reduce nurses' emotional exhaustion, increase work engagement, and improve resilience (Steinberg et al., 2017). A hospital-wide resilience evaluation program could also help nurses recognise the physical, mental, and emotional effects of stress, and assist them to develop institutional coping strategies for workplace challenges (Potter et al., 2013).

Although this systematic review was unable to conclude whether age, education, or nursing experience was associated with resilience, the findings suggest that a supportive work environment should be created for younger or less experienced nurses to improve resilience. The strategies include access to training, career progression, choice of hours, colleague support, performance feedback, and schedule flexibility. Preventing experienced nurses' unprofessional behavior such as belittling, negative criticism, or bullying, may mitigate the negative impacts on newly graduated nurses, thus retaining them in the nursing workforce (Freeling and Parker, 2015; Vogelpohl et al., 2013). Audiotaped clinical scenarios can be used for performance feedback or critical reflection to build supportive and collaborative collegial relationships (McDermid et al., 2016; McDonald et al., 2010). An educational program can be delivered, equipped with coping skills and emotional regulation, in conjunction with external supportive resources, to face workplace adversity (Foster et al., 2018).

Interventions for improving nurses' resilience should be accomplished within the constraints of the unique characteristics of different nursing specialties. Written exposure sessions, event-triggered counselling, mindfulness-based stress reduction, and regular aerobic exercise, can be used to mitigate the effects of catastrophic situations (Mealer et al., 2014; Mealer, Hodapp et al., 2017). Evaluating interpretive styles (Pannell et al., 2017), effective mentoring (Levine et al., 2017), healthy eating, adequate sleep, and regular exercise (Rushton et al., 2015) can provide nurses innumerable benefits and enable them to function effectively in stressful and emotionally charged situations without being overwhelmed.

Further research on resilience would help nurses better cope with workplace challenges, increase their capabilities, and reduce vulnerabilities. Establishing a consistent measurement framework would assist researchers to compare the results from different studies to draw robust conclusions for improving nurse resilience. Additionally, developing interventions should target nurses to assist in strengthening their internal resources and attenuating the effects of workplace adversity to stay in the nursing workforce.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ijnurstu.2019.02.014.

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