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LITERATURE REVIEW

Noneconomic and economic impacts of nurse turnover in hospitals: A systematic review

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Abstract

Aim: To examine and synthesize the noneconomic and economic impacts of nurse turnover in acute hospitals.

Background: Nurse turnover occurs when nurses leave their jobs or the profession and is a major concern for the healthcare industry. Many studies have investigated the determinants of nurse turnover.

Methods: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist was utilized in the current review. Article search was conducted in June 2021. Research articles published since January 2000 were included. Eight databases (e.g., CINAHL, PubMed, PsycINFO, and Web of Science) were used. The following eligibility criteria were applied for inclusion: Articles that (1) were nonexperimental quantitative studies, (2) examined the impact of actual nurse turnover in acute hospitals, (3) were a peer-reviewed original research article, and (4) were written in English or Korean.

Results: Among 9,041 searched articles, 16 were included in the review. Seven studies investigated the association of nurse turnover with processes and outcomes (workgroup processes, nurse staffing, nurse outcomes, and patient outcomes), and partially supported the negative impact of turnover. Nine studies found that nurse turnover is very costly.

Conclusion: Most studies investigated the turnover cost, which is costly. The negative noneconomic impact of nurse turnover was partially supported.

Implications for nursing practice and nursing policy: To prevent the adverse noneconomic and economic impacts of nurse turnover and retain nurses, healthcare organizations, nurse managers, and hospital staff nurses need to develop and implement prevention strategies and policies to address nurse turnover. Efforts to address nurse turnover can increase hospital competency to improve the quality of nursing care services and patient safety.

KEYWORDS
Employee turnover, hospitals, nurse, outcomes

INTRODUCTION

Nurse turnover, which occurs when nurses leave their jobs or the profession, is a major concern for the healthcare industry (Winter et al., 2020). Low retention rates and shortages of qualified nurses can affect many aspects of health care (Tang & Hudson, 2019). Several countries are facing shortages of qualified nurses due to high nurse turnover (International Council of Nursing, 2019). Healthcare organizations use resources to advertise, recruit, hire, and train new nurses to replace nurses who resign (Kim, 2016). Nurse turnovers also incur a loss of intellectual capital and productivity (Li & Jones, 2013).

Background

Turnover can be defined as the admission and departure of personnel working in an organization (Leitão et al., 2017), which is a process within hospitals. Studies on turnover use different conceptualizations and measurements (Halter et al., 2017). Nurses may leave the hospital or transfer to other units within the hospital; it thus involves both voluntary and involuntary movement and internal and external movement (Park et al., 2014). Nurse turnover rates vary from 15.1% in Australia (Roche et al., 2015), 27.65% in the USA (Nelson-Brantley et al., 2018), and 23% in Israel (Kerzman et al., 2020). The average turnover rate for South Korean nurses with 5.4 years of tenure was 12.4% (Hospital Nurses Association, 2019). Among newly licensed registered nurses (RNs) in South Korea, the turnover rate was 42.7% in 2017 (Hospital Nurses Association, 2019). In the USA, the national turnover rate of RNs was 17.8% (Thomas et al., 2022). Although nursing turnover rates vary, it is possible to see from these studies that turnover rates are globally high.

Most studies on nursing turnover focused on determinants of intent to leave, and only a few studies examine the impact of turnover (Halter et al., 2017, Hayes et al., 2012). In a systematic review of nurse turnover systematic reviews, Halter at al. (2017) found nine systematic reviews that examined the determinants of nurse staff turnover in adult health services. In this review, the determinants were categorized as individual, job-related, interpersonal, and organizational. Nurse stress and dissatisfaction at an individual level, managerial style, and supervisor support factors at the organizational level were significant factors (Halter et al., 2017). More recently, McDermid et al. (2020) performed a literature review of 20 articles to identify factors affecting the turnover rates of emergency nurses and found several contributing factors, including aggression, violence, serious incidents, and work environment. Falatah and Salem (2018) examined the contributing factors of nursing turnover in Saudi Arabia and found the nurses' demographics, their satisfaction, management and leadership types, and work-related variables (e.g., pay, promotion, and equity) in 11 studies.

Nurse turnover is costly and compromises quality of care and outcomes (Bae et al., 2021). As demonstrated earlier, previous studies have primarily investigated the factors contributing to turnover (Falatah & Salem, 2018; Halter et al., 2017; McDermid et al., 2020). However, few reviews have investigated the impact of nurse turnover. Most recent reviews of the impact of nurse turnover (Halter et al., 2017) found that the costs of turnover were solely focused on this topic. Halter et al. (2017) found nursing turnover costs to be high. In a comparative review, Duffield et al. (2014) found that Australia reported higher turnover costs as compared with the USA, Canada, and New Zealand. Li and Jones (2013) found that turnover costs were 0.31 times the salary at minimum and 1.3 times at maximum among nurses. Hayes et al. (2012) also reviewed the economic impact of nursing turnover and found that temporary replacements and decreased initial productivity added to the costs of nurse turnover.

Regarding the noneconomic impact of turnover, a review by Hayes et al. (2012) reported that both nursing care outcomes (e.g., mental health, job satisfaction) and patient outcomes (e.g., patient satisfaction) were affected by nurse turnover. Since their review, there has been a dearth of reviews that have comprehensively examined both noneconomic and economic impacts of nurse turnover in acute hospitals. However, there have been several studies since 2012 that have empirically investigated the impact of turnover. Therefore, an updated evaluation is required.

METHODS

Aims

The aims of this systematic review were to investigate the impacts of nurse turnover in acute hospitals and synthesize the evidence regarding the noneconomic impact on workgroup processes, nurse staffing, nurse outcomes, and patient outcomes and the economic impact of nurse turnover (e.g., costs).

Design

To investigate the impacts of nurse turnover in acute hospitals, a five-step approach—problem formulation, literature search, data evaluation, data analysis, and presentation—was utilized (Cooper, 1989). Research article search and selection for this review were reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist (Moher et al., 2009). Based on that, the eligibility criteria, search methods, research outcomes, quality appraisal methods, data extraction, and synthesis were illustrated. Because the current review did not use human subjects, an approval from the institutional review board of Ewha Womans University was not applicable.

Search methods

The following eligibility criteria were applied for inclusion in the systematic review: Articles were (1) nonexperimental quantitative studies, (2) examined the impacts of actual nurse turnover in acute hospitals, (3) peer-reviewed original research articles, (4) were written in English or Korean, and (5) were published since January 2000 until May 2021.

Following electronic bibliographic databases: CINAHL, Cochrane Library, DBpia, EBSCO, PubMed, PsycINFO, Research Information Sharing Service, and Web of Science were used to find relevant studies. The search terms include (1) "nurse (s)" and "turnover" and "acute"; (2) "nurse (s)" and "turnover" and "hospital (s)"; (3) "nursing" and "turnover"

and "acute"; (4) "nursing" and "turnover" and "hospital (s)." Nurse turnover represents independent variables, and acute hospitals represent study settings without limiting the outcome variables and included all types of impacts of turnover. The titles, abstracts, and keywords were searched to identify all relevant articles. Additional searches were also conducted in the included studies and previous reviews to identify additional relevant articles.

Search outcomes

A total of 9,029 articles were identified (Supplementary Figure S1). After removing duplicate articles, 2,162 unique articles remained. After the title screening, 2,064 articles were excluded and 98 remained. Among them, after the abstract screening, 34 articles remained. In the full-text review, 23 articles were excluded for several reasons: they were not nonexperimental quantitative studies ($n = 3$), did not study the impacts of nurse turnover ($n = 12$), were not conducted in acute hospitals ($n = 6$), or did not study actual nurse turnover ($n = 2$). Additional five articles manually were searched. The 16 articles were included and assessed for methodological quality.

Quality appraisal

A 13-item quality assessment tool for correlation studies (Cicolini et al., 2014; Cummings et al., 2008) was used to evaluate the quality of included articles. Each question was in a dichotomous answer format. Among 13 items, 12 items about research methods were scored either 0 or 1, and one item about measurement was scored as 0 or 2. The maximum total score was 14. Higher scores represent better quality of the study. Using the total score, each article was categorized into low (0–4), medium (5–9), and high (10–14) quality. Supplementary Table S1 presents the items and summarizes the quality appraisal of included studies.

Data extraction

The data extracted were the first author's name, year, country, study design, sample, quality score/quality, measures and the mean values nurse turnover, measures of outcomes (instruments), unit of analysis and data analysis, and main findings ($p < 0.05$) were extracted from each study. Table 1 presents the data extracted from each study.

Synthesis

Given the heterogeneity of the data analyses, measures of turnover, and measures of outcomes, a meta-analysis was not conducted. Using the extracted data, a narrative synthesis of the included studies was conducted. The noneconomic impacts of nurse turnover in acute hospitals were synthesized in terms of workgroup processes, nurse staffing, nurse outcomes, and patient outcomes (Table 2). The costs of turnover were reported as the cost per turnover, the ratio of turnover costs to salary, total cost of turnover, and the percentage of turnover cost for each category based on Li and Jones's study (2013) (Table 3).

RESULTS

Characteristics of the reviewed studies

Of the 16 articles included in the review, seven studies (Bae et al., 2014, 2010; Jones, 2005, 2008; Park et al., 2014; Reilly et al., 2014; Waldman et al., 2004) were conducted in the USA (Table 1). Eight other studies were conducted in South Korea (Kim, 2016), Brazil (Leitão et al., 2017; Ruiz et al., 2016), New Zealand (North & Hughes, 2006; North et al., 2013), Canada (O'Brien-Pallas et al., 2010), Germany (Winter et al., 2020), and Australia (Roche et al., 2015). One international study (O'Brien-Pallas et al., 2006) was conducted in four countries. In the quality appraisal, only one study (O'Brien-Pallas et al., 2010) was rated as high. Twelve (Bae et al., 2010, 2014; Leitão et al., 2017; North & Hughes, 2006; North et al., 2013; O'Brien-Pallas et al., 2006; Park et al., 2014; Reilly et al., 2014; Roche et al., 2015; Ruiz et al., 2016; Waldman et al., 2004; Winter et al., 2020) were rated medium, and three (Jones, 2005, 2008; Kim, 2016) were rated low. Six studies used longitudinal designs (Bae et al., 2010; North et al., 2013; O'Brien-Pallas et al., 2010; Park et al., 2014; Reilly et al., 2014; Roche et al., 2015), and the rest used cross-sectional study designs.

Nine studies were conducted with a guidance of a theoretical model or framework as follows: Bae et al. (2010) used an input–process–outcome framework (McGrath, 1964); Jones (2005, 2008) used human capital theory (Cohn & Geske 1990); O'Brien-Pallas et al. (2006, 2010) drew on a nurse turnover model (O'Brien-Pallas et al., 2001); Park et al. (2014) used a longitudinal framework; Reilly et al. (2014) applied a context-emergent turnover theory (Nyberg & Ployhart 2013); Winter et al.'s (2020) study reviewed the determinants of hospital staff shortages, and Waldman et al.'s (2004) evaluated turnover cost models that consider the cost of reduced productivity. Three studies used relatively large samples (Bae et al., 2010; O'Brien-Pallas et al., 2010; Park et al., 2014), while eight studies were conducted at a single hospital (Jones, 2005, 2008; Kim 2016; Leitão et al., 2017; North & Hughes, 2006; Reilly et al., 2014; Ruiz et al., 2016; Waldman et al., 2004).

Regarding measures of nurse turnover, nursing unit-level quarterly (Bae et al., 2014; Park et al., 2014) and monthly (Bae et al., 2010, 2014; Leitão et al., 2017; Reilly et al., 2014; Ruiz et al., 2016) turnover rates were used. Several studies used annual turnover rates. The annual turnover rate ranged from 9.49% (O'Brien-Pallas et al., 2006) to 44.3% (North et al., 2013). The monthly turnover rate ranged from 0% (Leitão et al., 2017) to 2.53% (Leitão et al., 2017) for one month and from 4.29%

TABLE 1 Characteristics of reviewed studies

Authors (year), country	Study design	Sample	Quality score/quality	Measures/mean values of nurse turnover	Measures of outcomes (instruments)	Unit of analysis /data analysis	Main findings ($p < 0.05$)
Bae et al. (2010), USA	Longitudinal	268 nursing units, 141 hospitals	8/medium	RN unit turnover rates/4.29% (Jan–Feb), 4.58% (Mar–Apr)	Workgroup cohesion (Sauter et al., 1997), relational coordination (Gittell, 2002), workgroup learning (Rybowiak et al., 1999), Patient satisfaction (Bacon & Mark, 2009), length of day, patient falls, medication errors	Nursing unit/ordinary least squares, Poisson regression	Nursing units with turnover rates between 3.31% and 4.50% were likely to have lower levels of workgroup learning compared with nursing units with no turnover ($\beta = -0.183$, $p < 0.01$). Nursing units with turnover rates between 0% and 3.3% of turnover were likely to have lower levels of patient falls than nursing units with 0%. turnover ($\beta = -0.297$, $p < 0.05$).
Bae et al. (2014), USA	Cross-sectional	35 nursing unit, 3 hospitals, 511 unit-month data points, 171 unit-quarter data points	6/medium	RN unit turnover rate/5.00% (quarterly turnover rate), 1.82% (monthly turnover rate)	Patient falls, falls with injury, pressure ulcer, unit-acquired pressure ulcer	Unit-month, unit-quarter/negative binomial regression, logit regression	NS relationship with patient falls and pressure ulcers
Jones (2005), USA	Cross-sectional	3 service lines in 1 hospital	4/low	RN turnover externally/19.4% (3 services lines, annual turnover) 18.5% (total annual turnover rate)	RN turnover cost, total turnover cost (NTCCM [Jones, 1990])	RN, hospital/descriptive	RN turnover cost ranged from $62,100 to $67,100. Total nurse turnover cost for the 3 services lines raged from $5.9 million to $6.4 million.
Jones (2008), USA	Cross-sectional	3 service lines in 1 hospital	4/low	RN turnover externally/19.4% (3 services lines, annual turnover) 18.5% (total annual turnover rate)	RN turnover cost, total turnover cost (NTCCM [Jones, 1990] adjusted by CPI)	RN, hospital/descriptive	RN turnover cost ranged from $82,000 to $88,000. Total nurse turnover cost for the 3 services lines raged from $7,875,000 to $8,449,000.

(Continues)

TABLE 1 (Continued)

Authors (year), country	Study design	Sample	Quality score/quality	Measures/mean values of nurse turnover	Measures of outcomes (instruments)	Unit of analysis /data analysis	Main findings ($p < 0.05$)
Kim (2016), South Korea	Cross-sectional	2 nurses in 1 hospital	3/low	Not reported	RN turnover cost (NTCCM [Jones, 2004])	RN/descriptive	Turnover costs were 8,111,163 in KRW consisting of 25.14% of nurses' average annual income. The costs spent for the experienced nurse were 2.27 times less than the novice nurse.
Leitão et al. (2017), Brazil	Cross-sectional	3 ICU, 1 hospital	6/medium	Monthly nurse turnover rate/0% (Feb), 1.72% (Mar), 2.53% (Apr)	Incidence of nonplanned extubation of endotracheal cannula, incidence of loss of nasogastric/enteral tube, incidence of skin injury, incidence of loss of central venous catheter	Nursing unit/Pearson correlation	NS relationship between nurse turnover and quality of patients' care
North & Hughes (2006), New Zealand	Cross-sectional	2 units, 1 hospital	5/medium	Annual nurse turnover rate/10.2%	Modified cost of turnover (Buchan & Seccombe, 1991)	Nursing unit/descriptive	The cost of RN turnover per nursing unit for the six-month period was just under $5,7893 in NZ$.
North et al. (2013), New Zealand	Prospective	19 units, 228 unit-months	7/medium	Annual RN turnover rate/44.3% ranged 13.7% to 90.9%	Modified cost of turnover (Buchan & Seccombe, 1991; O'Brien-Pallas et al., 2006)	RN/descriptive, Spearman's rank order correlation	Per RN turnover cost was 23,800 in NZ$. The turnover rate is negatively correlated with the percentage deviation of actual FTE below budgeted FTE.
O'Brien-Pallas et al. (2006), Australia, Canada, New Zealand, USA	Retrospective, cross-sectional	11 units	7/medium	Annual RN turnover rate/9.49% (7.4% and 11.4% for medical and surgical units, respectively)	Turnover cost (Buchan & Seccombe, 1991)	RN/descriptive	Average cost of turnover per nurse was $21,514 ranged from $10,100 to $33,062.

(Continues)

TABLE 1 (Continued)

Authors (year), country	Study design	Sample	Quality score/quality	Measures/mean values of nurse turnover	Measures of outcomes (instruments)	Unit of analysis /data analysis	Main findings ($p < 0.05$)
O'Brien-Pallas et al. (2010), Canada	Repeated cross-sectional and longitudinal	4,481 nurses, 182 units, 41 hospitals in wave 1, 3,844 nurses, 163 units, 39 hospitals in wave 2	12/high	Annual RN turnover rates/ 19.9% ranged from 13.7% (geriatrics units) to ICU (26.7%)	Nurse mental health (SF-12 mental health status [McHorney et al., 1992]), job satisfaction (McCloskey/Mueller Satisfaction Scale [Mueller & McCloskey, 1990]), medical error	Multilevel (nurse, unit levels)/random intercept hierarchical linear model, hierarchical logistic regression	Higher turnover rates were associated with deteriorated mental health ($\beta = -6.749$, $p < 0.05$) and lower job satisfaction ($\beta = -14.212$, $p < 0.05$). Higher turnover rate was associated with an increased likelihood of medical error (OR = 1.38, $p < 0.05$).
Park et al. (2014), USA	Longitudinal	10,935 unit-quarter observations, 2,294 units, 465 hospitals	8/medium	Quarterly RN turnover rate in unit/5.81% ranged from 5.41% (surgical units) to 6.14% (step-down)	Unit-acquired pressure ulcer, RN HPPD	Multilevel (unit, hospital levels)/multilevel logistic models	Higher rates of RN turnover in prior and current quarters were associated with lower levels of RN staffing in the current quarter ($\beta = -0.004$, $p < 0.001$; $\beta = -0.002$, $p = 0.0071$). The lagged effect of RN turnover on unit-acquired pressure ulcers was significant (OR = 1.004, 95% CI = 1.000–1.008). NS association between concurrent RN turnover and unit-acquired pressure ulcer.
Reilly et al. (2014), USA	Longitudinal	12 units, 1 hospital, 838 unit-month observations	6/medium	Unit-level monthly voluntary nurse turnover rates/ 0.61% ranged from 0% to 6.58%	Job demands (monthly adjusted patient days/number of nurses in unit), patient satisfaction (Hospital Consumer Assessment of Healthcare Providers and Systems, 6 items focusing on nursing services)	Nursing unit/fixed effects panel regression, panel vector autoregressive model	The effect of voluntary turnover rates on job demands ($b = 13.30$, SE = 3.23, $p < 0.001$) was positive and statistically significant. Voluntary turnover had effects on patient satisfaction through job demand, which were negative and significant.

(Continues)

TABLE 1 (Continued)

Authors (year), country	Study design	Sample	Quality score/quality	Measures/mean values of nurse turnover	Measures of outcomes (instruments)	Unit of analysis /data analysis	Main findings ($p < 0.05$)
Roche et al. (2015), Australia	Longitudinal	1,673 nurse, 62 general units, 11 hospitals	7/medium	Annual turnover rate/15.1% ranged from 12.6% to 16.7%	Turnover cost (NTCCM [Jones, 2008])	Unit/descriptive	$49,225 per FTE in Australian dollars ranged from $17,728 to $104,255.
Ruiz et al. (2016), Brazil	Exploratory and descriptive	12 inpatient units and 15 specialized units, 1 teaching hospital	5/medium	External monthly turnover rate including nurse, technician, assistant/0.98 ranged from 0.84% to 1.06%	Turnover cost (NTCCM [Jones, 2004])	Unit/descriptive	Turnover/employee cost was R$2,759.69 ranged from R$2,221.42 to R$3,073.23.
Waldman et al. (2004), USA	Cross-sectional	1 academic medical center	6/medium	No reported	Turnover cost (CoRP [lesser effectiveness of new employees compared with experienced workers] and LCs [Waldman et al., 2003])	Hospital/descriptive	Cost per nurse by phase of employment was $1,635 to hire and $15,825 to train. CoRPs for nurses were $6,027 (Pareto LC) and $14,026 (linear LC).
Winter et al. (2020), Germany	Cross-sectional	104 German hospitals	7/medium	Estimation of the average rate of fluctuation of nurse per year (annual turnover) in a hospital <5%: 33%, 6–10%: 48%, 11–15%: 15%, 16–20%: 4%, >20%: 0%	Patient satisfaction (Schwappach et al.2011)	Hospital/least-square regression	In the multivariate regression, fluctuation of nurse is significantly negatively related to patient satisfaction with nursing care ($\beta = -1.13$, $p < 0.01$).

Note: β, coefficient estimates; CI, 95% confidence interval; CoRP, cost of reduced productivity; CPI, Consumer Price Indices; FTE, full-time equivalent; ICU, intensive care unit; KRW, South Korean Won; LC, learning curves; SE, standard error; NS, nonsignificant; NTCCM, The Nursing Turnover Cost Calculation Methodology; NZ$, New Zealand dollars; OR, odds ratio; R$, Brazilian currency; RN, registered nurse; SF, short form; HPPD, hours per patient day; USA, United States of America.

Quality appraisal: 0–4 = LO, 5–9 = Med, 10–14 = HI (Cicolini et al., 2014; Cummings et al., 2008).

TABLE 2 Noneconomic impacts of nurse turnover in acute hospitals

Nurse turnover	Noneconomic impacts	Findings	Authors (year)
I. Workgroup process			
RN turnover rate (Jan–Feb)	Workgroup cohesion	Not significant	Bae et al. (2010)
RN turnover rate (Mar–Apr)	Relational coordination with other healthcare providers	Not significant	Bae et al. (2010)
RN turnover rate (Mar–Apr)	Relational coordination with physicians and pharmacists	Not significant	Bae et al. (2010)
RN turnover rate (Jan–Feb, 0% as ref, > 0% to ≦ 3.3%, > 3.3% to ≦ 4.5%, > 4.5 to ≦ 7.5%, > 7.5%)	Workgroup learning	Decreased (> 3.3% to ≦ 4.5%) Not significant (other turnover groups)	Bae et al. (2010)
II. Nurse staffing			
RN turnover in quarter	RN HPPD in the current quarters	Decreased	Park et al. (2014)
RN turnover in quarter	RN HPPD in the subsequent quarters	Decreased	Park et al. (2014)
Voluntary nurse turnover rates	Job demands (monthly adjusted patient days/number of nurses in unit)	Increased	Reilly et al. (2014)
III. Nurse outcomes			
Annual RN turnover rate	Mental health	Decreased	O'Brien-Pallas et al. (2010)
Annual RN turnover rate	Job satisfaction	Decreased	O'Brien-Pallas et al. (2010)
IV. Patient outcomes			
RN turnover rate (Jan–Feb, Mar–Apr)	Patient satisfaction	Not significant	Bae et al. (2010)
Voluntary nurse turnover rate	Patient satisfaction	Decreased	Reilly et al. (2014)
Estimation of the average rate of fluctuation of nurse per year (annual turnover)	Patient satisfaction	Decreased	Winter et al. (2020)
RN turnover rate (Jan–Feb, 0% as ref, > 0% to ≦ 3.3%, > 3.3% to ≦ 4.5%, > 4.5 to ≦ 7.5%, > 7.5%)	Patient falls	Decreased (> 0% to ≦ 3.3%) Not significant (other turnover groups)	Bae et al. (2010)
Monthly RN turnover	Patient falls	Not significant	Bae et al. (2014)
Quarterly RN turnover	Injury falls	Not significant	Bae et al. (2014)
Quarterly RN turnover	Pressure ulcer	Not significant	Bae et al. (2014)
Quarterly RN turnover	Unit-acquired pressure ulcer	Not significant	Bae et al. (2014)
Lagged quarterly RN turnover rate	Unit-acquired pressure ulcers	Increased	Park et al. (2014)
Concurrent quarterly RN turnover rate	Unit-acquired pressure ulcers	Not significant	Park et al. (2014)
RN turnover rate (Jan–Feb, 0% as ref, > 0% to ≦ 3.3%, > 3.3% to ≦ 4.5%, > 4.5 to ≦ 7.5%, > 7.5%)	Medication errors	Not significant	Bae et al. (2010)
Annual RN turnover rate	Medical errors	Increased	O'Brien-Pallas et al (2010)
RN turnover rate (Jan–Feb)	Average length of patient stay	Not significant	Bae et al. (2010)
Monthly nurse turnover	Incidence of nonplanned extubation of endotracheal cannula	Not significant	Leitão et al. (2017)
Monthly nurse turnover	Incidence of loss of nasogastric/enteral tube	Not significant	Leitão et al. (2017)
Monthly nurse turnover	Incidence of skin injury	Not significant	Leitão et al. (2017)
Monthly nurse turnover	Incidence of loss of central venous catheter	Not significant	Leitão et al. (2017)

Note: HPPD, hours per patient day; ref, reference group; RN, registered nurse.

TABLE 3 Economic (costs) impacts of nurse turnover in acute hospitals

Authors (year)	Costs per turnover	Ratio of turnover costs to salary	Total Turnover cost	Percentage for turnover cost of category
Jones (2005)	$62,100–67,100	1.2–1.3	$5.9–6.4 million	- Prehire, 80–86% (vacancy = 72–78% of total costs) - Post-hire, 14–20% (orientation/training = 8–9% of total costs)
Jones (2008)	$82,000–88,000	N/A	$7.9–8.5 million	- Prehire, 82–87% (vacancy = 70–78% of total costs) - Post-hire, 13–18% (orientation/training = 7–8% of total costs)*
Kim (2016)	8,111,163 in KRW	0.25	N/A	- Prehire, 9% (vacancy = 5% of total costs) - Post-hire, 91% (productivity of new hire = 88% of total costs)*
North and Hughes (2006)	N/A	N/A	57,893 in NZ$.	- Direct, 80% (temporary replacement costs = 70% of total cost) - Indirect, 20% (orientation/training = 18% of total costs)
North et al. (2013)	23,800 in NZ$	N/A	N/A	- Direct, 87% (temporary cover costs = 83% of total costs) - Indirect, 13% (preceptor costs = 6% of total costs)*
O'Brien-Pallas et al. (2006)	$21,514	N/A	N/A	- Direct, 29% (temporary replacement = 20% of the total costs) - Indirect, 71% (productivity of new hire = 45% of the total costs)*
Roche et al. (2014)	$49,225 per FTE in Australian dollars	N/A	N/A	- Direct, 49% (temporary replacement = 44% of the total costs) - Indirect, 51% (termination = 25% of the total costs)
Ruiz et al. (2016)	R$2,759.69	3	R$314,605.62	- Prehire, 32% (vacancies = 30% of the total costs) - Post-hire, 68% (decreased productivity of newly hired professional = 64% of the total costs)
Waldman et al. (2004)	$23,487 (Pareto LC) –31,486 (linear LC)	N/A	$6,130,107-$8,217,846	- To hire, 5–7% - To train, 50–67% - CoRP, 26%-45%*

Note: CoRP, cost of reduced productivity; FTE, full-time equivalent; KRW, South Korean Won; LC, learning curves; N/A, not applicable; NZ$, New Zealand dollars; R$, Brazilian currency.
*Calculated by the author based on the cost of each category reported in the article.

to 4.58% (Bae et al., 2010) for two months. The quarterly turnover rate was between 5% and 6% (Bae et al., 2014; Park et al., 2014).

The outcome measures, impacts of nurse turnover, included workgroup processes (e.g., workgroup learning) (Bae et al., 2010), nurse staffing (hours per patient day [HPPD] of RN), job demands (measured by monthly adjusted patient days divided by the number of nurses) (Park et al., 2014; Reilly et al., 2014), and nurse outcomes (e.g., job satisfaction) (O'Brien-Pallas et al., 2010). The outcome measures also included patient outcomes, which are patient satisfaction, patient falls, pressure ulcers, medication errors, medical errors, average length of patient stay, nonplanned extubation of the endotracheal cannula, loss of nasogastric or enteral tube, skin injury, and loss of central venous catheter (Bae et al., 2010, 2014; Leitão et al., 2017; O'Brien-Pallas et al., 2010; Park et al., 2014; Reilly et al., 2014; Winter et al., 2020). Nine studies (Jones, 2005, 2008; Kim 2016; North & Hughes 2006; North et al., 2013; O'Brien-Pallas et al., 2006; Roche et al., 2015; Ruiz et al., 2016; Waldman et al., 2004) measured the costs of turnover as an outcome.

Impacts of nurse turnover

The impacts of nurse turnover were categorized into the noneconomic impacts (workgroup processes, nurse staffing, nurse outcomes, and patient outcomes), and the economic impact of nurse turnover (costs).

Workgroup processes

Bae and colleagues (2010) examined workgroup processes as an impact of RN turnover. They defined the workgroup process as workgroup cohesion (Sauter et al., 1997), relational coordination (Gittell, 2002), and workgroup learning (Rybowiak et al., 1999). RN turnover was significantly related to workgroup learning alone (Table 2). Compared with nursing units with 0% RN turnover for two months, nursing units with higher turnover rates (3.3%–4.5%) reported a decrease in workgroup learning ($\beta = -0.183$, $p < 0.01$).

Nurse staffing

Two studies (Park et al., 2014; Reilly et al., 2014) investigated the effects of RN turnover on nurse staffing (Table 2), which they measured as RN HPPD and job demands. Both studies found that when RN turnover increased, RN HPPD decreased (lagged RN turnover: $\beta = -0.004$, $p < 0.001$; concurrent RN turnover: $\beta = -0.002$, $p = 0.0071$) and an increase in job demands ($b = 13.30$, standard error [SE] = 3.23, $p < 0.001$), indicating that nurses take care of more patients.

Nurse outcomes

O'Brien-Pallas et al. (2010) examined the annual RN turnover's effects on several nurse outcomes, including mental health (McHorney et al., 1992) and job satisfaction (Mueller & McCloskey, 1990) (Table 2). They found a negative relationship between the annual RN turnover rate and nurses' mental health ($\beta = -6.749$, $p < 0.05$) and job satisfaction ($\beta = -14.212$, $p < 0.05$).

Patient outcomes

Regarding patient outcomes, seven studies (Bae et al., 2010, 2014; Leitão et al., 2017; O'Brien-Pallas et al., 2010; Park et al., 2014; Reilly et al., 2014; Winter et al., 2020) examined patient satisfaction (Bacon & Mark, 2009; Schwappach et al., 2011), patient falls including injury falls, unit-acquired ulcers and total pressure ulcers, medication errors, medical errors, average length of patient stay, nonplanned extubating of endotracheal cannula, loss of nasogastric or enteral tube, skin injury, and loss of central venous catheter (Table 2). Among the 17 relationships between RN turnover and patient outcomes, only five were significant. Voluntary turnover negatively and significantly affected patient satisfaction through job demands (Reilly et al., 2014). Annual turnover was negatively related to patient satisfaction with nursing care ($\beta = -1.13$, $p < 0.01$) (Winter et al., 2020). RN turnover rates were negatively related to patient falls (Bae et al., 2010). Nursing units that reported lower turnover rates (ranging from 0% to 3.3%) for two months were related to fewer patient falls compared with nursing units reporting a zero turnover rate ($\beta = -0.297$, $p < 0.05$). When lagged quarterly RN turnover rates increased, unit-acquired pressure ulcers increased (odds ratio [OR] = 1.004, 95% confidence interval = 1.000–1.008) (Park et al., 2014). Annual RN turnover rates were related to increased medical errors (OR = 1.38, $p < 0.05$) (O'Brien-Pallas et al., 2010).

Costs of turnover

The costs of turnover are presented in Table 3. All nine studies examined these using descriptive statistical analyses for calculation and estimation of nurse turnover costs. One study (Jones, 2008) used data collected in a previous study (Jones, 2005) adjusted for inflation. The total turnover costs were most often calculated using the Nursing Turnover Cost Calculation Methodology (NTCCM) (Jones, 1990, 2004, 2008) in five studies (Jones, 2005, 2008; Kim, 2016; Roche et al., 2015; Ruiz et al., 2016) and the method employed by Buchan and Seccombe (1991) in three studies (North & Hughes, 2006; North et al., 2013; O'Brien-Pallas et al., 2006). Waldman et al. (2004) used learning curves (Waldman et al., 2003) to ascertain the costs of reduced productivity (CoRP) in terms of turnover cost, which included Pareto and linear learning curves.

The costs per nurse turnover calculated from $21,514 to $88,000 in the USA (Jones, 2005, 2008; O'Brien-Pallas et al., 2006; Waldman et al., 2004). For studies in other countries, the cost per turnover varied as follows: 8,111,163 South Korean Won (KRW) (Kim, 2016); 23,800 New Zealand dollars (NZ$) (North et al., 2013); $49,225 Australian dollars (Roche et al., 2015); and $2,759.69 in Brazilian currency (R) (Ruiz et al., 2016). Jones (2005) reported that the turnover cost per person was 1.2 to 1.3 times the average salary for nurses. Ruiz et al. (2016) found that the turnover cost was three times the average salary of nurses. Meanwhile, Kim (2016) reported that the turnover cost per person was 25.14% of the salary of the nursing staff. In the USA, the total turnover cost ranged from $5.9 million to 8.5 million (Jones, 2005, 2008; Waldman et al., 2004). North and Hughes (2006) reported NZ$57,893, and Ruiz et al. (2016) reported R$314,605.62 as the total turnover cost.

Four studies (Jones, 2005; North & Hughes 2006; Roche et al., 2015; Ruiz et al., 2016) reported the percentage of each cost category. Five studies (Jones, 2008; Kim, 2016; North et al., 2013; O'Brien-Pallas et al., 2006; Waldman et al., 2004) reported the turnover cost of each category. Based on that information, the percentage of each cost category was calculated for this review. Four studies (Jones, 2005, 2008; Kim 2016; Ruiz et al., 2016) categorized the costs of turnover into pre- and post-hire costs, and another four studies (North & Hughes 2006; North et al., 2013; O'Brien-Pallas et al., 2006; Roche et al., 2015) categorized them into direct and indirect costs. Prehire costs were considered to be direct costs, and post-hire costs were considered to be indirect costs (Jones, 2005). One study (Waldman et al., 2004) categorized the turnover cost into hiring, training, and CoRP. Four studies (Jones, 2005, 2008; North & Hughes 2006; North et al., 2013) reported that the prehire or direct costs consisted of more than 50% of the total costs, ranging from 80% to 87%. Five other studies (Kim 2016; O'Brien-Pallas et al., 2006; Roche et al., 2015; Ruiz et al., 2016; Waldman et al., 2004) reported that the prehire or direct costs consisted of less than 50% of the total costs, ranging from 5% to 49%. Five studies (Jones, 2005, 2008; North & Hughes, 2006; North et al., 2013; Roche et al., 2015) found that vacancy or temporary replacement costs constituted the largest cost category, ranging from 44% to 83%. Three studies (Kim, 2016; O'Brien-Pallas et al., 2006; Ruiz et al., 2016) found that the cost related to the productivity of newly hired nurses constituted the largest cost category, ranging from 45% to 88%. One study (Waldman et al., 2004) found that training costs constituted the largest cost category.

DISCUSSION

This review examined 16 articles on the impact of nurse turnover. The noneconomic and economic cost of nursing turnover was the focus of the reviewed studies. The findings of this review were in line with a previous review by Halter and colleagues (2017). Only seven studies examined the

impacts of nurse turnover, other than the costs. More studies are needed to examine the noneconomic impacts of nurse turnover from different aspects, including the care process and nurse and patient outcomes. Although the exact impacts of nurse turnover are difficult to determine, four of the seven studies that examined the impact of turnover partially found them to be negative in nurse staffing, nurse outcomes, and patient outcomes, which has been supported by a previous review (Hayes et al., 2012). More evidence is needed to determine the noneconomic impacts of nurse turnover.

The studies included used different conceptualizations and measures of turnover. Several of them measured RN unit turnover based on nurse turnover data collected at the nursing unit level, which could include both internal and external turnover. The duration of the turnover measures varied from one month to three months. Those studies examined workgroup processes, nurse staffing, and patient outcomes as impacts of turnover. Two studies used hospital-level annual turnover rates to evaluate nurse and patient outcomes. Three studies that examined the costs of turnover focused on external turnover, which refers to nurses leaving the hospital during the study period. Other studies on turnover costs included both internal and external turnover. This heterogeneity creates inconsistency in the measures of nurse turnover (e.g., duration, level, and internal/external) and creates difficulties in comparing turnover rates across studies. This finding is corroborated by a previous review (Halter et al. 2017). Future studies need to develop appropriate measures to evaluate each impact of nurse turnover and provide an appropriate rationale for those measures.

Three of the studies in this review were determined to be of weak quality, and 12 were rated as being of medium quality. Only one study was rated as being of high quality. The scores of sampling, measurement of dependent variables, and statistical analysis items in the quality assessment were low (Supplementary Table S1). Only four studies used probability sampling. Six studies that examined the costs of turnover were conducted at a one setting, as opposed to multiple sites. A previous review of nursing turnover costs also found that the studies were mostly conducted in a hospital and used relatively small sample sizes (Li & Jones, 2013). Small sample sizes reduce the generalizability of the study findings because each hospital might have different nurse turnover rates and related costs. Thus, studies with a sufficiently large sample size should be conducted.

Regarding the noneconomic impacts of nurse turnover, reviewed studies found a partial negative impact of nurse turnover on nurse staffing, nurse outcomes, and patient outcomes. Although it is important to understand the underlying mechanisms of these impacts, only few studies have examined these relationships in detail. The underlying mechanisms were explained by workgroup processes, job demands measured by dividing the patient days by the number of nurses, and RN staffing levels as a mediator of the relationship of RN turnover with patient outcomes. This underlying mechanism of turnover–outcome relationships was partially supported. The relationship between turnover and outcome can be explained by work conditions (Bae et al., 2021). High turnover can create poor work conditions that might be detrimental to the patient quality of care and their safety. Such poor quality of care can lead to additional turnover among nurses (Nelson-Brantley et al., 2018). Poor quality of care is harmful to patients and creates unnecessary healthcare expenditures. Future studies should focus on examining not only nurse turnover–outcome relationships but also the underlying theoretical and empirical mechanisms of those relationships.

Another consideration suggested by researchers (Bae et al., 2010) regarding the impact of nurse turnover is the use of a moderator. Moderating and mediating variables are distinct concepts. Workgroup processes and nurse staffing can be mediating variables that explain the underlying mechanism of the relationship between turnover and outcomes. On the other hand, the moderating variables can find the strength of the turnover–outcome relationship. When researchers examine the turnover–outcome relationship, moderating variables can provide further insight on the characteristics of nursing units with the highest risk for turnover. Future research needs to include moderators to determine more precise impacts of nurse turnover.

Regarding the costs of nurse turnover, eight studies categorized those costs into pre- and post-hire costs, or direct and indirect costs. Like the review by Halter et al. (2017), this systematic review found that the costs related to the orientation and training of new nurses and unfilled positions/vacancy comprised the largest proportion of expenses in nursing turnover. The total turnover costs were calculated using the NTCCM in five studies and Buchan and Seccombe's (1991) method in three studies. The NTCCM presents evidence for categorizing turnover costs for healthcare providers, though it might not include all costs related to turnover. This approach was developed for North America and quantifies turnover costs in acute hospitals. Thus, it is necessary to examine its validity and modify it for, and apply it to, different settings and geographic areas (Kim, 2016).

The costs of nurse turnover were examined in five countries: the USA, South Korea, New Zealand, Australia, and Brazil. One study examined the costs of nurse turnover in multiple countries. Compared with a previous review regarding the costs of nurse turnover (Li & Jones, 2013), this review found more studies conducted in countries other than the USA. However, the number of studies examining the costs of nurse turnover remains limited (Ruiz et al., 2016). Most of the studies reviewed here are the only ones to assess nurse turnover costs in each country with smaller samples. Thus, more studies on the costs of nurse turnover should be conducted with larger samples. International studies provide an opportunity to compare the nurse turnover costs in countries with different currencies and financial situations.

This review has several limitations. Although efforts were made to include all studies examining the relevant research questions, the search terms and databases used in this review may not include all of them. Additionally, published studies can overreport significant findings. Reporting bias should be considered when we interpret the findings of this review. As

this review focused on the impacts of nurse turnover in acute hospitals, other reviews with this research question should be conducted for other settings, including long-term care settings.

CONCLUSIONS

In conclusion, this review found 16 articles that examined the impacts of nurse turnover in acute hospitals. Most studies on nursing turnover investigated economic costs, and seven of them examined the noneconomic impacts of nurse turnover, which included workgroup processes, nurse staffing, nurse outcomes, and patient outcomes. Based on the small number of studies, it is difficult to determine the noneconomic impacts. This review did find a negative impact of nurse turnover on nurse staffing and nurse outcomes. However, the negative relationships of nurse turnover with workgroup process and patient outcomes were only partially supported. As previous reviews have found, nursing turnover is costly. Future research should examine both the noneconomic and economic impacts of nurse turnover and the underlying mechanisms of the nurse turnover and outcome relationship.

Implications for nursing and health policy

This review found the negative impacts of nurse turnover on the care process and outcomes in acute hospitals. Based on the costs of nurse turnover in the USA, South Korea, New Zealand, Australia, and Brazil, nurse turnover was very costly: up to three times the average salary of nurses. This review's findings provide empirical evidence about the noneconomic and economic impacts of nurse turnover and emphasize the significance of devising prevention strategies and policies to address nurse turnover. Healthcare institutes and national and local health departments need to make efforts to prevent and reduce nurse turnover. Creating a positive work environment will help in reducing nurse turnover. Further studies need to evaluate nurse-retention strategies and continue estimating the costs of nurse turnover, specifically the noneconomic impact of nurse turnover in acute care hospitals and other healthcare settings. A better understanding of the noneconomic and economic impacts of nurse turnover and retention strategies can increase hospital competency to provide quality nursing care and, thus, improve patient safety.

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AUTHOR CONTRIBUTION

Study design: SHB; data collection: SHB; data analysis: SHB; study supervision: SHB; manuscript writing: SHB; critical revisions for important intellectual content: SHB.

ETHICS STATEMENT

As the current review did not use human subjects, an approval from the institutional review board of Ewha Womans University was not applicable.

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REFERENCES

Bacon, C. T., & Mark, B. (2009). Organizational effects on patient satisfaction in hospital medical-surgical units. *Journal of Nursing Administration*, 39, 220–227. https://doi.org/10.1097/NNA.0b013e3181a23d3f

Bae, S.-H., Cho, M., Kim, O., Pang, Y., Cha, C., Jung, H., Kim, S., & Jeong, H. (2021). Predictors of actual turnover among nurses working in Korean hospitals: A nationwide longitudinal survey study. *Journal of Nursing Management*, 29(7), 2102–2114. https://doi.org/10.1111/jonm.13347

Bae, S.-H., Kelly, M., Brewer, C. S., & Spencer, A. (2014). Analysis of nurse staffing and patient outcomes using comprehensive nurse staffing characteristics in acute care nursing units. *Journal of Nursing Care Quality*, 29, 318–326. https://doi.org/10.1097/NCQ.0000000000000057.

Bae, S.-H., Mark, B., & Fried, B. (2010). Impact of nursing unit turnover on patient outcomes in hospitals. *Journal of Nursing Scholarship*, 42, 40–49. https://doi.org/10.1111/j.1547-5069.2009.01319.x

Boyle, D., Wallace, D., Andrews, J. L., Johnson, M. S., Bates, M., Edenfield, S. M., Carr, R., Campbell, L., Hamilton, B. K., & Taunton, R. L. (1997). Psychometric evaluation of the organizational job satisfaction scale. *Journal of Nursing Measurement*, 5, 53–69.

Buchan, J., & Seccombe, I. (1991). Nurse turnover costs. *Health Manpower Management*, 17, 23–25.

Cicolini, G., Comparcini, D., & Simonetti, V. (2014). Workplace empowerment and nurses' job satisfaction: A systematic literature review. *Journal of Nursing Management*, 22, 855–871. https://doi.org/10.1111/jonm.12028

Cohn, E., & Geske, T. G. (1990). The economics of education. e-book. http://books.google.com/books?id=EHCdAAAAMAAJ

Cooper, H. (1989). *Integrating research: A guide for literature reviews*. Sage.

Cummings, G., Lee, H., Macgregor, T., Davey, M., Wong, C., Paul, L., & Stafford, E. (2008). Factors contributing to nursing leadership: A systematic review. *Journal of Health Services Research & Policy*, 13, 240–248. http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2010077645&site=ehost-live

Duffield, C. M., Roche, M. A., Homer, C., Buchan, J., & Dimitrelis, S. (2014). A comparative review of nurse turnover rates and costs across countries. *Journal of Advanced Nursing*, 70, 2703–2712. https://doi.org/10.1111/jan.12483

Falatah, R. & Salem, O. A. (2018). Nurse turnover in the Kingdom of Saudi Arabia: An integrative review. *Journal of Nursing Management*, 26, 630–638. https://doi.org/10.1111/jonm.12603

Gittell, J. H. (2002). Coordinating mechanisms in care provider groups: Relational coordination as a mediator and input uncertainty as a moderator of performance effects. *Management Science*, 48, 1408–1426. https://doi.org/10.1287/mnsc.48.11.1408.268

Halter, M., Halter, M., Boiko, O., Pelone, F., Beighton, C., Harris, R., Gale, J., Gourlay, S., & Drennan, V. (2017). The determinants and consequences of adult nursing staff turnover: A systematic review of systematic reviews. *BMC Health Services Research*, 17, 824. https://doi.org/10.1186/s12913-017-2707-0

Hayes, L. J., O'Brien-Pallas, L., Duffield, C., Shamian, J., Buchan, J., Hughes, F., Laschinger, H. K. S., & North, N. (2012). Nurse turnover: A literature

review: An update. *International Journal of Nursing Studies*, 49, 887–905. https://doi.org/10.1016/j.ijnurstu.2011.10.001

Hospital Nurses Association. (2019). A survey on hospital nursing staffing 2018. Business report for Hospital Nurses Association. https://khna.or.kr/home/pds/utilities.php?bo_table=board1&wr_id=8052

International Council of Nurses (2019). ICN International Workforce Forum calls for urgent action from governments to address global nursing shortage. https://www.icn.ch/news/icn-international-workforce-forum-calls-urgent-action-governments-address-global-nursing#:~:text=Geneva%2C%20Switzerland%3B%204%20March%202019,nurses%20who%20care%20for%20them

Jones, C. B. (1990). Staff nurse turnover costs: Part II. measurements and results. *Journal of Nursing Administration*, 20, 27–32.

Jones, C. B. (2004). The costs of nurse turnover: Part 1: an economic perspective. *Journal of Nursing Administration*, 34, 562–570. https://doi.org/10.1097/00005110-200412000-00006

Jones, C. B. (2005). The costs of nurse turnover: Part 2: application of the nursing turnover cost calculation methodology. *Journal of Nursing Administration*, 35, 41–49. https://doi.org/10.1097/00005110-200501000-00014

Jones, C. B. (2008). Revisiting nurse turnover costs: Adjusting for inflation. *Journal of Nursing Administration*, 38, 11–18. https://doi.org/10.1097/01.NNA.0000295636.03216.6f.

Kerzman, H., Van Dijk, D., Siman-Tov, M., Friedman, S., & Goldberg, S. (2020). Professional characteristics and work attitudes of hospital nurses who leave compared with those who stay. *Journal of Nursing Management*, 28(6), 1364–1371. https://doi-org-ssl.access.ewha.ac.kr/10.1111/jonm.13090

Kim, M. (2016). Nurse turnover costs: A medium-sized hospital case. *Asia-pacific Journal of Multimedia Services Convergent with Art, Humanities, and Sociology*, 6, 41–49. https://doi.org/10.35873/ajmahs.2016.6.8.005

Leitão, I. M. T. A., de Sousa, F. S. P., dos Santos Santiago, J. C., Bezerra, I. C., & de Morais, J. B. (2017). Absenteeism, turnover, and indicators of quality control in nursing care: A transversal study. *Online Brazilian Journal of Nursing*, 16, 119–129. https://doi.org/10.17665/1676-4285.20175623

Li, Y., & Jones, C. B. (2013). A literature review of nursing turnover costs. *Journal of Nursing Management*, 21, 405–418. https://doi.org/10.1111/j.1365-2834.2012.01411.x

McDermid, F., Judy, M., & Peters, K. (2020). Factors contributing to high turnover rates of emergency nurses: A review of the literature. *Australian Critical Care*, 33, 390–396. https://doi.org/10.1016/j.aucc.2019.09.002

McGrath, J. E. (1964). Social psychology, a brief introduction. Holt, Rinehart and Winston.

McHorney, C. A., Ware, J. E., Rogers, W., Raczek, A. E., Lu, J. F. (1992). The validity and relative precision of MOS short- and long-form health status scales and Dartmouth COOP charts. Results from the Medical Outcomes Study. *Medical Care*, 30, Ms253–265. https://doi.org/10.1097/00005650-199205001-00025

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *BMJ*, 339, b2535. https://doi.org/10.1136/bmj.b2535

Mueller, C. W., & McCloskey, J. C. (1990). Nurses' job satisfaction: A proposed measure. *Nursing Research*, 39, 113–117.

Nelson-Brantley, H. V., Park, S. H., & Bergquist-Beringer, S. (2018). Characteristics of the nursing practice environment associated with lower unit-level RN turnover. *Journal of Nursing Administration*, 48(1), 31–37. https://doi.org/10.1097/NNA.0000000000000567

North, N., & Hughes, F. (2006). Methodological challenges to researching nursing turnover in New Zealand: A progress report of a national study. *Asia Pacific Journal of Health Management*, 1, 45–51.

North, N., Leung, W., Ashton, T., Rasmussen, E., Hughes, F., & Finlayson, M. (2013). Nurse turnover in New Zealand: Costs and relationships with staffing practises and patient outcomes. *Journal of Nursing Management*, 21, 419–428. https://doi.org/10.1111/j.1365-2834.2012.01371.x

Nyberg, A. J., & Ployhart, R. E. (2013). Context-emergent turnover (CET) theory: A theory of collective turnover. *The Academy of Management Review*, 38, 109–131. https://doi.org/10.5465/amr.2011.0201

O'Brien-Pallas, L., Doran, D. I., Murray, M., & Cockerill, R. (2001). Evaluation of a client care delivery model: Part 1: Variability in nursing utilization in community home nursing. *Nursing Economics*, 19, 267–276.

O'brien-Pallas, L., Griffin, P., Shamian, J., Buchan, J., Duffield, C., Hughes, F., Laschinger, H. K. S, North, N., & Stone, P. W. (2006). The impact of nurse turnover on patient, nurse, and system outcomes: A pilot study and focus for a multicenter international study. *Policy Politics Nursing Practice*, 7, 169–179. https://doi.org/10.1177/1527154406291936

O'brien-Pallas, L., Murphy, G.T., Shamian, J., Li, X., & Hayes, L. J. (2010). Impact and determinants of nurse turnover: A pan-Canadian study. *Journal of Nursing Management*, 18, 1073–1086. https://doi.org/10.1111/j.1365-2834.2010.01167.x

Park, S. H., Boyle, D. K., Bergquist-Beringer, S., Staggs, V. S., & Dunton, N. E. (2014). Concurrent and lagged effects of registered nurse turnover and staffing on unit-acquired pressure ulcers. *Health Services Research*, 49, 1205–1225. https://doi.org/10.1111/1475-6773.12158

Reilly, G., Nyberg, A. J., Maltarich, M., & Weller, I. (2014). Human capital flows: Using context-emergent turnover (CET) theory to explore the process by which turnover, hiring, and job demands affect patient satisfaction. *Academy of Management Journal*, 57, 766–790. https://doi.org/10.5465/amj.2012.0132

Roche, M. A., Duffield, C. M., Homer, C., Buchan, J., & Dimitrelis, S. (2015). The rate and cost of nurse turnover in Australia. *Collegian*, 22, 353–358. https://doi.org/10.1016/j.colegn.2014.05.002

Ruiz, P. B. O., Perroca, M. G., & Jericó, M. C. (2016). Cost of nursing turnover in a teaching hospital. *Revista da Escola de Enfermagem da USP*, 50, 101–108. https://doi.org/10.1590/S0080-623420160000100014

Rybowiak, V., Garst, H., Frese, M., & Batinic, B. (1999). Error orientation questionnaire (EOQ): Reliability, validity, and different language equivalence. *Journal of Organizational Behavior*, 20, 527–547. https://doi.org/10.1002/(SICI)1099-1379(199907)20:4<527:AID-JOB886>3.0.CO;2-G

Schwappach, D. L., Frank, O., & Hochreutener, M. A. (2011). 'New perspectives on well-known issues': Patients' experiences and perceptions of safety in Swiss hospitals. *Zeitschrift fur Evidenz, Fortbildung und Qualitat im Gesundheitswesen*, 105, 542–548. https://doi.org/10.1016/j.zefq.2010.07.002

Tang, J. H., & Hudson, P. (2019). Evidence-based practice guideline: Nurse retention for nurse managers. *Journal of Gerontological Nursing*, 45(11), 11–19. https://doi.org/10.3928/00989134-20191011-03

Thomas, A. O., Bakas, T., Miller, E., Johnson, K., & Cooley, H. (2022). Burnout and turnover among NICU nurses. *The American Journal of Maternal Child Nursing*, 47(1), 33–39. https://doi.org/10.1097/NMC.0000000000000780

Waldman, J. D., Kelly, F., Arora, S., & Smith, H. L. (2004). The shocking cost of turnover in health care. *Health Care Management Review*, 29, 2–7. https://doi.org/10.1097/00004010-200401000-00002

Waldman, J. D., Yourstone, S. A., & Smith, H. L. (2003). Learning curves in health care. *Health Care Management Review*, 28, 41–54. https://doi.org/10.1097/00004010-200301000-00006

Winter, V., Schreyögg, J., & Thiel, A. (2020). Hospital staff shortages: Environmental and organizational determinants and implications for patient satisfaction. *Health Policy*, 124, 380–388. https://doi.org/10.1016/j.healthpol.2020.01.001

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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