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REVIEW

A systematic review of the association between nursing staff and nursing-sensitive outcomes in long-term institutional care

Astrid Tuinman¹ | Mathieu H. G. De Greef² | Evelyn J. Finnema³ | Petrie F. Roodbol³

¹Department of Health and Well-being, Windesheim University of Applied Sciences, Zwolle, The Netherlands

²Human Movement Sciences, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands

³Department of Health Science, Section of Nursing Research, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands

Correspondence

Astrid Tuinman, Department of Health and Well-being, Windesheim University of Applied Sciences, Campus 2, 8017 CA Zwolle, The Netherlands.
Email: a.tuinman@windesheim.nl

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Abstract

Aims: To examine the association between type of nursing staff and nursing-sensitive outcomes in long-term institutional care.

Design: This systematic review included studies published in English, German, and Dutch between January 1997 and January 2020.

Data sources: The databases Medline (PubMed), CINAHL, PsycINFO, Embase, and the Cochrane Library were searched. Original quantitative studies were included.

Review methods: The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines were followed. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was used to critically appraise the reporting of the studies.

Results: Fifteen articles were included. Of 33 quality of care outcomes, 21 were identified as nursing-sensitive outcomes of which 13 showed a significant association with nursing staff, specifically: Activities of daily living, aggressive behavior, bladder/bowel incontinence, contractures, expressive language skills, falls, infection (including vaccination), range of motion, pain, pressure ulcers, and weight loss. However, studies reported inconsistent results regarding the association among RNs, LPNs, CNAs, and HCAs and these nursing-sensitive outcomes, evidence shows that more RNs have a positive impact on nursing-sensitive outcomes. As to the evidence regarding the other type of nursing staff, especially HCA, findings regularly showed a negative association.

Conclusion: Future research should be expanded with structure and process variables of which the mediating and moderating effect on nursing-sensitive outcomes is known. These may explain variances in quality of care and guide quality improvement initiatives. Researchers should consider fully applying Donabedian's structure-process-outcomes framework as it is a coherent entirety for quality assessment.

Impact: This review provides an overview of quality of care outcomes that are responsive to nursing interventions in long-term institutional care. As the effects can be monitored and documented, quality assessment should focus on these nursing-sensitive outcomes. The inconclusive results make it difficult to provide recommendations on who should best perform which care.

KEYWORDS

literature review, long-term care, nursing homes, nursing outcomes, nursing staff, outcome assessment (health care), skill mix, standardized nursing terminology, systematic review

1 | INTRODUCTION

Worldwide, there are concerns about the appropriate number and composition of nursing staff to provide care that meets quality criteria such as patient safety and patient centeredness (Organization for Economic Co-operation and Development [OECD], 2016). Where number refers to the amount of nursing staff, composition refers to the staff mix (e.g., registered nurses and nursing assistants) that is often related to the educational level and licensure of staff (Dellefield et al., 2015; Van den Heede et al., 2007).

To ensure quality of care in long-term institutional care, minimum nursing staff standards have been established in several countries (Harrington et al., 2012) including the Netherlands (The National Health Care Institute, 2017a, 2017b). Despite these important preconditions (Harrington et al., 2016), an increase in the number of nursing staff does not necessarily lead to better quality of care (Hamers et al., 2016; Harrington et al., 2016). Inadequacies in quality of care in long-term institutional care are also associated with the staff mix (Dellefield et al., 2015).

Long-term institutional care (LTIC) refers to nursing and residential care facilities that provide a combination of accommodation, intensive care, and support with psychosocial functioning for older people (OECD, 2019). When people are admitted, they generally stay there until the end of their lives. In LTIC, approximately 70% of the nursing staff are less educated staff such as certified nursing assistants or nurse aides who provide the majority of hands-on care (OECD, 2019).

Due to the growing numbers of older adults and governmental policies that promote home-based care, LTIC has evolved into high acuity settings (OECD, 2019). Residents experience an increasing number of severe physical and cognitive limitations (OECD/European Commission, 2013) and their care concerns physical, psychological, social, and environmental needs (Toot et al., 2017; Verbeek-Oudijk, & Van Campen, 2017). Furthermore, the average length of stay has reduced, varying from 9 (Stevenson, & Roberts, 2012) to 18 months (Hoben et al., 2019; Stevenson & Roberts, 2012). These developments have intensified the work of nursing staff and affect the staff qualifications that are needed (OECD, 2019).

Reviews about the association between nurse staffing and quality of care in LTIC show mixed results regarding specific types of nursing staff (e.g., registered nurses, nursing assistants) and better or worse quality of care outcomes (Backhaus et al., 2014; Castle, 2008; Spilsbury et al., 2011). For example, a positive, negative, or no association was determined for registered nurses (RN) and licensed practical nurses (LPN) with the quality outcomes of catheter use, restraint use, and hospitalization (Backhaus et al., 2014; Spilsbury et al., 2011). These mixed results may be related to methodological considerations such as study design or sample size of included studies (Backhaus et al., 2014; Castle, 2008; Spilsbury et al., 2011), or to the selection of quality outcomes. Selected outcomes may be to a greater or lesser extent sensitive to nursing care in general and/

or specific staff types depending on their scope of practice (Castle, 2008; Moorhead et al., 2018).

Considering the worldwide shortage of nursing personnel (Drennan, & Ross, 2019) and concerns about quality of care in LTIC, it is important to understand which outcomes are specifically sensitive to nursing interventions and, therefore, for which nursing staff can be held accountable and thus can be impacted by nurse staffing levels. This review adds to previous research by providing an overview of the contribution of different types of nursing staff to nursing-sensitive outcomes in LTIC.

1.1 | Background

A well-known and much quoted approach to assess quality of care is the conceptualization into structure-process-outcome by Donabedian (2003) that guided this review. Structure encompasses the characteristics of the setting in which care occurs, including human (e.g., personnel), physical (e.g., equipment), and organizational (e.g., budget resources) factors needed to provide it (Donabedian, 1988, 2003). Process refers to what occurs while providing care. It comprises technical and interpersonal competencies of nursing staff in implementing the interventions that are necessary to establish care outcomes based on residents' care needs. Outcomes are the effects of the provided care on the residents' health status. Concerning quality assessment, preexisting knowledge should be available regarding the relationship between structure and process, as well as between process and outcome. Only then will a good structure set the condition for good outcomes, and the care provided will be responsible for the observed outcomes (Donabedian, 1988, 2003). Translated to this review, this means that nursing staff perform interventions within their scope of practice that aim to achieve care outcomes that result from their interventions, also called nursing-sensitive outcomes.

The Nursing Outcomes Classification (NOC), a research-based standardized language for nursing outcomes (Moorhead et al., 2018), was adopted for this review. A nursing-sensitive patient outcome is described in the NOC as an individual, family, or community state, behavior, or perception that is measured through indicators along a continuum in response to nursing care (Moorhead et al., 2018). The NOC describes labels and definitions of outcomes that are sensitive for nursing interventions and provides a categorization into domains, classes, outcomes, and indicators (Moorhead et al., 2018). Thus, in this review, the structural (independent) variables concerned the type of nursing staff and the outcome (dependent) variables regarded nursing-sensitive outcomes. Research questions included:

- Which quality outcomes described in studies can be identified as nursing-sensitive outcomes?
- What is the association between the type of nursing staff and nursing-sensitive outcomes?

2 | THE REVIEW

2.1 | Aims

The aim of this systematic review was to synthesize the evidence of the association between the type of nursing staff and nursing-sensitive outcomes to assess their impact on quality of care in LTIC. The results of this review may support managers in optimizing the deployment of nursing staff to enhance quality of care.

2.2 | Design

This systematic review adhered to the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) (Moher et al., 2015). The study protocol is registered in the International Prospective Register of Systematic Reviews (PROSPERO; registration number CRD42020189668).

2.3 | Search methods

2.3.1 | Inclusion and exclusion criteria

Studies were eligible if they (1) examined the association between nursing staff in LTIC and nursing-sensitive outcomes, (2) were written in English, German, or Dutch, (3) were published in peer reviewed journals, and (4) described quantitative original research. Excluded were literature reviews, letters to editors, reports, book chapters, and doctoral dissertations.

LTIC is defined as facilities that provide accommodation and long-term care services for older people with moderate-to-severe functional and cognitive limitations (OECD, 2019). In this review, this includes nursing homes, residential care, and assisted living. Excluded were hospital-based nursing homes and specialized skilled facilities such as hospices or rehabilitation units as they are fundamentally different in terms of staffing and resident population (Konetzka et al., 2008).

Nursing staff is defined as paid LTIC staff who provide direct care, assistance with activities of daily living (ADL), and other personal support (OECD, 2019). Nursing staff can be expressed in *type* and *number* (Arling, & Mueller, 2014). *Types* of staff included are registered nurses (RNs), licensed practical/vocational nurses (LPNs/LVNs), certified nursing assistants (CNAs), and healthcare assistants (HCAs) (OECD, 2019) such as nurse aides. Although educational background of nursing staff varies widely between, and even within, countries (OECD, 2019), CNAs receive a minimum number of training hours to obtain a certificate while HCAs mostly do not require certification and on-the-job training is provided. Excluded were 'licensed nursing staff' when this merged RNs and LVNs/LPNs into one category. Also, studies reporting on the association between 'total staffing' and outcomes or with a focus on contract, temporary, or specialized (e.g., medication aid, administrative RN) nursing staff

were excluded. Regarding the *number* of nursing staff, studies were included when they differentiated per type of nurse, for example, RN full-time equivalent per resident day or RN nursing hours per resident day.

Quality outcomes, also referred to as quality indicators, that were described in the studies were included when they could be associated with a nursing-sensitive outcome as described in the NOC (Moorhead et al., 2018) by comparison of relevant outcome labels and definitions. Furthermore, Donabedian (2003) distinguishes between *specific* and *generic* outcomes of care. *Specific* outcomes indicate whether a specific (clinical) objective has been attained. They are more likely to be sensitive to interventions of a single discipline and to variations in provided interventions (Donabedian, 2003; Moorhead et al., 2018). *Generic* outcomes are intended to provide an estimate of the health status of a care recipient regardless of a diagnosis and are influenced by a variety of factors other than the care provided (Donabedian, 2003). For that reason, generic outcomes such as mortality, hospitalization, quality of life, and patient satisfaction were excluded. Additionally, studies using a composite quality of care outcome or deficiency citations were omitted.

2.3.2 | Search strategy

The search strategy was developed with the assistance of an information specialist/librarian of the university. Combinations of terms included Medical Subject Headings (MeSH), text words, and word variants with respect to place of residence and nursing staff as well as terms related to quality of care (Box 1). An electronic search was conducted of studies published from January 1997 (first edition of the NOC) to January 2020 in the following databases: Medline (PubMed), CINAHL, PsycINFO, Embase, and the Cochrane Library.

2.4 | Search outcomes

References from the search were downloaded into the bibliographic software package RefWorks (ProQuest LLC, 2019). The initial search yielded 3902 publications out of which 1008 duplicates were removed. After screening titles and abstracts, of 116 potential relevant publications, full-text articles were obtained. Following the assessment of these, 18 studies were critically appraised of which 15 were included in the present review. Figure 1 displays the PRISMA flow diagram of article selection and reasons for exclusion.

AT (principal author) and PR independently screened publications' titles and abstracts for eligibility. Subsequently, a list of potentially relevant studies was created, including those with uncertainty, and full-text articles (116) were obtained. These were assessed by AT in accordance with the inclusion and exclusion criteria. If multiple publications were available for a study, data from the most recent and/or complete publication were included. When there was

BOX 1 Search strategy PubMed

("Nursing Homes"[Mesh] OR "Residential Facilities"[Mesh: NoExp] OR "Assisted Living Facilities"[Mesh] OR "Homes for the Aged"[Mesh] OR nursing home*[tiab] OR "homes for the aged"[tiab] OR residential[tiab] OR elderly care[tiab] OR assisted living[tiab] OR care home*[tiab] OR long term care[tiab] OR long term institutional care[tiab] OR longterm care[tiab] OR long term facilit*[tiab]).

AND.

("Personnel Staffing and Scheduling"[Mesh] OR "Nursing Staff/organization and administration"[Mesh:noexp] OR "Nursing Staff/supply and distribution"[Mesh:noexp] OR skillmix[tiab] OR "skill mix"[tiab] OR staff mix[tiab] OR staffing[ti] OR skill level*[tiab] OR (occupancy[tiab] AND rate[tiab]) OR (task[tiab] AND "differentiation"[tiab]) OR "nurse staffing"[tiab] OR staffing level*[tiab] OR (nurse-patient[tiab] AND ratio[tiab])).

AND.

("Quality of Health Care"[Mesh] OR "Nursing Audit"[Mesh] OR "Patient Reported Outcome Measures"[Mesh] OR "Outcome Assessment (Health Care)"[Mesh] OR (quality[tiab] AND indicator*[tiab]) OR clinical indicator*[tiab] OR nursing audit*[tiab] OR patient reported outcome measures[tiab] OR (quality[tiab] AND outcome*[tiab]) OR quality of care[tiab] OR nursing outcome*[tiab] OR nurse outcome*[tiab] OR patient outcome*[tiab] OR nursing sensitive[tiab] OR outcome*[ti] OR quality[ti]).

ambiguity regarding whether to include or exclude a study, PR and MdG were involved to reach consensus about the inclusion of studies for quality appraisal. References of included articles (15) and relevant reviews were searched for additional studies and yielded no additional publications. A log of decisions was kept throughout the selection process.

2.4.1 | Quality appraisal

The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was used to critically appraise the reporting of the studies. The checklist addresses three main types of studies, i.e., cohort, case-control, and cross-sectional studies, and consists of 22 items related to studies' title, abstract, introduction, methods, results, and discussion (Vandenbroucke et al., 2007). The appraisal was conducted by AT and MdG independently. A record was kept whereby, per STROBE item, comments were written and recommendations about inclusion or exclusion of the study. Subsequently, studies were discussed and differences were resolved by consensus.

2.4.2 | Data abstraction and synthesis

Data extraction was conducted by AT with a standardized template that included first author, year of publication, country, design, setting, population, sample size, data sources and measurements, staffing variables, outcome variables, covariates, statistical methods, and key results of studies.

After consultation with a statistician, it was decided that the heterogeneity of included studies precluded meta-analytic techniques. Instead, the results of studies were summarized via content analysis which facilitates categorizing and summarizing data according to key concepts and themes (Polit, & Beck, 2012). The findings were summarized per type of nursing staff and nursing-sensitive outcome.

3 | RESULTS

3.1 | Study characteristics

Table 1 provides a summary of included studies. Studies were mostly conducted in the U.S.A. ($N = 10$). Study designs were cross-sectional ($N = 9$), longitudinal ($N = 5$), or cohort ($N = 1$) with follow-ups varying from 90 days to 4 years. The majority of studies applied secondary analyses using administrative survey data, such as the Minimum Data Sets (MDS) ($N = 7$) and the On-line Survey Certification and Reporting System (OSCAR) ($N = 5$). Analyses were primarily conducted on the facility level ($N = 11$) with nursing home samples ranging from 19 to approximately 17,000 facilities. Four studies performed resident-level analyses with samples ranging from 257 to 6145 residents of which two studies also analyzed on the unit level with samples ranging from 156 to 282 units. Except for the study of Alexander (2008), resident (e.g., gender, age), facility (e.g., size, ownership), or market (e.g., reimbursement, population ≥ 65 years) covariates were included that were considered to moderate the effect on nursing-sensitive outcomes.

Staffing variables were mostly defined as hours per resident per day (hprd) ($N = 7$), full time equivalent per 100 residents (fte/100 residents, beds) ($N = 3$), and staff-to-resident ratio ($N = 2$).

3.2 | Identified nursing-sensitive outcomes

Of the total of 33 distinct quality of care outcomes described in the included studies, 21 (64%) could be identified as nursing-sensitive outcomes (NSOs). Table 2 displays an overview of these 21 outcomes with examples of an NSO according to the NOC. Generally, the outcome variable pressure ulcer ($N = 8$) was studied followed by weight loss ($N = 6$) and infection ($N = 6$) (Table 1). Quality outcomes that were not identified as NSOs primarily concerned physical restraints, drug use, range of motion exercises, toileting program, or ADL training.

FIGURE 1 PRISMA flow diagram of article selection

3.3 | Association between registered nurses and nursing-sensitive quality of care outcomes

All of the 15 studies investigated the association between RNs and outcomes of which five solely included RNs (Table 1). Five of the eight studies examining the outcome 'pressure ulcer' showed that more RN staff was significantly associated with a decrease in pressure ulcer prevalence. Five studies examined the outcomes 'infection' and 'weight loss'. Three found that more RN staff was significantly associated with a decrease in the percentage of infections, and one study determined that more residents per RN led to an increase in residents with weight loss. One of three studies examining the outcome 'ADL' found that more RN staff significantly increased residents' needs for help with it. Two studies investigated the outcome 'falls'. More RN staff was significantly associated with fewer falls in one study but the other ascertained that more RN staff on

somatic wards increased the probability that residents experienced a fall. The outcomes 'contractures' and 'range of motion' were investigated with each being in different studies. More RN staff was significantly associated with fewer residents having contractures and deteriorated range of motion. No significant association was found for the association between RNs and the outcomes 'aggressive behavior' (1 study), bladder/bowel incontinence' (3), 'expressive language skills' (1), and 'pain' (1) (Table 1).

3.4 | Association between licensed practical nurses and nursing-sensitive quality of care outcomes

Seven studies (47%) assessed the association between LPNs and outcomes (Table 1). Two studies investigated the outcome 'infection' and found that more LPN staff was associated with

TABLE 1 Summary of characteristics of included studies

First author (year, Country)	Study design (follow-up)	Sample population and size	Data source and level of analysis	Nursing staff ^a	Quality outcome ^b	Significant findings [*]
Alexander (2008, USA)	CS	510 NH	QO from MDS in NHC Staffing from NHC Facility-level analyses	RN/LPN/CNA – hprd	ADL Depressed or anxious High risk PU Incontinence bowel/bladder Move in/around room	↑RN then ↓ADL ↑LPN then ↓ADL ↑CNA then ↑Incontinence bowel and bladder
Arling et al. (2007, USA)	LO (90 days)	105 NH 156 units 5,314 residents	QO from self-report staff Staffing from self-report staff Unit- and resident-level analyses	RN/LPN/Aid – RSTprd	ADL Continence	↑NA time then ↓ADL
Backhaus et al. (2017, The Netherlands)	CS	95 LTCF 282 units 2,604 residents SOM units 3,541 residents PG units	QO from LPZ Staffing from LPZ Unit- and resident-level analyses	BRN – hprd	Falls PU	Somatic wards ↑BRN then ↑falls
Castle and Engberg (2008, USA)	CS	6,005 NH	QO from MDS in NHC Staffing from surveys Facility-level analyses	RN/LPN/NA – fte/100 residents	PU high risk PU low risk Pain	↑RN then ↓PU low risk ↑NA then ↓Pain
Castle et al., (2017, USA)	LO (9 months)	±17,000 NH 1,128,418 residents	QO from MDS Staffing from OSCAR Facility-level analyses	RN/LPN – fte/100 residents	UTI	Residents with catheter ↑RN then ↓UTI Residents without catheter ↑RN then ↓UTI ↑LPN then ↑UTI
Dyck (2006, USA)	CS	2,951 NH 363,895 residents	QO from MDS Staffing from OSCAR Facility-level analyses	RN/LPN/CNA – hprd	Dehydration WL	↑NA3 hrs then ↓WL
Konetzka et al. (2008, USA)	LO (3 years)	1,366 NH 399,206 residents	QO from MDS Staffing from OSCAR Facility-level analyses	RN – hprd	PU UTI	↑RN then ↓PU ↑RN then ↓UTI
Lee et al., (2014, USA)	CS	195 NH	QO from MDS Staffing from state surveys Facility-level analyses	RN – hprd	PU UTI WL	↑RN then ↓PU

(Continues)

TABLE 1 (Continued)

First author (year, Country)	Study design (follow-up)	Sample population and size	Data source and level of analysis	Nursing staff ^a	Quality outcome ^b	Significant findings*
Lin (2014, USA)	LO (1999 to 2003)	3275 NH	QO from OSCAR Staffing from OSCAR Facility-level analyses	RN/LPN/CNA – hprd	Contracture PU	↑RN then ↓PU ↑RN then ↓Contracture
Reid and Chappell (2003, Canada)	LO (1 year)	257 residents	QO from validated scales Staffing from NH survey Resident-level analyses	RN/CA-to-resident ratios	Agitation Cognitive function Expressive language skills Physical function Social skills	↑CA then ↓Expressive language skills
Shin and Hyun (2015, Korea)	CS	19 NH	QO from NH survey Staffing from NH survey activity-level analyses	RN/CNA/QCW – hprd	ADL increase Aggressive behavior Dehydration Depression Cognitive decline Falls Incontinence PU ROM decreased UTI WL	↑RN then ↓falls ↑RN then ↓ROM (deteriorated) ↑QCW then ↑Aggressive behavior
Shin and Shin (2019, Korea)	CS	60 NH	QO from survey Staffing from NH survey Facility-level analyses	RN (direct-care) – hprd	WL	–
Weech-Maldonado et al. (2004, USA)	CS	1.134 NH	QO from MDS ⁺ Staffing from OSCAR Facility-level analyses	RN – fte	Cognitive decline Mood decline PU	↑RN then ↓PU
Zimmerman et al. (2002, USA)	LO (2 years)	59 NH 2.015 residents	QO from resident and medical records Staffing from Form 671 Resident-level analyses	RN/LPN/NA – fte/100/beds/week	Infection	↑LPN then ↑Infection ↓NA then ↑Infection
Zimmermann and Pfaff (2018, Germany)	CS	166 NH 8.665 residents	QO from care documentation Staffing from Project EQisA Facility-level analyses	RN/CNA/ACS – to-resident ratio measured in fte	WL	Residents' without CI ↑RN residents then ↓WL ↑ACS residents then ↓WL

Abbreviations: ACS, additional care staff; ADL, activities of daily living; CA, care aid; CH, cohort; CNA, certified nursing assistant; CS, cross-sectional; hprd, hours per resident day; LO, longitudinal; LPN, licensed practical nurse; LTCF, long-term care facility; LVN, licensed vocational nurse; MDS, Minimum Data Set; NA, nurse aid; NH, nursing home; NHC, Nursing Home Compare; NU, nursing unit; OSCAR, Online Survey, Certification and Reporting; PG, psychogeriatric; PR, physically restrained; PU, pressure ulcer; QCW, quality care worker; QO, quality outcome; RN, registered nurse; ROM, range of motion; RSTprd, resident-specific time per resident day; SOM, somatic; UTI, urinary tract infection; WL, weight loss.

^aOnly nursing staff who met inclusion and exclusion criteria are displayed.

^bOnly quality outcomes which met inclusion and exclusion criteria are displayed.

* $p < .05$ nursing-sensitive outcomes; ↑, increase; ↓, decrease.

TABLE 2 Linkage of quality outcomes described in included studies with one example of a nursing-sensitive outcome from the NOC^a and frequency of occurrence in included articles

Quality outcome	NOC domain	NOC class	Nursing-sensitive outcome (NOC code)	Definition	Number	First author, year
ADL (e.g. decline in, needs increased)	Functional health	Self-care	Self-Care: ADL (0300)	Personal actions to perform the most basic and physical tasks and personal activities independently with or without assistive device	3	Alexander (2008), Arling et al. (2007) and Reid and Chappell (2003)
Agitation	Psychosocial health	Psychological well-being	Agitation level (1214)	Severity of disruptive physiological and behavioral manifestations of stress or biochemical triggers	1	Reid and Chappell (2003)
Aggressive behavior (e.g. verbal, physical)	Psychosocial health	Self-control	Aggressions self-restraint (1401)	Personal actions to refrain from assaultive, combative or destructive behavior towards others	1	Shin and Hyun (2015)
Anxious	Psychosocial health	Psychological well-being	Anxiety level (1211)	Severity of manifested apprehension, tension or uneasiness arising from an unidentifiable source	1	Alexander (2008)
Bladder incontinence (e.g. loss of control, increase in)	Physiologic health	Elimination	Urinary continence (0502)	Control of elimination of urine from the bladder	3	Alexander (2008), Arling et al. (2007) and Shin and Hyun (2015)
Bowel incontinence (e.g. loss of control, increase in)	Physiologic health	Elimination	Bowel continence (0500)	Control of passage of stool from the bowel	3	Alexander (2008), Arling et al. (2007) and Shin and Hyun (2015)
Cognitive (e.g. decline, function)	Physiologic health	Neurocognitive	Cognition (0900)	Ability to execute complex mental processes	3	Reid and Chappell (2003), Shin and Hyun (2015) and Weech-Maldonado et al. (2004)
Contracture	Functional health	Mobility	Joint movement (0206)	Active range of motion with self-initiated movement	1	Lin (2014)
Dehydration	Health knowledge & behavior	Risk control	Risk control: dehydration (1937)	Personal actions to understand, prevent, eliminate or reduce the threat of inadequate water in the intracellular and extracellular compartments of the body	1	Dyck (2006) and Shin and Hyun (2015)
Depressed	Psychosocial health	Psychological well-being	Depression level (1208)	Severity of melancholic mood and loss of interest in life events	2	Alexander (2008) and Shin and Hyun (2015)
Expressive language skills	Physiologic health	Neurocognitive	Communication: expressive (0903)	Expression of meaningful verbal and/or non-verbal messages	1	Reid and Chappell (2003)
Falls	Health knowledge & behavior	Safety	Falls occurrence (1912)	Number of times an individual falls	2	Backhaus et al. (2017) and Shin and Hyun (2015)
Infection/vaccination (Vaccination)	Physiologic health	Immune response	Immune status (0702)	Natural and acquired appropriately targeted resistance to internal and external antigens	1	Alexander (2008)

(Continues)

TABLE 2 (Continued)

Quality outcome	NOC domain	NOC class	Nursing-sensitive outcome (NOC code)	Definition	Number	First author, year
Infection (e.g., UTI)	Health knowledge & behavior	Risk control	Risk detection (1908)	Personal actions to identify personal health threats	6	Alexander (2008), Castle et al. (2017), Konezka et al. (2008), Lee et al. (2014), Shin and Hyun (2015) and Zimmerman et al. (2002)
Mood (decline)	Psychosocial health	Psychological well-being	Mood equilibrium (1204)	Appropriate adjustment of prevailing emotional tone in response to circumstances	1	Weech-Maldonado et al. (2004)
Move in/around the room	Functional health	Mobility	Mobility (0208)	Ability to move purposefully in own environment independently with or without assistive device	1	Alexander (2008)
Range of motion (decreased)	Functional health	Mobility	Mobility (0208)	Ability to move purposefully in own environment independently with or without assistive device	1	Shin and Hyun (2015)
Pain (acute, chronic)	Perceived health	Symptom status	Pain level (2102)	Severity of observed or reported pain	2	Alexander (2008) and Castle and Engberg (2008)
Pressure ulcers (high and low risk)	Health knowledge & behavior	Risk control	Risk control: pressure injury (1942)	Personal actions to understand, prevent, eliminate or reduce the threat of developing pressure-induced tissue damage	8	Alexander (2008), Backhaus et al. (2017), Castle and Engberg (2008), Konezka et al. (2008), Lee et al. (2014), Lin (2014), Shin and Hyun (2015) and Weech-Maldonado et al. (2004)
Social skills	Psychosocial health	Social interaction	Social interaction skills (1502)	Personal behaviors that promote effective relationships	1	Reid and Chappell (2003)
Weight loss	Health knowledge & behavior	Health behavior	Weight maintenance behavior (1628)	Personal actions to maintain optimum body weight	6	Alexander (2008), Dyck (2006), Shin and Hyun (2015), Lee et al. (2014), Shin and Shin (2019) and Zimmermann and Pfaff (2018)

Abbreviations: ADL, activities of daily living; NOC, Nursing Outcomes Classification; UTI, urinary tract infection.

*Example of nursing-sensitive outcome directly related to interventions that could be performed by nurse staffing to achieve/prevent the outcome. Depending on the health status of the resident and his/her preferences other nursing-sensitive outcomes good be relevant.

more residents having an infection. One of two studies examining the outcome 'ADL' determined that more residents needed help with their ADL when more LPN staff was available to assess their status. A significant association between the number of LPNs and the outcomes 'aggressive behavior' (1), bladder/bowel incontinence' (3), 'contracture' (1), 'falls'(1), and 'range of motion'(1), 'pain' (2), pressure ulcer' (3), and 'weight loss' (4) was absent (Table 1).

3.5 | Association between certified nursing assistants and nursing-sensitive quality of care outcomes

The association between CNAs and outcomes was assessed by five (33%) studies (Table 1). No association was found in all three studies examining the outcome 'pressure ulcer'. One of three studies examining the outcome 'weight loss' found that, when a facility had ≥ 3 h of NA time per resident per day, a decrease of residents with unintentional weight loss occurred. One of two studies that examined the outcome 'incontinence' determined that more NA staff was significantly associated with an increase of residents with bladder and bowel incontinence. Studies about the association between NAs and the outcomes 'ADL'(1), 'aggressive behavior' (1), 'contracture' (1), 'falls'(1), infection'(2), and 'range of motion'(1) showed no significant results (Table 1).

3.6 | Association between healthcare assistants and nursing-sensitive quality of care outcomes

Six studies (40%) assessed the association between HCAs and outcomes (Table 1). There were two studies for each investigated outcome that included 'infection', 'weight loss', and 'ADL' of which one study consistently found significant results. Lower numbers of HCAs were associated with a higher occurrence of infections. More residents per HCA increased the percentage of residents with unintentional weight loss. The more time that HCAs spent with residents, the more that residents experienced a decline in ADL. The outcomes 'pain', 'aggressive behavior', and 'expressive language skills' were individually examined by one study per outcome. More HCA staff was significantly associated with a decrease of residents experiencing pain and an increase of residents showing aggressive behavior. The higher the HCA-to-resident ratio, the greater the decline in expressive language skills. A significant association between the number of HCAs and the outcomes of 'bladder/bowel incontinence' (2), 'falls' (1), 'pressure ulcers' (2), and 'range of motion' (1) was absent (Table 1).

No significant association was determined in any of the studies between the type of nursing staff and the outcomes of agitation, anxiety, cognition, dehydration, depression, mood, move in/around the room, and social skills.

4 | DISCUSSION

Of the 33 quality of care outcomes described in the included studies, 21 were identified as nursing-sensitive outcomes of which 13 showed a significant association with nursing staff. The impact of the number of nursing staff was found in: ADL, aggressive behavior, bladder/bowel incontinence, contractures, expressive language skills, falls, infection (incl. vaccination), range of motion, pain, pressure ulcers, and weight loss. According to the NOC, these outcomes respond to nursing interventions, and the effects can be monitored and documented. This means that nursing staff is of decisive importance for the quality of care with regard to these outcomes (Moorhead et al., 2018).

Included studies particularly reported a significant positive association (more staff leads to better results) between RNs and nursing-sensitive outcomes. Especially regarding pressure ulcers and urinary tract infections, $\geq 60\%$ of the studies found that more RN staff led to a decrease in them. In addition to positive associations, significant negative associations (more staff leading to worse outcomes) were reported among LPNs, CNAs, and, specifically HCAs, and various nursing-sensitive outcomes such as infection, incontinence, and ADL. However, while examining the same nursing-sensitive outcome, different studies could show contradictory results, positive versus negative association, or no association with nursing staff.

Differences in study results regarding the nursing-sensitive outcomes may be that the included studies primarily relied on secondary quality outcome data derived from mandatory standardized surveys such as the MDS and OSCAR. Besides reporting bias (Spilsbury et al., 2011), nursing-sensitive quality outcomes in these surveys may not all be equally sensitive to nursing practice in LTIC. For example, experts considered only 13 of the 35 MDS (version 2.0) quality indicators as sensitive to practice in the Canadian LTIC of which nine were most sensitive to nursing interventions (Estabrooks et al., 2013). Of these nine, although not consistently, seven corresponded to significant outcomes found in this review either in a positive direction (falls in the last 30 days (RN), pressure ulcer (RN), late loss ADL function (RN and LPN), unexplained weight loss (RN, CNA and HCA), urinary tract infection (RN and HCA), worsening pain (HCA)), or negative direction (falls (RN), urinary tract infection (LPN), late loss ADL function, aggressive behavior (HCA)). Estabrooks et al., (2013) contend that the focus of quality of care should be on outcomes that are sensitive to care practices in LTIC as they will have the greatest potential for functional improvement and decelerating the decline of residents. As some of these nursing-sensitive outcomes were solely examined in one or two studies included in this review (e.g., falls, pain), more research is needed concerning the association between types of nursing staff and these specific outcomes for LTIC.

Besides methodological concerns, the inconsistent evidence regarding the association between types of nursing and nursing-sensitive outcomes may be due to the amount of time that nursing staff spent with residents. For example, when NAs had more time (≥ 3 h) per resident per day, a decrease of residents with unintentional weight loss occurred (Dyck, 2006). In addition, more residents

per RN, resulting in less time with residents, led to an increase of residents with unintentional weight loss (Zimmermann, & Pfaff, 2018). Donabedian (2003) contends that, in order to observe improvements in quality of care, certain thresholds such as for staffing, must be met in order to have an effect on quality outcomes. Staffing variables of the included studies were generally (7) defined as hours per resident per day. Zhang et al. (2006) found that thresholds of RN staffing range between 0.31 hprd (minimum for a reasonable quality of care) and 1.83 hprd (highest quality possible considering cost-effectiveness). Except for Shin and Shin (2019), the included studies reported that RNs' hprd ranged from 0.08 to 0.60 (not in table), which may partially explain that in addition to positive associations also no associations were found with nursing-sensitive outcomes. As LTIC has evolved into high acuity settings, this may require more time from RNs and other nursing staff to meet residents' complex care needs and enhance quality of care.

Besides the number of hprd, the inconsistent evidence may be due to factors that moderate or mediate quality of care. Although the majority of included studies controlled for resident, facility, and/or market covariates, none of them included work environmental structure variables other than staffing that are known to have a mediating effect on quality of care outcomes such as nurse manager ability, leadership, and support (Flynn et al., 2010; Probst et al., 2010; White et al., 2020), nursing foundations (e.g., use of a nursing model, nursing diagnoses, and actual care plan documentation), and/or nurse-physician relationship (White et al., 2020). In addition, studies did not include potential moderating characteristics of nursing staff such as work experience, education, and professional certification (e.g., gerontological nursing) (Arling & Mueller, 2014).

Although nursing staff that are less educated provide the majority of hands-on care in LTIC, only a small number of studies included in this review considered the association between CNAs (33%) and/or HCAs (40%) and NSOs. Berta et al., (2013) state that these types of nursing staff are an understudied workforce. Because they are generally considered as unlicensed health care aids with an unregulated scope of practice (Berta et al., 2013; McMullen et al., 2015), this may prevent them from being recognized as a profession, which makes it difficult to collect comparable data (OECD, 2019). However, their role in LTIC is evolving from providing a basic level of care (e.g., assistance with ADL) to performing delegated tasks such as catheter care, medication administration, and wound care (Afzal et al., 2018; McMullen et al., 2015). Tuinman et al., (2016) found that nursing staff of varying levels performed comparable interventions in LTIC, suggesting a blurring of role differentiation that may affect the quality of care. In order to understand the association of unlicensed nursing staff and outcomes of quality of care, more research is needed. This should include structure variables such as training and scope of practice as these vary widely (Afzal et al., 2018; McMullen et al., 2015). Moreover, as unlicensed nursing staff may only perform delegated tasks when supervised by nurses, this should also be taken into account. Effective supervision may better prepare CNAs and HCAs for delegated tasks, resulting in better care processes and subsequently lead to improved NSOs.

Regarding the process of care, included studies predominately employed data derived from standardized surveys which means that mainly a (linear) relationship between structure (number of nursing staff) and outcome variables (quality of care) has been examined. Donabedian (2003) contends that outcomes are primarily the effect of care processes. Process variables include nursing staffs' competencies (knowledge, skills, and attitudes) to apply appropriate care strategies when implementing interventions. Future research into quality of care in LTIC necessitates adding mediating process variables to better understand what is actually done in providing care that contributes to the quality of care.

4.1 | Limitations

This review has several strengths such as a comprehensive search guided by an information specialist, the inclusion of several languages, and independent reviewers for aspects of screening, data extraction, and quality assessment. Still, some limitations must be considered. As in any review, the findings are limited by the methodological quality of the included studies. By using the STROBE checklist, studies (3) that were poorly described were excluded.

Unlicensed personnel were categorized with a variety of names such as (certified) nursing assistant, (nurse/care) aide, quality care worker, or additional care staff. As many studies did not report educational background, the research team decided whether they were certified nursing assistants with a minimum number of training hours in basic nursing skills. When a person was referred to as a 'nursing assistant', a certification was assumed, and it was decided to label this professional as a CNA. Others were labeled as an HCA, including a nurse aid. While the choices may be arbitrary, the authors believe it did not affect the results.

For this review, the authors decided to focus on *specific* outcomes as described by Donabedian (2003) because they are more likely to be sensitive to interventions of different levels of nursing staff and to variations in the executed the interventions. As a result, a complete scenario of the relationship between nursing staff and quality of care has not been provided. For example, an outcome such as 'quality of life' may be more sensitive to nursing staff such as CNAs who have more contact with residents.

Another limitation may be that the authors excluded dissertations and unpublished work, therefore, potentially important sources of information may have been missed, meaning the results may not represent all of the relevant work in this area. As the authors only included quantitative studies, it may be that publication bias was introduced. Finally, the majority of included studies were conducted in the U.S.A. (10) which may limit the generalizability of the results.

5 | CONCLUSION

Twenty-one of 33 quality outcomes could be identified as nursing-sensitive outcomes of which 13 showed a significant association with

nursing staff. However, the included studies reported inconsistent results regarding the association among RNs, LPNs, CNAs, and/or HCAs and these nursing-sensitive outcomes, there is evidence that more RNs have a positive impact on nursing-sensitive outcomes. As to the evidence regarding the other type of nursing staff, especially HCA, findings regularly showed a negative association. Research into the nursing staff and quality of care relationship in LTIC should be expanded with structure and process variables of which the mediating and moderating effect on quality of care is known. These may explain variances in quality of care outcomes and guide quality improvement initiatives in addition to adding numbers of nursing staff and/or time per resident per day. Furthermore, evidence needs to be expanded about which NSOs are most sensitive to nursing interventions, specifically in view of the current complexity of care in LTIC. Finally, future research into quality of care in LTIC should consider to fully apply the theoretical framework of Donabedian since it is a coherent entirety in which good structure leads to good processes, and good processes lead to good outcomes (Donabedian, 2003).

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CONFLICT OF INTEREST

The authors declare that they have no competing interest or relationship, financial or otherwise, or personal, religious or political beliefs that might be perceived as influencing an author's objectivity.

PEER REVIEW

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DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

ORCID

Astrid Tuinman <https://orcid.org/0000-0001-5003-8013>

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