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Review

Nurse Staffing Impact on Quality of Care in Nursing Homes: A Systematic Review of Longitudinal Studies

Ramona Backhaus MSc^{a,*}, Hilde Verbeek PhD^a, Erik van Rossum PhD^{a,b},
Elizabeth Capezuti PhD, RN, FAAN^c, Jan P.H. Hamers PhD, RN^a

^a CAPHRI School for Public Health and Primary Care, Department of Health Services Research, Maastricht University, Maastricht, The Netherlands

^b Zuyd University of Applied Sciences, Research Centre on Autonomy and Participation, Heerlen, The Netherlands

^c Hunter College, City University of New York, New York, NY

A B S T R A C T

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Background: The relationship between nurse staffing and quality of care (QoC) in nursing homes continues to receive major attention. The evidence supporting this relationship, however, is weak because most studies employ a cross-sectional design. This review summarizes the findings from recent longitudinal studies.

Methods: In April 2013, the databases PubMed, CINAHL, EMBASE, and PsycINFO were systematically searched. Studies were eligible if they (1) examined the relationship between nurse staffing and QoC outcomes, (2) included only nursing home data, (3) were original research articles describing quantitative, longitudinal studies, and (4) were written in English, Dutch, or German. The methodological quality of 20 studies was assessed using the Newcastle-Ottawa scale, excluding 2 low-quality articles for the analysis.

Results: No consistent relationship was found between nurse staffing and QoC. Higher staffing levels were associated with better as well as lower QoC indicators. For example, for restraint use both positive (ie, less restraint use) and negative outcomes (ie, more restraint use) were found. With regard to pressure ulcers, we found that more staff led to fewer pressure ulcers and, therefore, better results, no matter who (registered nurse, licensed practical nurse/ licensed vocational nurse, or nurse assistant) delivered care. **Conclusions:** No consistent evidence was found for a positive relationship between staffing and QoC. Although some positive indications were suggested, major methodological and theoretical weaknesses (eg, timing of data collection, assumed linear relationship between staffing and QoC) limit interpretation of results. Our findings demonstrate the necessity for well-designed longitudinal studies to gain a better insight into the relationship between nurse staffing and QoC in nursing homes.

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During the last 3 decades, there has been growing concern about nursing home quality in most industrialized countries,^{1–4} with an apparent variability of quality among countries.⁵ Poor quality of nursing home care has often been associated with insufficient staffing levels,⁶ as staffing is presumed to affect the quality of care (QoC) and life of nursing home residents.⁷ In the United States (US), since 1987, federal government regulations have mandated minimum staffing levels. In addition, some US states have introduced additional nurse

staffing requirements for nursing homes.⁷ Conspicuously, experts recommended higher staffing standards than those mandated for US nursing homes.⁸ Inconsistent US findings on staffing and quality in nursing homes suggest that further research is needed.⁹

In recent years, the relationship between staffing and QoC in nursing homes has received considerable attention. Reviews of studies reveal only weak evidence about the association between nurse staffing and QoC in nursing homes.^{6,10,11} For example, Bostick et al¹⁰ describe the functional ability of residents, the prevalence of pressure ulcers, and residents' weight loss as the most nurse sensitive quality indicators with regard to staffing, but consensus on which quality indicators are most nursing sensitive is absent.² Spilsbury et al¹¹ concluded that the existing research evidence demonstrates inconsistent and contradictory findings about the relationship between nurse staffing and the QoC in nursing homes. They included 50 studies, predominantly from the US and with a cross-sectional design,

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* Address correspondence to Ramona Backhaus, MSc, CAPHRI School for Public Health and Primary Care, Department of Health Services Research, Maastricht University, P.O. Box 616, 6200 MD Maastricht, The Netherlands.

E-mail address: r.backhaus@maastrichtuniversity.nl (R. Backhaus).

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demonstrating provisional evidence that total nurse, registered nurse (RN) and nurse assistant (NA) staffing influenced the QoC for nursing home residents. The authors¹¹ underscore the cross-sectional design as a major criticism of prior studies. Conclusions from cross-sectional studies are possibly biased because of unobserved factors that affect nursing home quality, correlating with the explanatory variables used in these studies.¹² As a result, these designs could account for the weak associations found in prior studies.^{6,10–12}

More evidence is needed, especially from longitudinal studies. For this reason, the aim of this study is to review recent longitudinal studies focusing on nurse staffing and QoC outcomes in nursing homes. This will provide more reliable evidence about staffing and QoC in nursing homes, as we expect less inconsistent and contradictory results compared with those obtained in prior reviews.^{6,10,11} The results of this study will contribute to the discussion about implementing minimum staffing standards and will help to determine optimal nurse staffing levels in nursing homes.

Definitions

In our study, 4 different categories of nursing staff will be distinguished: (1) total nurse staff including RNs, licensed practical nurses (LPN)s or licensed vocational nurses (LVN)s, and nurse assistants (NA)s; (2) RN staff; (3) LPN or LVN staff; and (4) NA staff.

Two staffing characteristics, namely ‘nurse staffing levels’ and ‘professional staff mix’ will be central in our analysis, as they are considered to influence QoC in nursing homes.¹³ Studies assessing ‘nurse staffing levels’ focus on numbers of nurses. ‘Nurse staffing levels’ can be defined as the ratio of (1) nurse staff to residents or (2) nurse hours per resident.¹⁰ In studies examining ‘nurse staffing levels,’ each category of nursing staff (total staff, RN staff, LPN/LVN staff, NA staff) is considered separately. However, ‘professional staff mix’ is measured as a ratio of different staff categories, for example the ratio of RN to total nurse staff or the ratio of RN to LPN and NA staff.

With regard to QoC outcomes, we will distinguish between clinical (eg, pressure ulcers, infections), process-related (eg, restraining, hospitalization), and administrative outcomes (ie, deficiency citations). Nursing home deficiency citations have been widely used as quality indicators in US nursing home studies.¹⁴ In the US, nursing home deficiency citations are given to those nursing homes that failed to meet at least 1 federal or state QoC requirement.¹⁵

Methods

Search Strategy

In April 2013, a literature search was performed. The search strategy included terms related to staffing, quality of care, and the place of residence. Search terms with respect to staffing (Staffing OR “Staff mix” OR “RN mix” OR “RN ratio” OR “Skill mix” OR “Staff utilization”) were combined using the Boolean operator ‘AND’ with search terms relating to QoC (“Quality of care” OR “Patient outcomes” OR “Resident outcomes”) and terms referring to the place of residence (nursing homes OR residential facilit* OR Long term care facilit* OR “Assisted living” OR “Residential care” OR “Housing for the elderly” OR care homes OR “Long term care setting” OR institutional* OR “Homes for the aged” OR Special care unit*). Articles published between January 2007 and April 2013 were retrieved by searching PubMed, CINAHL, EMBASE and PsycINFO. Longitudinal studies prior to 2008 were extracted from the review conducted by Spilsbury et al.¹¹ as they have selected and reviewed 50 out of 13,411 potential studies published from 1980 to 2007. To obtain all relevant articles published in 2007, we decided to include studies published in 2007 in

our own search as well. Furthermore, all the bibliographies of included articles were searched for additional references.

Eligibility Criteria

Studies were eligible if they (1) examined the relationship between nurse staffing and QoC outcomes, (2) included only nursing home data, (3) were original research articles describing quantitative, longitudinal studies, and (4) were written in English, Dutch, or German.

Study Screening and Data Extraction

The retrieved articles were managed in an Endnote library (version X6). Two researchers (R.B., H.V.) independently screened titles and abstracts for relevance. After reaching consensus on the results of the independent screening of abstracts, full-text articles were obtained for potentially relevant studies. In addition, the principal author (R.B.) searched the review by Spilsbury et al.¹¹ for longitudinal studies. Two members of the research team independently screened the full-text articles and scored them as ‘include,’ ‘possibly include,’ or ‘exclude.’ To reach consensus about the final list of included studies, disagreement between the researchers was discussed and resolved.

The principal researcher (R.B.) extracted data from all relevant articles using a standardized form specifically developed for the current study. For all included articles, data on the following items were collected: publication type, aims of the study, study method, independent staffing variables, covariates, findings of the study, and potential limitations and recommendations. The extracted data were discussed within the research team.

Methodological Quality

The methodological quality of included studies was assessed using the Newcastle-Ottawa scale for assessing the quality of non-randomized studies¹⁶ (Table 1). The scale consists of 9 items covering 3 domains: selection (representativeness of the cohort), comparability (controlling for confounders), and outcomes (assessment and follow-up). Two researchers (R.B., H.V.) independently rated the quality of each included study on a scale from 0 stars to 9 stars. Studies were classified into groups of low (less than 6 stars), moderate (6–7 stars), or high (8–9 stars) quality studies.^{17,18} Disagreement between the researchers was discussed to reach consensus. Table 2 shows the final assessments of all included studies.

Data Synthesis and Analysis

Because of the heterogeneity in studies regarding their assessment of nurse staffing characteristics and QoC data, we did not conduct a meta-analysis. Instead, the findings of included studies were summarized in a systematic way. Low-quality studies ($n = 2$) were excluded from analysis. While summarizing the findings, we distinguished studies examining ‘nurse staffing levels’ and ‘professional staff mix.’ For both categories, the results of included studies were grouped per QoC outcome (eg, pressure ulcers, infections, restraint use). Per QoC outcome, the results were categorized into 4 different groups on the basis of whether they examined (1) total staff, (2) RN staff, (3) LPN/LVN staff, or (4) NA staff. In presenting our findings, we distinguished between studies that found a positive and statistically significant relationship between staffing and QoC outcomes, a negative and statistically significant relationship or no statistically significant association.

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