Systematic Review of Studies of Staffing and Quality in Nursing Homes

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Purpose: To evaluate a range of staffing measures and data sources for long-term use in public reporting of staffing as a quality measure in nursing homes.

Method: Eighty-seven research articles and government documents published from 1975 to 2003 were reviewed and summarized. Relevant content was extracted and organized around 3 themes: staffing measures, quality measures, and risk adjustment variables. Data sources for staffing information were also identified.

Results: There is a proven association between higher total staffing levels (especially licensed staff) and improved quality of care. Studies also indicate a significant relationship between high turnover and poor resident outcomes. Functional ability, pressure ulcers, and weight loss are the most sensitive quality indicators linked to staffing. The best national data sources for staffing and quality include the Minimum Data Set (MDS) and On-line Survey and Certification Automated Records (OSCAR). However, the accuracy of this self-reported information requires further reliability and validity testing.

Conclusions: A nationwide instrument needs to be developed to accurately measure staff turnover. Large-scale studies using payroll data to measure staff retention and its impact on resident outcomes are recommended. Future research should use the most nurse-sensitive quality indicators such as pressure ulcers, functional status, and weight loss. **(J Am Med Dir Assoc 2006; 7: 366–376)**

Keywords: Nursing homes; staffing; quality; review

Numerous studies in the past 3 decades have explored the relationships between staffing levels in nursing homes and quality of care measures. However, the wide array of studies researching staffing and quality of care, many with conflicting results, make it increasingly difficult to interpret and use the findings. The demand for evidence to establish staffing levels based on quality of care is growing, but finding the best evidence to support these decisions has become more and more complex. A systematic review of staffing and quality of care is critical to synthesize relevant research and assist the long-term care community to understand the "state of the art" in the measurement of staffing and quality of care.

Systematic reviews are considered the "gold standard" for reviewing a body of research, whereby the results of many independent studies can be synthesized to offer valid evidence on a particular topic of interest.[1] Systematic reviews usually focus on the rigor of randomized controlled trials to assess the effectiveness of a particular intervention. But, many nursing studies seek to answer different questions such as the impact of nursing care on certain conditions that do not easily lend themselves to experimental designs. Many nursing studies that are descriptive, observational, correlational, or quasi-experimental have not been included in systematic reviews because when judged against randomized controlled trials they have been classified as "lower level" evidence. Evans and Pearson[1] suggest that systematic reviews bring together all valid and relevant evidence to determine the "effectiveness, appropriateness, and feasibility of an intervention. This approach would provide a more useful basis for health care decisions, because it better reflects the complex nature of these decisions" (p. 596). Staffing is not an intervention, but it *is* a critical factor in carrying out interventions to improve the quality of care in nursing homes. Therefore, the traditional approach to reviewing literature must be adapted to address questions regarding the impact of staffing on specific quality measures; the appropriate staff-mix conducive to quality; and the feasibility of staffing recommendations.

FOCUS OF THE REVIEW

Under a consulting agreement with the Colorado Foundation for Medical Care, the authors conducted a systematic literature review of staffing measures linked to quality outcomes in nursing homes. The purpose of this literature review

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was to evaluate a range of staffing measures and data sources for long-term use in public reporting of staffing as a quality measure in nursing homes. Specifically, the Staffing Quality Measure (SQM) project, funded by the Centers for Medicare and Medicaid Services (CMS), was intended to broaden the investigation of measures beyond staffing ratios to include turnover and staff mix, and to assess alternative data source options for future use. This review focused on studies in which staffing measures have been validated and are reliable.

TYPE OF STUDIES FOR INCLUSION

To ensure an inclusive investigation of staffing measures linked to quality outcomes in nursing homes, the authors used 2 methods to review the literature. First, a combined electronic literature search of 4 databases (Ageline, CINAHL, HealthSTAR, and MEDLINE) was conducted. The search was limited to research articles published from 1975 to 2003 in the English language. Key words of nursing homes, nursing staff, and quality of health care were combined and duplicates were removed. The electronic search yielded 96 citations. A manual review of citations and abstracts was performed to eliminate those articles without a clear research focus. Inclusion criteria for the manual review included (1) publication in a peer-reviewed journal and (2) a research study of staffing variables linked to quality measures. A total of 45 articles were eliminated, leaving 51 articles identified from the electronic search.

In the second method, the authors reviewed relevant CMS and General Accounting Office (GAO) documents in relation to staffing to identify original staffing studies that have been completed but were not identified in the electronic search. Congress mandated a report from CMS to determine if minimum staffing ratios were appropriate and, if appropriate, what the potential cost and feasibility implications were for minimum ratio requirements. The CMS studies were reported in 2 phases: Phase I was presented in 2000 and Phase II in 2001. In addition, 2 literature reviews regarding nurse staffing and quality in nursing homes,[2,3] as well as a consensus paper on recommended staffing standards[4] were consulted to check for key articles that may have been overlooked in the search. A total of 32 articles and government documents were identified from the manual search. Four articles accepted for publication in peer-reviewed journals but still in press were added to the final total. This review of staffing measures linked to quality outcomes encompasses a total of 87 citations.

METHODS

The research team carefully reviewed and summarized each article, extracted relevant content, and organized the information around 3 themes: staffing measures, quality measures, and risk adjustment variables. In addition, the sources of data for staffing and quality measures were also identified and summarized. Four summary tables identify each variable, how it was measured, and the frequency of that measure or data source found in previous studies. The first table reviews all staffing measures found in the literature (Table 1). The second table presents all nursing home quality measures that were used (Table 2). The third table describes various risk adjustment and control variables that were used (Table 3). Since a meta-analysis was beyond the scope of this project, no attempt was made to demonstrate that one variable had a stronger relationship than any other. Therefore, frequencies with which the specific measures were found are provided to indicate the prevalence of these variables in the literature. The progress of the literature review was discussed bimonthly during project conference calls and drafts of the review were shared with the project team for feedback throughout the development of this review.

DATA SOURCE FOR STAFFING VARIABLES

Several sources of data were used in studies to obtain staffing information. Table 4 identifies the data sources from which staffing or control measures were obtained. Some instruments were specific to the state in which the studies were conducted and did not allow for easy comparison across other states. For example, all states require Medicaid Cost Reports for reimbursement purposes, but these vary from state to state as to the types of staffing information they require nursing homes to collect and report. Staffing measures can be calculated from Cost Reports in some states; however, in other states no staffing measures can be derived from Cost Reports. Medicaid Cost Reports vary with respect to whether hours *worked* or hours *paid* is reported. This difference can skew the staffing report by overestimating the actual staffing level.

Other studies collected data from multiple sites using industry surveys or payroll data in which no reliability or validity testing was available. The most frequently used source of data was the On-line Survey and Certification Automated Records (OSCAR). The OSCAR is a national database that evolved from the Medicare/Medicaid Automated Certification System (MMACS) and is composed of self-reported nursing home information provided to state survey agencies during annual inspections and/or to become certified as Medicare and Medicaid health care facilities. OSCAR includes basic demographic and compliance information on approximately 210,000 providers and suppliers in the United States.

RESULTS

The results of this review are presented according to 3 major categories. *Staffing Measures* refer to various nurse staffing calculations used in the literature and range from staff ratios (number of staff per resident) to staff turnover rates. *Quality Measures* indicate a proxy measurement for quality care and are classified as either resident outcomes (eg, pressure ulcers or catheter use) or facility outcomes (eg, hospital admissions, mortality rates, or code violations). The third category of *Risk Adjustment/Control Measures* indicates variables that were used in the studies to factor out any extraneous effects that might impact the study results. These variables are labeled as case-mix (ie, patient acuity levels), resident characteristics (eg, age, gender, diagnosis), facility characteristics (ie, size, ownership, location, etc.), or market/economic characteristics (eg, unemployment rates, wage index, or other market influences).

Table 1. *Summary of Staffing Measures Used in Reviewed Studies*

Variable	Specific Measure	No. of Studies
Staffing ratios per resident or per bed	Ratio of RNs, LVNs, or NAs to residents	3
	FTEs per resident (RN, LPN, and NA)	4
	FTEs per 100 nursing home residents	3
	RNs and LPNs per bed	1
	Direct care staff per bed	2
	Staffing FTE per 100 beds	1
	RN/100 beds, total nursing staff/100 beds	1
Staffing hours per resident per day (HPRD) or per bed or per day	Staffing hours per resident, per day	18
	Average annual nursing FTE per patient day	1
	Nursing hours	1
	FT and PT staffing hours per patient	1
	RN hours per patient	2
	RN hours per day	1
	RN, LPN, and NA minutes per day	1
	Nursing care per patient day by personnel category	1
	Therapy staff minutes per week	1
Staff mix	Nursing hours (ratio of RN to LVN HPRD)	1
	Staff mix (Ratio of licensed to unlicensed staff in a day)	3
	Staff intensity (staff/100 residents adjusted for case-mix)	1
	Number of RN, LVN, and aides per total nursing staff	1
	RN ratio (RNs as a percent of direct care staff)	1
Staff utilization	Resident specific time from RUG-III	1
	Staff attributes (allocation of nursing and non-nursing staff)	1
	Staff time utilization (RN, NA, and total staff)	2
	NA time required to implement selected care processes	2
	NA involvement in care planning	1
	Use of APN	1
Turnover rates and retention	Total number of RNs, LPNs, and CNAs minus number employed divided by number employed at end of year.	2
	Aide turnover rate	3
	Proportion of RN, LPN, and NA that voluntarily terminate employment in a year	2
	Turnover (number of staff leaving due to voluntary resignation, dismissal, or retirement as percentage of FTEs)	2
	Turnover using a hospital survey	1
	Turnover percentage (% of total staff and NAs that left the facility during the cost report period (usually 1 year)	2
	Turnover; comparison of high and low turnover facilities.	1
	Turnover rate of the total organization and of NAs only.	1
	Retention (Percentage of total nursing assistants that remained with the facility for the entire cost report period).	3

RN, registered nurse; LVN, licensed vocational nurse; NA, nursing assistant; FTE, full time equivalent; LPN, licensed practical nurse; FT, full time; PT, part time; RUG-III, Resourse Utilization Group, version III; APN, advanced practice nurse.

STAFFING MEASURES

Staffing was examined using numerous methods with the most emphasis placed on staffing ratios. Almost half of the studies (42) used some measure of staff-to-resident or staff hours–to-resident ratio. Staff mix or staff utilization were also identified as significant variables to be studied. The type of staff (licensed or unlicensed) that interacted with the residents or the amount of time spent with them was often discussed.

Basically, there are 2 main staffing measures: (1) the ratio of staff to residents and (2) the number of hours per resident. Most of the reviewed studies used some measure of hours per resident day, which is preferable to a measure of hours per facility bed that can inaccurately reflect staffing due to fluctuations in facility census.[5–19]

Most of the studies reviewed had separate measures for registered nurse (RN), licensed practical nurse (LPN), and certified nursing assistant (CNA) staffing. Staffing measures are usually reported for each category of nursing staff (ie, RN, LPN/licensed vocational nurse (LVN), nursing assistant (NA), licensed/non-licensed, or total nursing staff) or by the responsibilities of staff (direct care staff or administrative staff). Studies performed by CMS in their congressionally mandated report did not analyze total nursing hours, but this is a widely used measure.[7,11–15,20–24]

Several recent studies have found an association between higher total staffing levels and improved quality of care.[7,11–13,15–17] Some studies also report that greater numbers of licensed staff (RN and LPN) are associated with better quality.[10,11,25–29] Increased RN time is also associated with

Table 2. *Summary of Quality Measures Used in Reviewed Studies*

Variable	Specific Measure	No. of Studies
Resident outcomes	Functional status/functional ability/Activities of daily living (ADL) decline/dressing/ transfer/Katz score/Barthel index	17
	Physical restraint use	15
	Pressure ulcers/pressure sores/bed sores/bedfast/immobility/skin trauma	14
	Catheter use/urinary incontinence	11
	Confused or disoriented residents/organic brain syndrome	9
	Use of psychoactive drugs	7
	Weight change/weight loss	6
	Verbal aggression/physical aggression/ disruptive behavior/behavioral problems	5
	Urinary tract infections	4
	Bowel incontinence	3
	Contractures	3
	Dehydration	3
	Fractures	3
	Tube feedings/intubated residents	3
	Accidents	1
	Minimum Data Set	2
	Quality of life	1
	Resident care (grooming, hygiene, availability of water)	2
	Resisting assistance with ADLs	2
	Use of antibiotics	1
Facility outcomes	Deficiencies/code violations/complaint data	12
	Death/mortality rates/survival rates	10
	Hospital admissions/re-hospitalization rates	10
	Discharge rates	7
	Average length of stay (ALOS)	1
	End of life care	1
	Hospital days	1

improved patient outcomes.[5,6,8,25,26] While several studies have measured the impact of direct care staff on quality care, only a few studies consider the impact of non-nursing staff (social workers, physicians, dietitians, physical therapists, activity aides, etc.) on quality.[8,22,29,30]

Staffing Ratios per Resident or per Bed

Inconsistencies exist in the way staffing ratios are calculated. Ten of the reviewed studies reported staffing ratios as the number of full-time equivalents (FTE) per resident, while 5 of the studies reported the number of FTEs per bed. A few studies divided FTEs by the total number of residents, while other studies used 100 residents or 100 beds as the denominator. Hospital-based homes have higher nursing staff levels.[11] Ownership and certification were also important predictors of total nursing staff.[7,11,31] Facilities vary with respect to their ratio of nurses to residents. Fifteen of the 87 studies reported staffing ratios as the number of FTE staff to residents or to beds ranging as follows:

- RNs: 0.06 to 0.25 FTEs per resident
- LPNs: 0.05 to 0.12 FTEs per resident
- NAs: 0.21 to 0.38 FTEs per resident

Staffing Hours per Resident per Day (HPRD) or per Bed or per Day

Staffing ratios are more commonly reported as hours per resident per day (HPRD) (25 out of 87 studies). This is generally calculated from OSCAR data collected over a 2-week period and reported as the total FTEs by category (RN, LPN, NA), multiplied by 70 hours, multiplied by 14 days, then divided by the total number of residents in the facility.

Less variance is seen when measuring staffing hours per resident day as compared to FTEs per resident or bed. Overall staffing levels in OSCAR tended to be underreported when compared to other surveys. Feng and colleagues[32] compared OSCAR data with a concurrent research survey of the same facilities and found overall staffing levels were apt to be lower in OSCAR. They recommended further refinement of OSCAR and more systematic survey methods to aid in decision making regarding minimal staffing levels. The range for HPRD across studies is as follows:

- RNs: 0.2 HPRD to 0.7 HPRD
- LPNs: 0.5 HPRD to 0.7 HPRD
- NAs: 1.95 HPRD to 3.4 HPRD

Staff Mix and Staff Utilization

A few qualitative studies have found an association between better training/management practices, nurse aide involvement, and improved patient outcomes.[23,30,33,34] One study describing processes of care found no significant differences in staffing hours or staff-mix across 3 groups of facilities with good, average, or poor resident outcomes.[16]

Nurse staffing expenditures is an alternative measure to nursing hours. The Phase II CMS study more fully assessed staffing-relevant factors other than staffing numbers/ratios by examining the relationship between expenditures and

Table 3. *Summary of Risk Adjustment/Control Measures Used in Reviewed Studies*

Variable	Specific Measure	No. of Studies
Case-mix	10 case-mix variables (ADL effort, patient turnover, plus 8 other variables associated with need for additional staff time)	1
	13 items from Form 3652-A to calculate case-mix	1
	6-item standardized composite (number of residents who receive special assistance/therapy)	1
	Classification system A-K	1
	Facility Risk Scores (FRS)/Resident Risk Scores (RRS)	1
	LTC severity-of-illness index from MMACS (Thoms index)	5
	Nurse intensive case-mix (6 functional abilities & 3 psychosocial characteristics)	1
	Resident characteristics (ADL index, mobility index, depression, dementia, behavioral symptoms, incontinence, and pressure sores)	6
	Resource Utilization Groups (RUG III)	7
	Severity of illness by 11 major diagnoses	1
	Staff assistance-average percentage of residents needing staff assistance in ADLs	1
Resident characteristics	Age	4
	Barthel ADL Index	2
	Bedfast status/bed mobility (extensive assistance)	2
	Body Mass Index (BMI) (ratio of weight in kilograms to height in meters squared)	3
	Diagnoses, medical, psychiatric	2
	Diagnostic Information from Data PRO Files	1
	Eating (extensive assistance)	1
	Gender	1
	Incontinence (bladder and bowel)/catheter	2
	Katz ADL score	2
	MDS Cognitive Performance Scale	2
	Medications, number of routine	1
	Oxygen therapy (use of)	1
	Mobility (assistance needed for transfers/dependent for ambulation)	2
	Race	1
	Rapid Disability Rating Scale (RDRS)	1
	Sensory impairment (hearing, vision, peripheral vision)	2
Facility characteristics	Admission rate/number of admissions	2
	Benefit levels	2
Facility characteristics	Certification status (SNF Medicare only, Medicaid only, dually certified), Level of care (SNF, ICF, both)	10
	Costs (administrative and resident care costs, direct costs per patient day, operating costs, total expenses, nursing expenses, average daily cost) Costs per month	15
	DON tenure and experience	3
	Enforcement (civil fines and sanctions)	1
	Hospital based	8
	Location (urban, rural, metro)	14
	Minimal staffing regulation	1
	Noncompliance with a state correction order	1
	Occupancy rates/number of empty beds, staffed beds (licensed and setup nursing home beds), total number of patients	12
	Ownership (chain/multifacility or single/independent)	14
	Ownership, type of control (profit/proprietary/investor-owned, nonprofit/ nonproprietary/tax-exempt, or government)	34
	Payer mix, payment reimbursement rates (percent private-pay, Medicaid, Medicare, other)	22
	Profit (difference between revenue and cost), Net revenue	3
	Regions (Midwest, Northeast, South, West) (Pacific, Mountain, Central, New England, Mid-Atlantic) (CMS regions)	5
	Size (total number of beds)	28
	Special Care Units (SCU), Alzheimer's unit	3
	Therapy/services offered (PT/OT/RT, psych)	3
	Wages (Total per resident day) for NA, RN, and LPN Wages (hourly)/salaries (RN, LPN, NA, management)	9
	Workload (average facility)	1
	Length of stay (long-stay; short-stay)	2

Table 3. *Continued*

Variable	Specific Measure	No. of Studies
Market/economic characteristics	Total wages in dollars per resident day	1
	Bed shortage, empty beds per capita, excess capacity (average number of unoccupied beds)	3
	Hospital Price Input Index per county (used by CMS, referred to in this study as the HCFA Index)	1
	Herfindahl index (index of nursing home market share concentration based on beds), tightness of market	7
	Medicaid reimbursement policy	6
	Per capita income level	5
	Unemployment rate	3

ADL, activities of daily living; LTC, long-term care; MMACS, Medicare and Medicaid Automated Certification System; SNF, skilled nursing facility; ICF, intermediate care facility; DON, director of nursing; CMS, Centers for Medicare and Medicaid Services; PT, physical therapist; OT, occupational therapist; RT, respiratory therapist; NA, nursing assistant; RN, registered nurse; LPN, licensed practical nurse; HCFA, Health Care Financing Administration.

quality. One study in particular focused on minimal nurse aide staffing thresholds, the cost associated with minimum staffing, and its relationship to quality.[24] White[24] reported that the average cost of Medicare reimbursement related to nursing care (RNs, LPNs, NAs) was $62 per resident day. The estimated short-stay minimum staffing threshold cost $54 per resident day, and the higher staffing requirement suggested by long-stay analyses would cost about $63 per resident day. "A potential implication of this finding is that the marginal costs to *Medicare* associated with a minimum staffing requirement are much lower than the costs to facilities of staffing at the higher level" (p. 10–14).

Table 4. *Summary of Data Sources Used in Reviewed Studies*

Variable	Specific Measure	No. of Studies
State- specific instruments	Medicaid Nursing Facility Cost Reports	11
	Brown University survey of nursing home staff turnover in Rhode Island	1
	Long-Term Care Facility Integrated Disclosure and Medi-Cal Cost Reports (Disclosure Report) (California).	2
	Client Assessment, Review, and Evaluation Form 3652-A (Texas Department of Human Services).	1
	Iowa Outcome Oriented Survey of 1983	2
	Long Term Care Facilities Survey (LTCFS) conducted by the State Health Data Center, PA Department of Health	1
	Minnesota Department of Human Services Long-Term Care Division facility profiles.	1
	North Carolina Division of Medical Assistance (DMA), and the NC Office of State Health Planning (OSHP)	1
	PA Department of Health LTC Facilities Questionnaire, and Health Profiles of PA Counties.	1
	Rhode Island Nursing Home Study	1
	Missouri Division of Aging annual nursing home survey	1
	Missouri State Board of Health	1
	Wisconsin Annual Nursing Home Survey WI Psychotropic Screen Protocol (PSP)	2
	Tennessee Department of Public Health	1
Data from multiple sites	American Health Care Association (AHCA)	1
	Annual Survey of Hospitals of AHA	1
	Management Minutes Questionnaire (MMQ)	2
	Multiphasic Environmental Assessment Procedure (MEAP)	1
	Nurse Staffing Data Collection Tool	1
	Payroll data	2
	Resident Assessment Instrument (RAI) Evaluation Survey.	1
National databases	Area Resource Files (ARF)	4
	Medicare and Medicaid Automated Certification System (MMACS)	6
	National Medical Expenditure Survey (NMES)	1
	National Nursing Home Survey	1
	On-line Survey and Certification Automated Records (OSCAR)	20
	Veterans Administration (VA) Patient Assessment File, VA Management Database, VA Cost Distribution Report, VA Office of Academic Affairs	1

Turnover Rates and Retention

Surprisingly, only a small number of the studies reviewed (14) included turnover as an important staffing measure.[7,14,23,25,26,30,33–41] Turnover is recognized in the literature as a significant staffing issue. However, consistent and reliable data on turnover is hard to come by. No reliable consistent measure of staff turnover has been established. Although it is possible to calculate turnover and/or staff retention, actual turnover rates are calculated in various ways with no standard method for comparison. White[24] obtained turnover data from 3 states selected for their availability of turnover data. Turnover was calculated differently for each state and all turnover calculations were based on unaudited, self-reported data. Higher staff turnover was found in for-profit facilities with more than 100 beds and in homes that offered lower benefits and NA wages. Some studies have found an association between low staff turnover and improved resident outcomes.[23,25,30,38,39] One study found that resident outcomes were better for facilities that had higher retention among directors of nursing (DONs).[26] Rantz and colleagues[16] also found this to be true in facilities that had higher retention of DONs and nursing home administrators. Another study discovered that nursing homes with the lowest administrator turnover rates (1 administrator versus 3 or more administrators) had the fewest health and safety deficiencies.[42]

The majority of turnover data were obtained from investigator-constructed surveys that ranged from a 43% to 65% response rate. Turnover rates explained from 8.6% to 31.2% of the variance in specific quality measures studied. One study found that RN turnover was positively related to discharge rates leading the authors to suggest that turnover should be reevaluated from a positive perspective.[35] Annual turnover rates for all nursing staff in the reviewed studies ranged from 40% to 190%. Average turnover levels were high and there was a great deal of variance across facilities and across the studies. Annual turnover rates by category across all studies ranged as follows:

- RNs: 35.6% to 116.5%
- LPNs: 50.7% to 113.88%
- CNAs: 68.5% to 170.5%

QUALITY MEASURES

Quality is a difficult concept to capture directly; therefore, measures of quality are a proxy for quality, either as resident or facility outcomes. Certain resident outcomes indicate when substandard care is being provided, for example, accidents, fractures, and urinary catheterization place the resident at greater risk and may result in hospitalization. The absence or low incidence of these resident outcomes indicates that quality care is delivered.

Facility outcomes such as mortality rates, discharge rates, and code violations are questionable proxy measures of quality in facilities. Death is often an expected outcome for nursing home residents and the nature of the death is not always apparent in records. Mortality rates may be high due to poor care or due to clinical conditions that were not amenable to treatment. Code violations and deficiencies represent problems identified by state surveyors and may reflect inconsistencies in procedures and practices across and within states. In addition, surveyors may not detect additional problems with quality care that may result in false positives or false negatives regarding code violations. Discharge rates are a dubious indicator because there are "good" reasons for discharge (eg, return to home) and "bad" reasons for discharge (eg, transfer to hospital for infections or fractures).

Resident Outcomes

Several studies demonstrated that quality of care and resident outcomes are related to staffing[6,11,14,16,25–27,31,37,43] and staffing is very critical to quality of care. Numerous resident outcomes can be measured (and have been) in previous studies (Table 2). The resident outcomes that were most sensitive to staffing (ie, pressure ulcers, functional decline, and weight loss) are conceptually linked to staffing levels owing to the considerable amount of nursing staff time necessary to improve outcomes. The following resident outcomes were proven to be sensitive quality indicators related to staffing: pressure ulcers, functional ability, and weight loss.[5,6,8,11,14–16,27–29,31,43,44]

One study found that homes with the highest levels of RN staffing and highest expenses per day showed greater improvement in decubitus ulcers, fractures, and urinary tract infections (UTIs).[5] The same authors determined in a later study that employing a DON with more experience explained a lower prevalence of complications due to immobility.[26] Bostick[6] discovered a significant association between more RN staff and fewer pressure ulcers (odds ratio = 0.97, $P = .03$). In a well-designed large study (5379 facilities from 10 states), Kramer and Fish[14] found that staffing levels above the national average improved outcomes and avoided selected care problems such as pressure ulcers and skin trauma. Rantz and colleagues[16] learned that facilities with poor resident outcomes have several times more acquired pressure ulcers than facilities with good outcomes.

While turning immobile patients every 2 hours and feeding residents take a great deal of nursing assistant time, sufficient numbers of licensed staff are required to evaluate situations and supervise unlicensed staff. Functional decline among residents was measured in a number of ways, limiting the ability to compare studies; however, the general consensus was that as functional status declined, staffing levels needed to increase to maintain good outcomes. Inappropriate weight loss may be a sign of malnutrition and is frequently used as an indicator of poor nursing care. Hicks and colleagues[43] found that as activities of daily living (ADLs) declined and weight loss increased, the cost of services accelerated. While each individual quality of care measure does not make a large contribution to the costs, when considered collectively they can have a substantial financial impact on the operations of the home.

Facility Outcomes

Several studies used mortality rates, code violations, and discharge rates as proxy measures for quality (Table 3).[8–10,18,19,28,29,31,38,39,45] Bliesmer and colleagues[28] found that licensed (but not non-licensed staff) were significantly related to residents' improved functional ability, increased

probability of discharge home, and decreased probability of death. Harrington and colleagues[8] found that nursing staff and other direct care staffing levels had a significant negative relationship to deficiencies, although overall staffing levels did not explain much of the variation in deficiencies. Staffing hours alone predicted less than 1% of the total variance in deficiencies. Johnson-Paulson and Infeld[45] reported that, based on deficiency citations, facilities staffing at or close to a minimum level are more likely to provide poor quality of care than those that staff at higher levels.

RISK ADJUSTMENT/CONTROL MEASURES

Several variables have been used as covariates when studying the relationship between staffing and quality. These adjustments are made based on resident, facility, or economic characteristics (or a combination of these) to control for extraneous factors affecting quality.

Case-mix

Case-mix is an aggregate measure that combines several resident characteristics to represent the amount of staff effort needed to care for patients. Intuitively, nursing homes with higher case-mix (or acuity) measures require higher staffing levels. There are multiple ways to measure case-mix (Table 3) but most are fraught with complexity.[6,8,14,16,24,26,28,31,43,45] The most popular case-mix method is based on the Resource Utilization Group version III (RUG-III) resident classification system designed to measure the intensity of care and services required for different types of residents and is derived from the Minimum Data Set (MDS). This complex system has 44 distinct groups broken down into 7 categories: rehabilitation, extensive services, special care, clinically complex, impaired cognition, behavior problems, and physical functions. White[24] examined current Medicare payments related to nursing care under the Prospective Payment System (PPS) to understand the potential cost implications to Medicare of a minimum staffing requirement for nursing homes and found several inconsistencies across states when comparing resource groups.

Facility Characteristics

Facility characteristics have been used extensively in research about staffing and quality of care; nearly every study reviewed used one factor or another as a covariate. Ownership has been highly correlated with staffing levels and tended to be the most popular covariate, followed by size, payer mix, cost, location, occupancy rate, and certification status (Table 3). Hutt et al[11] reported a significant correlation between for-profit status and number of NA hours. Cohen and Spector[31] found that nonprofit status was associated with lower LPN staffing and higher RN staffing. Feuerberg and White[7] confirmed that turnover for all direct care staff was higher in for-profit facilities than in not-for-profit ones. In addition, Feuerberg and White identified facility size as the best predictor of staff retention. Retention was 24% higher at facilities with 100 to 199 beds and 40% higher in facilities with more than 200 beds when compared to those with fewer than 100 beds.[7] Extended DON tenure, higher DON education, and low rates of administrator turnover contributed to better resident outcomes.[25,26] However, information on DON tenure, education, and turnover is only available through self-report surveys and low response rates by DONs made this information difficult to obtain.

Market/Economic Characteristics

Several economic factors, including Medicaid reimbursement policies and total wages in dollars per resident day, have been used as covariates in previous studies (Table 3).[9,14,31,43,44] Cohen and Spector[31] found that a flat-rate Medicaid reimbursement policy had a negative impact on RN staffing and a positive impact on LPN staffing. Unfortunately, policies for Medicaid reimbursement differ among states and make analysis across states problematic. Total wages in dollars per resident day and staffing retention were significantly associated with quality in nursing homes, indicating that factors other than staffing levels may ensure nursing home quality.[7]

DISCUSSION

Based on the findings of this review, several questions arise regarding research on staffing and quality of care. The following questions offer a framework for the discussion of this issue.

1. Which procedure is the most reliable and accurate way to measure staffing?

   Thus far, the literature is not helpful for addressing issues regarding how often staffing measures should be collected or over what time period the data should be collected. The majority of studies that used a measure of staffing ratios per resident or bed were older studies for which the more widely used hours per resident measure were probably not available. Most of the studies reviewed used a measure of nursing hours (or FTEs) per resident per day. Other studies used a similar measure of staff per facility bed, which ultimately could be converted to nursing hours per resident day, given accurate resident census data. It is not clear if staffing could be calculated consistently across states for direct care staff and administrative staff. Regardless of the actual staffing measure used, it should be consistently collected and calculated from facility-to-facility and state-to-state. OSCAR is the only currently available national data source for staffing measures, but because of several limitations (eg, only a 2-week sample of staffing data collected at the time of survey, questionable accuracy of self-reported information, and not audited by CMS), it may be desirable to design a new data collection instrument. Previous studies have not addressed how the accuracy of reported staffing data would be verified. It may be desirable to require facilities to submit documentation to verify their staffing information (ie, payroll records). But details need to be worked out (who would do this, how would facilities be selected for verification).
2. What staffing variables, other than staff hours per resident per day, impact quality of care?

   The question of whether various staffing levels within categories (RN, LPN, NA) have a significant impact on

quality of care is a difficult one to answer. Some studies have shown better quality of care with higher levels of licensed staff. It is believed that short staffing may disproportionately occur at night or on weekends. Owing to data limitations, it is not known how this affects quality. Current payroll systems for some facilities would make this information difficult to collect. Another question to be considered is whether the benefits of this level of detail offset the increased administrative burden. It may not be feasible to collect information on staffing levels by shift or weekend/weekday even using payroll data as this approach has not been used in previous studies. Studies suggest that payroll records are a potential source of staffing data (at least for nursing hours by staff type and turnover/retention),[7,46] although no reviewed study has used payroll data as part of a large-scale data collection effort.

This raises another question of whether or not to include non-nursing staff categories. A few previous studies have collected information on non-nursing staff such as activity or restorative aides, physicians, social workers, dietitians, and respiratory and physical therapists; however, the impact of non-nursing staff on quality of care was not significant.

3. What is the most reliable, efficient way to calculate staff turnover?

As of this writing, no national source of staff turnover or retention is currently available. Medicaid Cost Reports for a few states collect turnover information. There is generally no distinction between voluntary (employees who leave of their own accord) and nonvoluntary turnover (those who are fired). Nonvoluntary turnover is thought to be beneficial, as it occurs through the termination of unsatisfactory employees. Prior studies have collected turnover and retention data from nursing facilities using a variety of methods. The different methods that one might use to calculate turnover, point to the importance of collecting from facilities the variables necessary to calculate turnover and retention, rather than asking facilities to calculate these themselves. Evidence from past studies show (1) a great deal of variance across facilities in turnover and retention and (2) proof of a relationship between turnover/retention and quality. This suggests that turnover and retention may be important to collect using a standard instrument. Most facilities can derive turnover and retention information from their payroll systems without much difficulty if the information is computerized and technical support is available to assist them to calculate this information accurately. It appears that payroll systems used by most nursing homes can calculate turnover or staff retention without excessive burden to nursing facility staff if the payroll data are entered into an electronic database. A national source of staff turnover or retention needs to be established so that this important variable can be measured accurately.

4. Which data source provides the most reliable accurate information on staffing and quality of care?

Potential data sources include (1) the MDS database, which would need to link to staffing information, although it may not correspond to the period covered by the staffing measures, but is still the best case-mix data source; (2) the OSCAR database, which contains several measures of facility case-mix and is a low-cost alternative to the MDS; and (3) state Medicaid Cost Reports.

Quality of care and resident outcomes can be measured uniformly and nationally using the MDS.[6,11,16] The MDS has the advantage of a common set of assessment items that are routinely obtained for all nursing home residents upon admission, at times of significant change in condition, and annually. Some would argue the reliability of MDS data because of inconsistencies in staff reporting and coding of information, and because it is not audited by CMS.[47] However, there is growing evidence in the literature regarding the validity and reliability of MDS data and the quality indicators subsequently derived from MDS data.[48–51] Resident characteristics are available from both MDS and OSCAR databases. One advantage of using MDS data is that it is timelier than OCSAR and quality indicators can be calculated at the resident level from MDS data. OSCAR data can only be calculated at the facility level.

OSCAR is the only national source of consistent staffing data; however, there are some questions about its accuracy although it seems to be improving.[20,21] The quality of OSCAR staffing data is limited because it relies on self-reported staffing information from nursing homes collected for only a 2-week period at the time of the actual survey and generally are not audited by surveyors.[4] OSCAR reports hours *worked* (not hours *paid* as some Medicaid Cost Reports do) and some facilities may increase their staff during the period around the survey, thus overstating the actual staffing in facilities. Another limitation is that OSCAR staffing data do not capture differences in education levels, capability, motivation, and experience of staff.

Medicaid Cost Report data cover the entire year but the staffing variables are not available for all states and states differ in the types of staffing information that are reported. Therefore, cost reports are probably not feasible as a data source for a national system. A few state-specific sources (California, Texas, and Kansas) show potential for the development of a national data collection tool that includes staffing hours and turnover data for both direct care staff and administrative staff. In a sample of Ohio nursing homes, Medicaid cost reports were more accurate than OSCAR data when compared to payroll data[11,14,20,21] and could prove to be a valid source for analyzing the relationships between staffing and resident outcomes.

Cost reports provide data only for the skilled nursing components of Medicaid-certified nursing homes and multilevel facilities. Using these cost reports means excluding facilities that provide only intermediate care and facilities that do not have Medicaid certification.

The accuracy of cost reports is subject to self-report bias by the nursing homes. Quality of the data is monitored through clerical and computer checks for errors and consistency, and facilities are subject to revision of the report until it passes quality review. Standardizing the cost reports across states for staffing information could be an option for annual staffing and turnover data for Medicaid certified facilities. The feasibility of enforcing a standardized approach for Medicaid cost reporting in all states is unknown and may be unlikely.

5. Which proxy measures for quality of care are the most sensitive and have a proven relationship to staffing levels?

   The research team concluded that resident-level outcomes are more sensitive measures of quality care and are preferred over facility-level outcomes and should be conceptually linked with staffing information. Pressure ulcers, functional status, and weight loss have proven to be the most sensitive quality indicators linked to staffing patterns, and should be measured as incidence measures (number of occurrences) if possible. Prevalence measures (ie, the presence or absence of the condition) require some case-mix adjustment system.

6. Which risk adjustments are necessary for determining the impact of staffing on quality of care?

   There is substantial literature on case-mix for reimbursement purposes, but no studies that consider how best to take case-mix into account for staffing and quality care. Several studies suggest that a consistent case-mix system is needed; however, no consensus was reached as to what this case-mix method should be. Potential case-mix adjustors include Resource Utilization Groups (RUG-III) nursing index, ADL index, OSCAR case-mix variables, other MDS items related to resident staff time requirements, and facility characteristics.

   National data sources for case-mix include the MDS and OSCAR. The RUG-III is derived from the MDS and is a sophisticated case-mix system used by the Medicare prospective payment system and Medicaid payment systems for about 15 states. RUG-III is in the public domain and can be used with or without computerized data. It can also be used in management, staffing level determination, and quality assurance. The RUG-III case-mix system describes actual resources provided to nursing home residents but does not address whether these levels or resources are appropriate.

   Adjusting case-mix when reporting staffing levels allows for consideration of differences in the needs and acuity of the facility's residents. However, it increases the complexity of the system and reduces its understandability to providers and consumers. It may be difficult to reach consensus on the risk adjustment method to be used—this was a subject of great controversy with the nursing home quality measures. Clearly, any research regarding staffing and quality needs to include both resident and facility adjusters in some fashion.

CONCLUSIONS

Future research should build upon the knowledge gained from previous research and should strive to validate the accuracy of staffing information available from national databases. More studies need to be conducted using the OSCAR database for staffing information and verifying its accuracy. Hours per resident per day (HPRD) seem to be the most accurate, albeit unverified, measure currently available to capture staffing levels for nationwide comparison. In addition to staffing levels, other variables such as DON education and experience and overall retention or turnover rates should be investigated more thoroughly. An instrument that measures retention or turnover consistently and accurately with little burden to the facility is desperately needed. Payroll data are a promising source for this information; however, this method has not had sufficient reliability and validity testing. A large-scale study using payroll data to measure staff retention and its impact on resident outcomes would be a valuable contribution to the literature.

Studies linking staffing information with quality should use some type of national source for case-mix adjustment (ie, the MDS and OSCAR). MDS data should be considered for the case-mix and resident level outcome measures. A risk adjustment model can be created using existing indices (eg, RUG-III), statistical models that examine how staffing levels vary across facilities with different values of the items used in the case-mix, or based on simulations or expert testimony about the amount of nursing time required to care for different types of residents. More research is needed to refine a case-mix measure that represents the level of care required and the amount of staff necessary to deliver quality care. Many facility characteristics are traditionally used for risk adjustment or control measures; however, any variable must be carefully chosen to ensure it is consistent and sensitive to fairly represent facilities for comparison.

Quality is a difficult concept to measure, yet certain resident outcomes such as functional status and the incidence of pressure ulcers and weight loss are the most sensitive quality indicators linked to staffing levels. More large-scale research is needed to further explain the link between staffing and quality, thereby providing additional empirical data that support staffing requirements and policy recommendations.

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