A Systematic Review of Research Evidence on: (a) 24-hour Registered Nurse Availability in Long-term Care, and (b) the Relationship between Nurse Staffing and Quality in Long-term Care

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July 2010

Funded as part of the Expedited Knowledge Synthesis program of the Canadian Institutes for Health Research

Commissioning province: Saskatchewan

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Abbreviations

Abbreviation/ Acronym	Description
ACSH	ambulatory care sensitive hospitalization
ADL	activities of daily living
ADRD	Alzheimer's Disease and Related Dementias
AOR	adjusted odds ratio
ARF	Area Resource File
CA	California
CAs	care aides
CDN	Canadian
CHPRD	converted hours per resident day
CNAs	certified nursing assistants/aides
CNS	clinical nurse specialist
coef	coefficient
DONs	directors of nursing
FTE	full time equivalent
hprd	hours per resident day
ICF	intermediate care facility
LPNs	licensed practical nurses
LTC	long term care facility
LVNs	licensed vocational nurses
MDS	Minimum Data Set
NAs	nursing assistants/aides
NH	nursing home
NPs	nurse practitioners
OR	odds ratio
OSCAR	On-line Survey, Certification, and Recording Data
P	probability value
PCH	personal care home (term used in Manitoba for LTC facilities)
PU	pressure ulcer (decubitus ulcer)
QI	quality indicator
RCA	resident care aide
RNPs	registered nurse practitioners
RNs	registered nurses
RPNs	registered psychiatric nurses
SCH	special care home (term used in Saskatchewan for LTC facilities)
SD	standard deviation
SNF	skilled nursing facilities (US term for nursing homes similar to CDN LTC)
UTI	urinary tract infection
VA	Veteran's Affairs

Executive Summary

Background

Long term care (LTC) facilities offer care for people requiring the availability of 24-hour nursing. Staff in LTC facilities include licensed nursing staff: registered nurses (RNs) registered psychiatric nurses (RPNs), and licensed practical nurses (LPNs), as well as unregulated nurse/care aides. RN/RPNs and LPNs are trained to assess residents and provide nursing care to promote health and prevent illness.

The work presented in this report includes:

- a review of existing nurse staffing regulations relating to 24-hour nurse staffing in LTC facilities (Chapter 2),
- literature review relating to the 24-hour RN cover question (Chapter 3), and
- the review of broader nurse staffing literature (Chapter 4).

Nurse staffing regulations

In Canada, six provinces require all LTC facilities, regardless of size, to have an RN on duty 24 hours a day; 7 days per week (24/7). Alberta requires an RN to be on-call, if not on duty, 24/7, and two provinces (New Brunswick, Nova Scotia) require an RN to be on duty 24/7 in larger facilities only (i.e. exceptions made for LTC facilities with less than 30 beds). British Columbia is the only province that does not have a regulatory requirement for an RN on duty 24/7.

Policy alternatives to the 24/7 on-duty RN/RPN in LTC (taken from existing arrangements in place in Canada or the US) include:

- General guidelines for 'sufficient' staffing to meet resident needs, but no specific staffing levels or occupations;
- A minimum of on-call RN/RPN staffing, if an RN/RPN is not on duty;
- Licensed nurse staffing that varies depending upon the number of residents or beds in the LTC facility;
- Nurse staffing that allows for exceptions or waivers to the requirement for RN/RPN staffing; and
- 24 hours/7 days per week RN, RPN or LPN staffing (current US Federal Policy).

Review of literature on 24/7 RN/RPN requirement

The policy question addressed by the review was: "What are the policy alternatives to 24-hour availability (on-call and/or on-site) of RNs/RPNs in special care homes, and what are the implications of each alternative in terms of care quality and resident outcomes?"
An exhaustive search was undertaken (involving review of the titles/abstracts of 5,707 empirical research articles and 657 reviews) that revealed a distinct paucity of research on the 24-hr RN/RPN question. No directly relevant studies were found.

Broader nurse staffing literature

The paucity of literature on the 24-hour RN question necessitated the expansion of the scope of the project to include broader literature on nurse staffing in LTC settings.
The research evidence on the mix of RN staff to other nursing staff in LTC settings is itself 'mixed'. Some studies indicate that reducing the RN ratio (i.e. fewer RNs relative to other nursing staff) would have negative consequences on quality and outcomes. However, other studies do not find such associations, indicating no quality reductions through such changes in the make-up of the nursing staff complement.

High quality studies that have explored the relationship between quality/outcomes and RN staffing levels predominantly indicate a positive relationship: higher levels of RN staffing are associated with better outcomes. The majority of the literature has explored the RN level question and fewer studies have looked at the LPN level and its link to quality and outcomes. The policy conclusions from the LPN literature suggest positive relationships (more LPNs associated with better outcomes) for some resident outcomes but negative relationships for other outcomes, even controlling for the number of RN staff. To be clear, a negative relationship indicates poorer outcomes associated with higher numbers of LPN staff.

Policy and research implications

The policy challenge in the Saskatchewan context is whether to move away from the current 24-hour RN requirement. There is no empirical research work to inform a policy switch but it should also be emphasised that there is no empirical work that supports the current regulatory requirement. The only literature that discussed the question explicitly is expert panel reports in the US, all of which recommended 24-hour RN cover in nursing homes.

None of the high quality research on nurse staffing mix and levels in LTC settings was undertaken in Canada; the vast majority of the research work cited in this report is from the US. Given the very different nurse training levels seen in Canada compared to the US, and the variability in resident populations in LTC settings between the two countries, the lack of Canadian research on this issue is surprising. Future Canadian research exploring the relationship between nurse staffing and outcomes in LTC settings is an urgent priority.

Chapter 1. Introduction

Long term care (LTC) facilities offer care for people requiring the availability of 24-hour nursing. Nursing and personal care is available on a 24-hour basis, with access to a physician and other health professionals as needs dictate. In addition to accommodation, meals, laundry and housekeeping services, LTC facilities provide medical/clinical supplies and devices, social and recreational programs, medication administration, and assistance with the essential activities of daily living.

In the past, the care needs of LTC residents varied substantially, ranging from residents in need of fairly minimal support to those with heavy care needs. Today most of the residents in LTC facilities require intensive levels of support verging on 'total care,' and individuals with lighter care needs increasingly tend to be at home or in assisted living housing. LTC residents are usually elderly, suffer from multiple chronic medical/psychiatric conditions, and often have cognitive dysfunction; they clearly represent a vulnerable population. There is evidence that seniors living in long-term care in many Canadian provinces are older and more disabled today than they were a decade ago (Menec, MacWilliam, Soodeen & Mitchel, 2002; Hillmer, Wodchis, Gill, Anderson & Rochon, 2005; Sharkey, 2008; Frohlich, De Coster & Dik, 2002)

Nursing staff in LTC facilities include licensed nursing staff: registered nurses (RNs) registered psychiatric nurses (RPNs), and licensed practical nurses (LPNs), as well as unregulated nurse/care aides. RN/RPNs and LPNs are trained to assess residents and provide nursing care to promote health and prevent illness. Care aides are often the staff who spend the most contact time with residents assisting them with activities of daily living.

Training requirements for LPNs and care aides differ from province to province. The education of nurses in Saskatchewan has, as in other provinces, evolved over the past decade. In Saskatchewan, the practical nursing program was recently increased to 65 weeks, or 1776 hours over 2 years; the first practical nurses to receive their 2-year diploma will be graduating in 2009-2010. Prior to this change, practical nurses graduated with a certificate in practical nursing after completing a 14-month program (Hoffman, Owens, Heska-Willard & Bateman, 2003). In contrast, a baccalaureate degree in nursing has been the entry-to-practice education requirement to become an RN or an RPN since 2000. Saskatchewan has also recently standardized the education for its Continuing Care Aides (CCAs) (in other jurisdictions CCAs are called nurses' aides, personal care workers, resident care attendants, etc.). Saskatchewan CCA's now have to complete a 6 month education program.

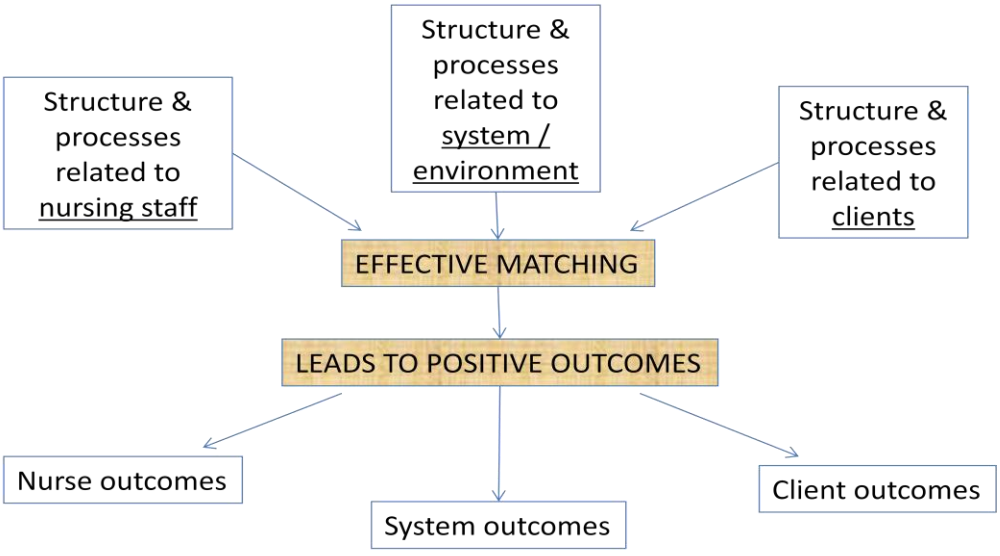
In recent years, many Canadian and United States (US) LTC facilities have begun to utilize LPNs, rather than RNs/RPNs, for resident clinical assessment and dispensing of medications. This has been in part due to the marked shortage of RNs/RPNs, the costs savings associated with LPN use, and the increased education and expanded scope of LPNs' competencies. Nonetheless, only 20 per cent of LPNs report working to their full scope of practice and researchers have identified that RNs/RPNs similarly are not working to their full scope of

practice but are spending much of their time on nursing duties that are within the scope of practice of LPNs and others (Besner, 2008). Thus, Canadian government and non-government stakeholders have called for the need to "focus on developing management policy to facilitate nurses to practice to their level of competency in various clinical settings" (Med-Emerg Inc, 2006, p.13.)

As the framework developed by the Canadian Nurses Association (2005) indicates (Figure 1.1), the structure and processes relating to nursing staff are just one component of inputs that might impact on the production of positive outcomes in LTC settings. Other factors relate to the system and environment (e.g. physical resources, organizational culture), and the client population (e.g. level of acuity, complexity, number). However, the focus of this report is the nursing staff input exclusively, and initially focuses on the specific staffing question concerning the appropriateness of 24-hour RN cover in the LTC facility.

Chapter 2 presents a review of existing nurse staffing regulations relating to 24-hour nurse staffing in LTC facilities, and provides a taxonomy of policy alternatives. The literature review methods and results relating to the 24-hour RN cover question are reported in Chapter 3, and Chapter 4 reports the review of broader nurse staffing literature. Chapter 5 contains the policy conclusions from the work, a general discussion and an overview of the future research agenda in this field.

Figure 1.1 Evaluation framework to determine the impact of nursing staff mix decisions



Canadian Nurses Association (2005)

Chapter 2. Long Term Care 24-hour Nurse Staffing: Regulations and Policy Options

Methods

To determine what regulations for registered nurse staffing in LTC facilities are currently in use in Canada, information on provincial requirements was obtained from provincial Chief Nursing Officers, and/or from provincial government web sites. The search was conducted and information received between October 2009 and January 2010. For comparison purposes, United States (US) LTC staffing regulations were also reviewed. Information was obtained from a comprehensive report on staffing regulations by Charlene Harrington (2008) and from US government web sites. Appendix 2.1 provides details on the regulations and Appendix 2.2 the contacts and sources of information.

Results

Canadian Provincial LTC RN[1] Staffing Requirements

In Canada, six provinces require all LTC facilities, regardless of size, to have an RN on duty 24 hours a day; 7 days per week (24/7) (see Table 1). Alberta requires an RN to be on-call, if not on duty, 24/7, and two provinces that require an RN to be on duty 24/7 make exceptions for LTC facilities with less than 30 beds. British Columbia is the only province that does not require an RN on duty 24/7.

Table 2.1 Provincial requirements for 24/7 RN staffing in LTC (2009)

Province	Require 24/7 RN staffing/on-call in LTC facilities
BC	no
AB	yes – minimum on-call
SK	yes – on duty 24/7
MB	yes – on duty 24/7 - but in the interim (until 2010), on-call
ON	yes – on duty 24/7
QC	yes – on duty 24/7
NB	yes – on duty 24/7 in NH with 30 beds or more
PE	yes – on duty 24/7
NS	yes – on duty 24/7 in NH with 30 beds or more; on duty minimum 8 hr/day in NH with less than 30 beds
NL	yes – on duty 24/7

Note: See Appendix 2.2 for more detailed information.

[1] RPNs are not specified here because they are only regulated in the western provinces, BC, AB, SK and MB. RPNs are not regulated in Ontario or any other province or territory in Canada.

United States LTC RN Staffing Requirements

Although the majority of US states do not require an RN 24/7[2], nineteen states (as of 2008) require, sometimes depending on the number of residents, one or more RNs on call if not on duty 24/7 (see Table 2.2).

Table 2.2 US States requiring 24/7 RN staffing/on-call (2008)

State	Require 24/7 RN staffing/on-call in skilled nursing or nursing facilities
AK	For 60+ occupied beds: RN on duty 24/7
CA	For 100+ beds: RN on duty 24/7
CO	RN on duty 24/7
CT	RN on duty 24/7
DC	RN (Nursing Supervisor) on duty 24/7
DE	RN on duty 24/7
HI	RN on duty 24/7
ID	For 90+ residents: RN on duty 24/7
KY	RN on duty or on call 24/7
ME	RN on duty or on call 24/7 For 100+: RN shall be on duty at night
MN	RN on duty or on call 24/7
MO	RN on duty or on call 24/7
MT	For 81+ beds: RN on duty 24/7
NJ	For 150+ licensed beds: RN on duty 24/7
PA	RN (Charge Nurse) on duty 24/7
RI	RN on duty 24/7
SC	RN on duty or on call 24/7
WI	RN on duty or on call 24/7 For 100+ beds: RN on duty 24/7
WV	RN on duty or on call 24/7

(Source: Harrington, 2008)

Policy Alternatives

A review of Canadian and US LTC staffing requirements finds that there are a variety of policies in place regarding requirements for licensed nurse staffing ranging from a requirement for an RN on duty at all times, to a requirement for "sufficient staffing" to meet residents' needs. [3] Five policy alternatives and examples of each are described below:

2 The remaining 31 states apply standards similar to the US federal law, noted above, of an LPN or an RN 24/7. Many states that do not require an RN on duty or on call 24/7 nonetheless require more hours of RN staffing per day than the minimum federal requirement of an RN, 8 consecutive hours a day, 7 days/week. For more details on state standards and regulations see Harrington, *Nursing Home Staffing Standards in State Statutes and Regulations,* 2008 at http://www.pascenter.org/documents/Staffing_regulations_1_08.pdf.

[3] See Appendix 1 for more information on regulations and see Appendix 2 for data sources.

1. Policy that requires RN or RPN staffing 24 hours/7 days per week (current Saskatchewan policy).

Examples:

Saskatchewan
Nursing care by a registered nurse or registered psychiatric nurse shall be provided on a 24-hour basis.

Ontario
Every licensee of a long-term care home shall ensure that at least one registered nurse who is both an employee of the licensee and a member of the regular nursing staff of the home is on duty and present in the home at all times.

2. Policy that provides general guidelines for sufficient staffing to meet resident needs, but no specific staffing levels or occupations.

Example:

British Columbia
A licensee must ensure that, at all times, the employees on duty are sufficient in numbers, training and experience, and organized in an appropriate staffing pattern, to (a) meet the needs of the persons in care,...

3. Policy that accepts a minimum of on-call RN/RPN staffing, if an RN/RPN is not on duty.

Examples:

Alberta
An operator shall have at least one nurse on duty at all times in his nursing home, and if at any time none of the nurses on duty are registered nurses or certified graduate nurses, the operator shall ensure that a registered nurse or certified graduate nurse is on call during that time.

Manitoba (interim policy until 2010)
The operator of a PCH [personal care home – equivalent of a LTC facility] *shall take steps to ensure that a registered nurse or registered psychiatric nurse is on-site at the home to supervise the nursing care 24 hours per day, seven days per week.*
If, after making best efforts to do so, the operator of a PCH is unable to secure a registered nurse or registered psychiatric nurse to be on-site at the home to supervise the nursing care for any period of time, as an interim measure only, the operator shall ensure that a

registered nurse or registered psychiatric nurse is accessible and a licensed practical nurse is on site at the PCH during the entire time period.

4. Policy for licensed nurse staffing that varies depending upon the number of residents or beds in the LTC facility.

Examples:

Nova Scotia
In every nursing home and nursing care section of a home for special care where there are less than thirty residents, there shall be at least one registered nurse on duty for no less than eight hours every day, and in the absence of the registered nurse, there shall be a person on duty in the home who is capable of providing emergency care.
In every nursing home and nursing care section of a home for the aged where there are thirty or more residents, there shall be at least one registered nurse on duty at all times.

New Brunswick
...in nursing homes with thirty beds or more, at least one registered nurse is on duty on the premises at all times...

California
LICENSED STAFF (RN, LPN/LVN)
For 1-59 licensed beds:
1 RN/LVN 24 hours/day
For 60-99 licensed beds:
1 Director of Nursing (DON) RN Day Full Time (may not be charge nurse) and
1 RN/LVN 24 hours/day
For 100+ beds:
1 DON RN (may not be charge nurse) and
1 RN 24 hours/day

Pennsylvania
LICENSED STAFF (RN, LPN/LVN)
1 DON RN FT (1 per facility) and
1 RN Charge Nurse 24hrs/7d/wk
For 1-59 residents: 1RN days and evenings; 1 RN/LPN nights
If LPN is Charge Nurse, RN must be on call
For 60-150 residents: 1 RN 24hr/7days/wk;
For 151-250 residents: 1 RN and 1 LPN 24 hr/7days/wk;
For 251-500 residents: 2 RNs 24hr/7days/wk

5. Policy for nurse staffing that allows for exceptions or waivers to the requirement for RN/RPN staffing.

Example:

US Omnibus Reconciliation Act (OBRA 87), Nursing Home Reform Act
Federal Waiver Requirements
The above federal requirement may be waived under the following situation:
The Secretary may waive the requirement that a SNF [skilled nursing facility; relatively equivalent to Canadian LTC facilities] *provide the services of a registered nurse for more than 40 hours a week, including a director of nursing specified in paragraph (b) of this section, if the Secretary finds that--*

(i) The facility is located in a rural area and the supply of skilled nursing facility services in the area is not sufficient to meet the needs of individuals residing in the area;

(ii) The facility has one full-time registered nurse who is regularly on duty at the facility 40 hours a week; and

(iii) The facility either--

(A) Has only patients whose physicians have indicated (through physicians' orders or admission notes) that they do not require the services of a registered nurse or a physician for a 48-hours period, or

(B) Has made arrangements for a registered nurse or a physician to spend time at the facility, as determined necessary by the physician, to provide necessary skilled nursing services on days when the regular full-time registered nurse is not on duty (OBRA '87, 1987)

In the US, fourteen states allow waivers or exceptions to their state nursing staff standards. "*However, five of these states ...indicated that waivers are very rare and only allowed in unusual circumstances...Texas allows time-limited waivers for regions unable to recruit RNs, while Colorado allows waivers only in rural areas"* (Tilly, Black, Ormond, & Harvell, 2003a, p. 9).

Example

Ohio Staffing Standard
All nursing homes must provide *2.75 direct care hours per resident per day (hprd), of which 0.20 hprd must be RN care, and 2.0 hprd nurse aide time. The remainder of the time – 0.55 hprd – can be other staff time* (i.e. RN, LPN, NA, activity or rehab aides, physio therapy, occupational therapy, social work, or dieticians who provide direct care).
Ohio Waiver Requirements
"Nursing homes can get waivers to substitute LPN time for the 0.20 RN requirement. To get a waiver, a home must demonstrate that it has tried to recruit RNs, offers competitive wages, and that the waiver will not harm residents...These waivers are very specific about

the timing of the waiver (e.g., three out of five days) and are usually valid for a year". (In 2002, 39 of Ohio's 920 NHs were granted waivers) (Tilly, et al., 2003b, p.A-44).

6. Policy that requires RN, RPN or LPN staffing 24 hours/7 days per week (current US Federal Policy).

Example:

US Omnibus Reconciliation Act (OBRA 87), Nursing Home Reform Act

- *1 RN DON (may serve as charge nurse if average occupancy of 60 residents or less)*
- *1 RN, 8 consecutive hours a day, 7 days/week*
- *1 RN/LPN 24 hours/day, 7 days/week*
- *Staffing "sufficient" to meet residents needs*

Chapter 3. 24-hour Registered Nurse/ Registered Psychiatric Nurse Long Term Care Staffing: Literature Review

The Saskatchewan Ministry of Health requested a synthesis of research evidence that might inform any possible changes to their regulatory requirement to have 24-hour on-call RN/RPN coverage at their special care homes (SCHs) (e.g. residential long-term care facilities). The research team was tasked to provide a summary of the key research undertaken in this area to assist the Ministry in making a decision on any proposed policy change. The desired outcome of the project was to determine if there was any research to indicate if the quality of care and resident safety would be compromised by the fuller utilization of LPNs in Special Care Homes[4].

The review work sought to answers the following questions:

- Would resident care be compromised if the requirement for 24-hour availability of a RN/RPN in Saskatchewan's special care homes was not present?
- Can the Saskatchewan Ministry of Health meet SCH residents' care requirements with a different nurse staff mix than the 24-hour availability of an RN/RPN?
- What evidence exists for different nurse staffing options in LTC facilities (i.e. special care homes), particularly options allowing the fuller utilization of LPNs in LTC facilities?
- What is the value of the current requirement for 24-hour availability of an RN/RPN in SCHs?

The final policy question agreed upon to guide this review was:

What are the policy alternatives to 24-hour availability (on-call and/or on-site) of RNs/RPNs in special care homes, and what are the implications of each alternative in terms of care quality and resident outcomes?

Search Methods

The Protocol for the Saskatchewan LTC Nurse Staffing Systematic Review presented four search models to address the 24-hour availability (on-call and/or on-site) of RNs/RPNs in special care homes. These models were used as guidelines for the searches and were adapted as the research team examined the literature and discussed various studies with other consultants and experts in the field. The search approach followed an iterative process where each search informed subsequent decisions as to how next to address the research question which resulted in revised searches until all options were exhausted (see Figure 3.1).

[4] In Saskatchewan, residential long term care facilities are called "special care homes," and they may be stand-alone; attached to an acute care hospital; or attached to a health centre, and they may be privately or publicly operated.

Search Inclusion and Exclusion Criteria

Inclusion Criteria: Time

To review findings relevant to current practice and care, only literature dating from 1990 was searched for (a cut off of 1990 was chosen to ensure the review was of recent research relevant to the current LTC/nursing context).

Inclusion Criteria: Language

To include all relevant Canadian literature, publications in both official languages were searched.

Inclusion Criteria: Place

Initial searches focused on Canadian-based research (published both nationally and internationally). However, because the vast majority of research linking staffing and quality of care has been conducted in other countries (primarily the United States) it was important to examine the literature from other countries that have a relatively similar long-term care system for seniors (the search was expanded to the United Kingdom, United States, Western Europe, Australia, and New Zealand). Nonetheless, caution must be used in interpreting the findings because of possible differences in residential care delivery, care levels, nurse staffing qualifications, and definition of job duties between Canada and other countries.

Preliminary 24-hour RN/RPN Search

Initial 24-hour RN/RPN Search

A search was performed in the National Library of Medicine's bibliographic database MEDLINE. This included the subject heading (MeSH term) *long term care/* and then relevant terms for *nurses*, *staffing models and Canada*. Subject terms and keywords for each concept were combined together using the boolan operator **OR**. The four concepts were then combined using **AND**. This resulted in 137 references from this search. MD reviewed the titles and abstracts and exported 14 to RefWorks for further review by JM and JG[5]. They reviewed the titles and abstracts and found none that met the inclusion criteria.

The intention of this search was to provide a quick view of possible papers that may address the 24-hour RN/RPN requirement in long term care. MD also reviewed many of the 137 records examining the MeSH subject headings and the terms in the abstracts. This examination provided additional relevant subject headings and keywords that were used to build the search strategies in later searches.

A number of research papers concerning the 24-hour question were expected to appear in the grey literature, consequently an Internet search through Google and Google Scholar was undertaken. A variety of search terms were used to create a number of different searches. At least 100 web pages were reviewed for each search. MD saved 66 full text reports or research

[5] The review work was undertaken by Janice Murphy (JM), Mimi Doyle-Waters (MD), Stirling Bryan (SB) and Joanne Gray (JG).

articles that appeared to address the 24-hour question. JM further reviewed the full text of these papers and found none that met the inclusion criteria.

Published Literature 24-hour RN/RPN Search

Brief 24-hour RN/RPN Search

A brief search was completed in five databases to ascertain whether the phrase *24-hour(s)* when combined with the subject heading *long term care/* would result in relevant studies. The databases included were CINAHL (32 references), MEDLINE (45 references), EMBASE (36 references), Ageline (90 references) and Academic Search Complete (18). From 221 references MD reviewed the titles and abstracts of 123 citations and exported 14 to RefWorks for further review by JM and JG. They reviewed the titles and abstracts found none that met the inclusion criteria.

Question 1 (24-hour RN/RPN - Canada) Search

A comprehensive search using the MeSH subject terms and keywords was developed in MEDLINE which included the concepts *long term care* AND *nurses* AND *staffing models*. The concepts *resident care* and *outcomes* were not included in order to create a more sensitive search. The search was further limited to terms that encompassed *Canada*. The research team reviewed the search terms and the search was revised several times to ensure everyone was satisfied with the comprehensiveness of the search terms. The MEDLINE search strategy was translated into equivalent terms in CINAHL, EMBASE, Ageline and Academic Search Complete. These searches resulted in 637 references and 544 after duplicates were removed. The titles and abstracts were reviewed by JM and JG. JM selected 8 and JG selected 10 for further review. The full text of these papers were reviewed by JM and either JG or SB. SB reviewed the reviews from EMBASE. There were 25 reviews in total and 23 after duplicates were removed. None met the inclusion criteria (see Appendix 3.3). The other reviews were included in the general searches. (see Appendix 3.4 for an example of a search)

Questions 2 and 3 (Nursing Knowledge & Scope of Practice – Canada) Search

A comprehensive search was developed in MEDLINE which included the concepts *long term care* AND *nurses* AND (*knowledge & skills* OR *scope of practice*) AND *Canada*. The research team reviewed the search terms and the search was revised to ensure appropriate search terms were included. The MEDLINE search strategy was translated into equivalent terms in CINAHL, EMBASE and Ageline. Academic Search Complete was not included as it did not appear to include relevant research. This resulted in 777 references and 562 after duplicates were removed. The titles and abstracts if available were reviewed by JM. None were selected for further review. SB reviewed the reviews from three of the four databases. There were 65 reviews in total and 55 after duplicates were removed. None met the inclusion criteria. (see Appendix 3.3)

Question 1 (24-hour RN/RPN - International) Search

The research team decided to expand the search to include the United States, Europe, Australia and New Zealand. The search strategy used in the Question 1 (Canada) search was rerun and the Canadian references removed which left studies from other countries. The same databases

were used in this search, MEDLINE, EMBASE, CINAHL and Ageline. This resulted in 5,954 references and 4,573 after duplicates were removed. The titles and abstracts were reviewed by JM and SB of which two were selected but when the full text of the papers were reviewed they did not meet the inclusion criteria. From the reviews there were 648 references and 579 after duplicates were removed. JM selected 1 based on title and abstract; SB selected 8 based on title as the abstracts were not available. A review of the full text found that none met the inclusion criteria. (see Appendix 3.3)

Grey Literature 24-hour RN/RPN Search

Websites and Organizations

The protocol (available upon request) lists relevant websites, organizations and governments that would be likely to address the 24-hour RN/RPN question. MD searched all the sites listed and reviewed all publications listed on these sites for discussion of the 24-hour RN/RPN coverage. Pertinent sections were then reviewed by JM with the option of further reviewing the full text. None of the documents were relevant to the 24-hour question.

Other database searches were also performed but are not described here. References from papers that addressed the topic but did not meet the inclusion criteria were scanned for citations that may have been missed, or were not included in the database searches. Numerous Google searches were completed due to suggestions by provincial and federal nursing contacts.

Editorials

The search for Question 1 (long term care, nurses, nurse staffing) was rerun and limited to editorials, comments and letters to the editor in the databases MEDLINE, EMBASE and CINAHL to capture any reference or mention of 24-hour RN/RPN coverage in long term care. This produced 312 references. The results of these searches were downloaded into RefWorks and reviewed. None were relevant to the 24-hour question. (See Appendix 3.3)

Dissertation Abstracts

ProQuest Dissertations and Theses which covers ninety percent of North American dissertations was searched regarding long term care and 24-hour RN/RPN coverage through a number of search variations. The British Library EThOS was also searched for relevant dissertations. Roughly 400 titles and abstracts were reviewed by MD. The full text of six theses were downloaded and reviewed by JM of which none were relevant. (See Appendix 3.3)

Academic & Regulatory Contacts

The protocol listed a number of key contacts in the nursing field, including fourteen academic and government contacts as well as 29 provincial/territorial RN, RPN, and LPN regulatory colleges and associations. These experts were contacted by email and/or telephone and their organization web sites were searched for relevant publications. Responses were received from eight of the provincial regulatory bodies or associations and from nine of the key contacts. None had information relevant to the 24-hr question. (See Appendix 3.5)

Provincial & Federal Nursing Contacts

The Chief Nursing Officer of Saskatchewan provided contact information for the provincial, territorial and federal Principal Nursing Officers. Eighteen nursing officers were contacted by email and by telephone and a response was received from each officer, or a representative of her/his office. Of the eighteen contacted, seven provinces, one territory and one federal nursing officer sent a total of 21 documents, which were reviewed (see Appendix 3.6). None of the documents provided empirical evidence relevant to the 24-hour question, but one document provided experts' opinions on the 24-hour question (Institute of Medicine [IOM], 1996). This is discussed later in this chapter.

Review Methods

Review Inclusion and Exclusion Criteria

Two reviewers independently applied the following inclusion/exclusion criteria (in addition to the search criteria) to all potential studies. Any disagreements were resolved by discussion, referring to a third party if necessary. Reviewers were not blinded to any features of the report including authorship; however inclusion/exclusion decisions were made prior to detailed scrutiny of the results.

Inclusion Criteria: Types of Studies

To focus on the most credible data sources, the review included empirical research studies, broadly defined to include both quantitative and qualitative investigations, published in peer-reviewed journals. Also included were research-based credible 'grey literature' (e.g. technical reports from government agencies or scientific research groups, working papers from research groups or committees, research conference presentations, evaluation studies, etc.). Government agencies, policy institutes and research units have released numerous reports that are not included in journals, but may provide credible, comprehensive and current information on valuable research findings. Studies that were considered "grey literature" included in this review are four reports of expert opinions on LTC 24-hour RN staffing (US Hartford Panel, Harrington et al. 2000; IOM, 1996, 2001, 2004).

Inclusion Criteria: Study Population

Nurses: Because the purpose was to find research that would inform policy on RN/RPN and LPN staffing, studies had to include Registered Nurse, Registered Psychiatric Nurse, and/or License Practical Nurses staffing variables to be included.

LTC Residents: The transferability of research findings from other settings may be limited due to differences in residents' care needs, therefore only studies conducted in publicly or privately operated residential long term care facilities serving seniors with heavy care needs[6] were included.

[6] Saskatchewan, special care home residents "are individuals usually having heavy care needs that cannot appropriately be met in the community through home/community based services." (Source: Government of Saskatchewan , retrieved October 7, 2009 at http://www.health.gov.sk.ca/special-care-homes).

Inclusion Criteria: Types of Interventions

Because the purpose was to find research that would inform policy on the requirement for 24-hour RN/RPN staffing, studies attempting to evaluate the impact of 24-hour nurse staffing examining of Registered Nurse, Registered Psychiatric Nurse, and/or License Practical Nurses staffing were included.

Inclusion Criteria: Resident Outcome Measures

Included quantitative empirical studies had to contain some measurement or assessment of how nurse staffing impacted residents' care, such as nurse staffing sensitive process-specific and/or outcome-specific quality indicators (Donabedian, 1966, 1988; Murphy, 2006; Rantz et al., 2004). Examples of measurements included the following (see Appendix 3.1 for information on resident care quality indicators).

Resident Process-Specific Quality of Care Indicators

- use of psychotropic medications
- use of restraints
- etc.

Resident Outcome-Specific Quality of Care Indicators

- incidence of pressure ulcers (i.e. bed sores)
- incidence of change in functioning
- etc.

Exclusion Criteria:

- Commentary or opinion publications, unidentified studies, newspaper articles, etc.
- Literature that did not examine 24-hour licensed nursing staff (RN, RPN, LPN)
- Quantitative empirical research focusing only on nurse staffing with no consideration of client outcomes related to nursing practice
- Literature focusing on children, youth, and/or adult clients in residential care facilities or group homes
- Literature in languages other than English or French
- Literature focusing only on acute care nursing and clients (i.e. not LTC)
- Literature focusing on long term care clients being cared for in acute care hospital units. The transferability of research findings from other populations may be limited due to differences in care levels.US nursing homes frequently care for both long-stay (e.g. > 90 days) residents as well as short-stay residents. Research on outcomes of short-stay (e.g. < 90 days) residents was excluded because this population is generally in the nursing home for rehabilitation and/or sub-acute care and the outcomes are different (e.g. discharge) than for long-stay residents.
- Other types of residential facilities that provide minimal or no personal care, such as assisted living facilities, rehabilitation centres, retirement centres, supportive housing, and personal care facilities.

Data Extraction Strategy

A data extraction form was developed and two reviewers piloted test the form on several papers independently to ensure all required information was being extracted and to check for degree of agreement (see Appendix 3.2 for the data extraction form used). Two reviewers then independently extracted data using the pre-designed data extraction form. Disagreements were resolved by discussion. Data from studies with multiple publications were extracted and reported as a single study.

The following data were extracted:

- Details of the study population and baseline characteristics of research groups.
- Details of the care setting and staffing composition
- Study methodology and data sources (longitudinal vs. cross-sectional; prospective vs. retrospective; secondary administrative vs. primary data; facility vs. individual level data, resident vs. facility level risk adjustments)
- Study outcome measures
- Quality assessment of the analysis
- Results were extracted, where possible, as raw numbers, including where given any summary measures with standard deviations, confidence intervals and p-values.

Quality Assessment Strategy

The quality of studies was assessed using a validated checklist appropriate to the study type (e.g. quantitative studies were assessed according to: sample population and size, longitudinal vs. cross-sectional design; secondary vs. primary data; nurse staffing sensitivity of the quality measures used, resident vs. facility level risk adjustments, etc.). Two reviewers independently, using a structured form, assessed the quality of the studies. Disagreements were resolved by discussion.

Methods of Analysis/Synthesis

The format in which the results are presented is dependent on what was available from the study reports. The search, as reported below, did not find any empirical studies on the 24-hour question; hence a formal meta-analysis was not possible. A narrative summary of the reports is used to present the conclusions of the grey literature reviewed.

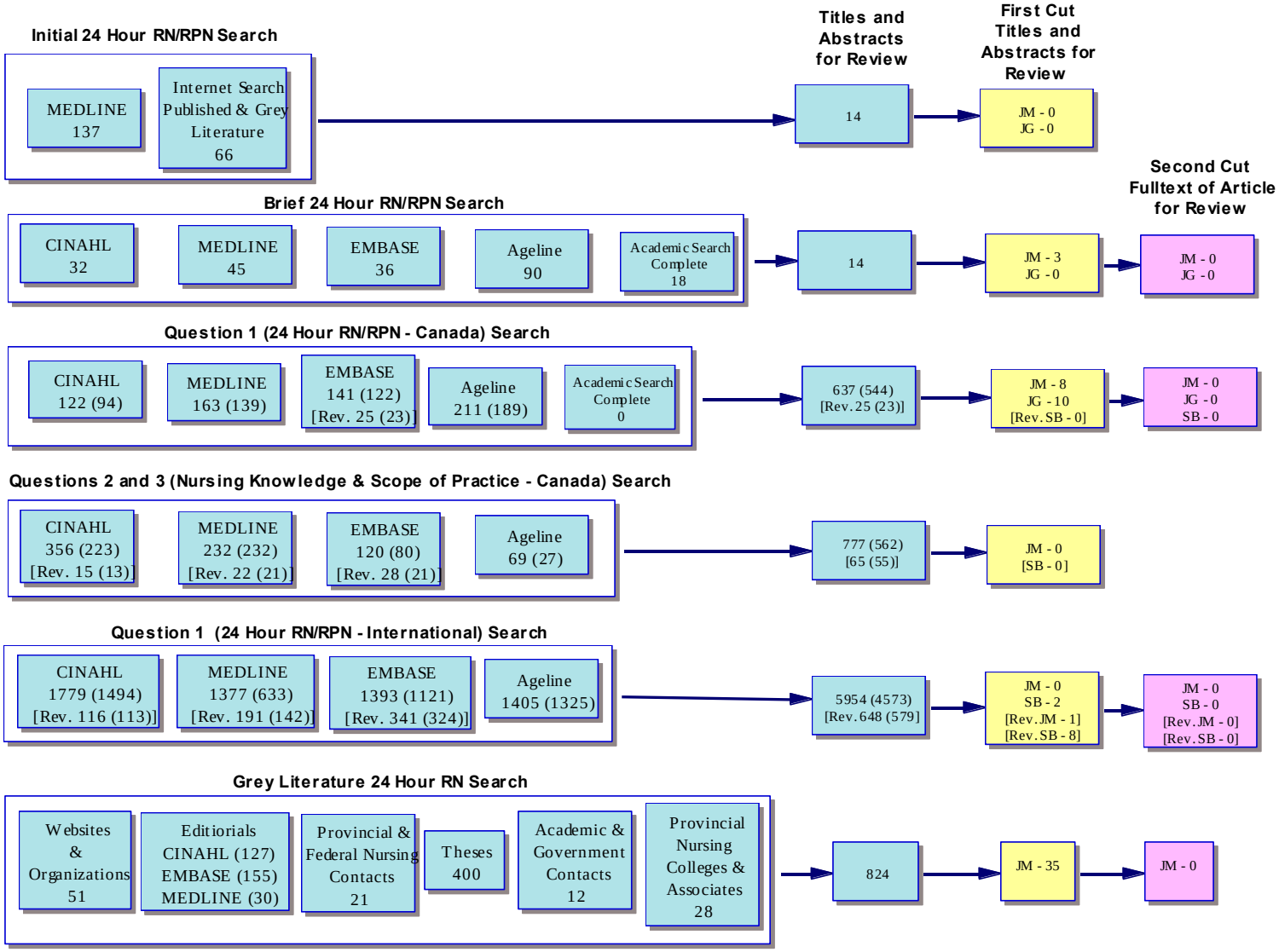
Documentation

The review process was tracked through a number of methods to provide thorough documentation. MS Word was used to record all search strategies through databases and the Internet. Unpublished documents and citations from database searches were downloaded or manually entered into RefWorks. Counts from citation results were recorded and dated and tracked throughout the identification of research papers. The research process was documented at each step to demonstrate the rigour of the review and to ensure study replication or updating if required (see Appendix 3.3 for the MS Word record of the searches).

Summary

The search resulted in a review of the titles and abstracts of a total of 5,707 empirical research articles and 657 reviews of empirical research. Of these 6,364 publications, 23 articles were pulled for review of the full text article (either because the abstract indicated the 24-hour question may have been studied, or because the abstract was not available). Overall, this exhaustive review of the research revealed that there is a paucity of research on the 24-hr RN/RPN question.

Figure 3.1 24-hour RN/RPN search



Results

Grey Literature: United States Experts' Opinions on LTC Licensed Nurse Staffing

While the search of the empirical research and grey literature did not result in any credible research relevant to the 24-hour question, the opinions of experts at the US Institute of Medicine (IOM, 1996, 2001, 2004) and the opinion of 34 experts who convened at the University of New York for a conference on long term care staffing and quality care (Harrington et al. 2000) are discussed here because they were cited repeatedly in the research literature.

Overall, these US expert committees have recommended that nursing homes be required to provide RN staffing 24 hours a day, 7 days a week (IOM, 1996, 2001, 2004; Harrington et al., 2000). In the US, nursing homes are predominantly staffed on a 24-hour basis with nurse's aides, who have a minimum of 75 hours of training, and licensed practical/vocational nurses, who have a minimum one-year of training (including just over 100 hours of clinical practice). Approximately three-quarters of registered nurses working in nursing homes have a 2-year diploma or associate degree.

Institute of Medicine (1996)

Commissioned by the US Congress, experts at the Institute of Medicine (IOM, 1996) reviewed the health care research related to nursing home (NH) staffing and quality of care. Despite the lack of research "specifically testing 24-hour nursing presence" (p. 153), the IOM expert committee recommended that the Centre for Medicaid Service (CMS) change the NH regulations to require a minimum presence of one registered nurse (RN), 24-hours a day, 7 days per week. The experts argued that "there was sufficient evidence in the literature reviewed that the presence of [an] RN...improved quality of care in nursing homes [and that] the needs of current residents require highly capable staff, consistent with RN education..." (p. 153).[7] The experts argued that "as the case-mix increases, resident care requires a highly qualified nursing staff present at all times, with the nurse needing a broad base of knowledge covering basic nursing, geriatrics, rehabilitation, and psychiatric skills. [And]...an LPN does not meet the qualification requirements stated above" (p. 152).[8] In addition, the experts noted that nursing assistants have received minimal training for the direct care responsibilities required of them[9] and therefore, they require the oversight and constructive supervision of a professional nurse. "In light of the data that indicate the fairly low level of education and high turnover rate among

[7] In 2000, 74% of RNs working in US nursing homes had a 2-year associate or diploma degree, the remainder had a baccalaureate degree (Harrington et al., 2000; IOM, 2001, 2004).
[8] In the IOM (1996) report, Johnson et al. describe the training of LPNs as averaging between 12 and 13 months, and consisting of approximately 108 hours of clinical experience and approximately 50 hours of geriatric theory (p. 426-452).
[9] In 1987, the US Omnibus Budget Reconciliation Action (OBRA), mandated that nursing assistants have a minimum of 75 hours of training, that they pass a certification exam and skills test, and that they receive 12 hours of in-service education per year (Wilner, M.A. "Training and education: What is needed to prepare nursing assistants to deliver good care" in Health Care Financing Administration, *Appropriateness of Minimum Nurse Staffing Ratios in Nursing Homes. Phase II Final Report.* Baltimore MD: CMS. 2001.)

NAs in nursing homes, the knowledge and judgement of an RN is critical to recognize a crisis or a regression of a condition" (p. 153)
(For reference, see Appendix 3.7, 3.8, and 3.9 for, respectively, information on the education programs for Saskatchewan LPNs, RNs, and NAs.)

The Hartford Panel (1998)

In 1998, another panel of 32 health care experts convened in New York for a one-day conference to review the evidence on staffing and quality of care in nursing homes. After the conference, draft recommendations were circulated to all attendees for comment, and the majority of conference participants (17[10]) supported recommendations for minimum nurse staffing standards as well as increases in the education and training of nursing staff. No research was identified that specifically examined 24-hour nursing presence and quality of care, but the experts concluded that the existing evidence "shows that RN staffing and total nurse (RN, LVN/LPN, and NA) staffing levels are important factors in ensuring high quality of care in nursing homes. These findings, along with the evidence for poor quality of care in many nursing homes, support the need for increased minimum nurse staffing levels to improve quality of care" (Harrington et al., 2000, p. 7).

The expert panel recommended the following minimum licensed nurse staffing for nursing homes[11]:
(From Table 3, p. 10, Harrington et al., 2000)

Administration Standard

- Full-time RN with a bachelor's degree as director of nursing (a provision for grandfathering current RN directors would be allowed for a specified time period)
- Part-time RN assistant director of nursing (full-time in facilities of 100 beds or more; this person may also be the MDS coordinator)
- Part-time RN director of in-service education (preferably with gerontology training; full-time in facilities of 100 or more)
- Full-time RN nursing facility supervisor on duty at all times, 24 hr/day, 7 days/week

Direct Care Staffing Standard

- Minimum licensed nurses (RN and LVN/LPN) providing direct care, treatments and medications, planning, coordination, and supervision at the unit level:
    - Day shift 1 FTE for each 15 residents (0.53 hr per resident day)
    - Evening shift 1 FTE for each 20 residents (0.40 hr per resident day)
    - Night shift 1 FTE for each 30 residents (0.27 hr per resident day)

[10] 17 of the 32 conference participants supported the recommendations, while 8 were unable to comment (due to government position or other reason), 3 did not respond, 1 did not feel competent to make a judgement, and 3 did not support the recommendations (2 NH administrators and 1 economist) (Harrington et al., 2000, p. 6).
[11] The authors note the recommendations "builds on the Nurse Staffing Standards accepted by the National Citizen's Coalition for Nursing Home Reform (1995)" (p. 10).

(See Appendix 3.10 for additional staffing standards recommended by the Hartford Panel.)

Institute of Medicine (2001, 2004)

In 2001, a second IOM expert committee recommended that Health Care Financing Administration (HCFA) "implement the IOM 1996 recommendation to require RN presence 24 hours per day. It further recommend[ed] that HCFA develop minimum staffing levels (number and skill mix) for direct care based on casemix-adjusted standards" (IOM, 2001, p. 193).[12] Although research on 24-hour nurse staffing was still lacking, in 2003, the IOM again recommended that nursing home standards be updated to "require the presence of at least one RN within the facility at all times[and] specify staffing levels that increase as the number of patients increase" (IOM, 2004, p. 9).

Summary

US experts consistently recommend that to improve the quality of resident care, that all LTC nursing staff need more geriatric and clinical education, and that more highly knowledgeable and skilled licensed nurses are needed to capably assess, coordinate, plan and supervise the care needs of a LTC resident population that has increasingly complex care needs. Indeed, the experts recommend that more qualified nurses are needed as the acuity (e.g. case-mix) of the resident population increases. The experts argue that in US nursing homes, LPNs, with their one-year of training, and nurses' aides, with their minimal training (e.g. 75 hours), require 24-hour RN supervision to ensure high quality of care.

[12] The IOM experts made other staffing recommendations, including "that facilities of 100 beds or more have a full-time RN director for in-service education (proportionately adjusted for smaller facilities), who would be responsible for the administration and supervision of an ongoing training program for staff at all levels The panel also recommended an increase in staffing levels at mealtimes, so that one staff member would be available for 30 to 60 minutes to assist each dependent individual with eating" (p. 191-192).

Chapter 4. A Review of the Nurse Staffing Mix and Levels Literature

Mid-way through the project, after the 24-hour RN/RPN coverage search found no results on the topic, the Research and Policy Teams met and agreed to a search of the literature that spoke 'indirectly' to the 24/7 RN/RPN question. Two areas of research were considered: first, research on the relationship between LTC nurse staffing mix and levels and nurse sensitive resident care indicators (i.e. incidence of pressure ulcers, change in functioning, etc.); and second, time permitting, research on the reason for and frequency of emergency transfers in LTC that might provide information on the after-hours nurse staffing needs in LTC[13].

Primary interest was in a critical review of the research on LTC nurse mix/levels associated with nurse sensitive resident care indicators; thus the new policy research question agreed upon for the second review was:

What are the implications of variation in nurse staffing mix and levels (for RNs and LPNs) in terms of care quality and resident outcomes?

Search Methods

A full review of the empirical literature required more time than was available, as the project was at its mid-point. Consequently, the research and policy teams agreed to limit the search to a review of the recent reviews, and if needed, to further review of key articles cited in the reviews to retrieve demographic, methodological and result details.

Search Inclusion and Exclusion Criteria

The inclusion and exclusion criteria described in chapter 3 were similarly applied to this second search. The primary difference between the two searches was the types of nurse staffing intervention. Because the purpose was to find research on the implications of variations in nurse staffing and mix, not on the requirement for 24-hour RN staffing, studies examining the influence of the mix of RNs/RPNs or LPNs to other nursing staffing on resident care outcomes; and/or studies examining the influence of individual nurse staffing levels (RN, RPN, and/or LPN FTE or hours per resident day) on resident care outcomes were included.

Literature that did not include licensed nursing staff (RN, RPN, LPN) mix or levels variables were not included (i.e. studies that only focused on other nurse staffing such as nurse

[13] A preliminary search for research on the reason and frequency of emergency transfers in LTC was conducted. A MEDLINE search was developed with the subject components LTC AND nurse staffing AND (Hospitalization AND (referral/assessment OR resident factors OR reasons for transfer). The search was limited to reviews through a variety of methods and resulted in 256 references which were downloaded into RefWorks for the reviewers. However, as priority was given to search for the most recent LTC nurse staffing and resident outcomes research the team decided to put aside temporarily the review of emergency transfers in LTC. Due to the project time constraints this search was not revisited at a later date.

practitioners or nursing assistants). Also, because of the lack of time available, only literature published in English was included.

Nurse Staffing Mix/Levels and Nurse Sensitive Resident Care Indicators Research Search

Three relevant review articles were known to exist based on searches to date and recommendation by Dr. Harrington (Castle, 2008; Collier & Harrington, 2008; Bostick, 2004). These three documents were reviewed and their reference lists were hand searched. In addition, to ensure no other critical reviews were missed, a systematic search for reviews of research on nurse staffing and the quality of resident care was conducted.

Q4 Staffing & Resident Outcomes: Reviews 2000-2010 Search

A search strategy was developed to examine empirical research on the impact of nurse staffing, and particularly LPN staffing, on resident care quality. The search components for LTC, nurses, and nurse staffing were rerun with some changes and then limited to reviews with a sensitive review filter. The search results were divided into two groups: those 1990 to 1999; and those from 2000 to 2010. This search strategy was run in MEDLINE, EMBASE and CINAHL. The search results from the two sets of dates were then downloaded into RefWorks.

A decision was made to focus on reviews published from 2000 to 2010 as these would cover the most recent and therefore most relevant research. After duplicates were removed the searches from the three databases produced 826 references from the original 920. In the first cut of titles and abstracts JM selected 12 from CINAHL and 6 each from MEDLINE and EMBASE. The full text of the 24 review papers were reviewed by JM and SB which resulted in the selection of three CINAHL reviews (Dellefield, 2000, Collier & Harrington, 2008, Wells, 2004), two from MEDLINE (Bostick, Rantz, Flesner & Riggs, 2006; Scott-Cawiezell & Vogelsmeier, 2006) and one from EMBASE (Castle, 2008) for a total of six review papers. Three reviews from the grey literature (California Department of Health Care Services [DHCS], 2004, Murphy, 2006, Sharkey, 2008) were also included in the final selection of review papers for a total of nine reviews.

Of the nine review papers only one used explicit quality criteria and applied this to make decisions on inclusion/exclusion (Murphy, 2006). The other paper that deals explicitly with limitations of studies, but in the discussion, is Castle (2008). All of the others were more narrative reviews and did not consider research quality. A reading of these reviews indicated that a thorough systematic review of the LTC nurse staffing and resident outcome literature has yet to be published in a peer-reviewed journal.

Q4 Staffing & Resident Quality of Care: Selected Reviews Search

JM identified the empirical studies on nurse staffing and resident care quality that the nine review articles cited and applied the agreed upon inclusion/exclusion criteria, making a new list of the best original empirical research to be included in this review. Most of the studies were cited in at least two of the reviews. This produced 114 unique studies. The studies were ranked from the best to worst (based on the ranking criteria described below). Considering all of the reviews, it can be argued that the most relevant research published between 1990 and

2005/2006 had been reviewed and that there was not a need to conduct a new search of all the research published in this time period. Collier and Harrington (2008) cited articles published as recently as 2008 (Konetzka, Stearns & Park), but they did not conduct a systematic review of the literature.
JM and SB reviewed the titles and abstracts of the 114 selected references. CH reviewed several of the reviews which accounted for 79 of the 114 references and selected 20. LK also reviewed a selected number of the references (50 of the 114) due to situations where the decision to cut was unclear.[14] From the 114 JM, SB and LK reviewed CH's 20 and selected 14. They also reviewed the full 114 and selected 19 papers in which they would review the full text.

Since the review of reviews covered the research up to November 2005, a systematic search was undertaken to examine the empirical research pertaining to nurse staffing and resident outcomes/quality of care in long term care from December 2005 to March 2010. The search concepts included LTC, nurses, nurse staffing and resident outcomes. The search was completed in the databases MEDLINE, EMBASE and CINAHL.

Q4 Staffing & Resident Quality of Care: 2006 – 2010 Search
As time permitted, a search strategy, based on the reviews search, was developed to examine recent empirical research on the impact of nurse staffing (RN, RPN, and LPN) on the quality of resident care that may have been missed in the reviews. The same search components: LTC, nurses, and nurse staffing were included but the search was limited to empirical studies between December 2005 and March 2010. This search strategy was run in MEDLINE (1715 references), EMBASE (1212 references) and CINAHL (1203 references) which resulted in 4,130 references. After duplicates were removed the total was 3,453. The search results were downloaded into RefWorks.

The first cut of the 3,453 resulted in 24 references. The 1201 titles and abstracts in CINAHL were reviewed by SB and six were selected for full review. JM and SB both reviewed the 1,714 MEDLINE titles and abstracts and selected 11. These first cuts were reviewed together and a list was made of 17 articles to include. Research focusing on agency staffing, APNs (advanced practice nurses), physicians, or physician extenders/nurse practitioners, and that did not include RN, LPN, or NA nurse staffing, was not included in the review. 538 references from EMBASE were also reviewed: SB selected 6 and JM selected 3 for further review. Of the final 24 references chosen in the first cut, seven were selected for full review. CINAHL was reviewed by SB, JM, and LK and they each selected 2 papers (Arling, Kane, Mueller, Bershadsky & Degenholtz, 2007 and Castle & Engberg, 2007). The three reviewers selected also five papers from MEDLINE (Dyck, 2007; Kim, Harrington & Green, 2009; Kim, Kovner, Harrington, Greene & Mezey, 2009; Konetzka et al., 2008; and Zhang, Unruh, Liu & Wan, 2006). JM and SB did not select any from EMBASE.

In summary, the reviews search produced 19 papers for full review and the 2006 to 2010 search produced seven papers for a total of 26. Of the seven papers identified in the 2006 to 2010

[14] Lisa Kuramato (LK), reviewed research methodologies and analyses.

search, four were duplicates of those included in the reviews: two from CINAHL were also cited in the Castle 2008 review paper and two from MEDLINE also appeared in the Collier and Harrington 2008 review paper. The three papers in MEDLINE (Dyck, 2007; Kim, Harrington et al., 2009; and Kim, Kovner et al., 2009) were not cited in the 9 review papers, which gave a total of 22 papers for full review. All 22 papers met the inclusion criteria.

Review Methods

Review Inclusion and Exclusion Criteria

The inclusion/exclusion criteria described in the 24-hour search (see chapter 3) were independently applied by two reviewers (in addition to the changes to the search criteria described above) to all potential studies. Any disagreements were resolved by discussion, and a third reviewer (LK), who is an expert in quantitative methods, was consulted for assessment of the methodologies and analysis applied in the studies. Reviewers were not blinded to any features of the report including authorship; however inclusion/exclusion decisions were made prior to detailed scrutiny of the results.

Data Extraction Strategy

The data extraction form developed for the 24-hour search was adapted for use in the nurse staffing mix/levels search. As before, two reviewers independently extracted data from the selected studies. Data from studies with multiple publications were extracted and reported as a single study. The data extracted was the same as described in chapter 3.

Documentation

The review process was tracked through a number of methods to provide thorough documentation. MS Word was used to record all search strategies through databases and the Internet. Unpublished documents and citations from database searches were downloaded or manually entered into RefWorks. Counts from citation results were recorded and dated and tracked throughout the identification of research papers. The research process was documented at each step to demonstrate the rigour of the review and to enable study replication or updating if required (see Appendix 4.1 for the MS Word record of the MEDLINE search).

Ranking and Selection of Studies

Three reviewers (SB, JM, and LK), independently, using a structured form, assessed the quality of the studies. Disagreements were resolved by discussion. The following characteristics were used to rank the studies:

Study Design

Randomized controlled trial design is the most preferred, followed by prospective longitudinal designs, retrospective longitudinal, and last, cross-sectional designs

Randomized controlled trial designs are the gold standard, but as they would involve assigning residents to one group receiving an intervention (e.g. RN staffing) and another group receiving an alternative intervention (e.g. LPN staffing), it is the least likely to be used in current LTC

placement policies. Longitudinal studies, research that looks at the same group over time, are the most costly, but are required to measure causal effects. Cross-sectional designs are like a snapshot, providing a glimpse of a sample of people at one point in time, and while they are easier to conduct, they are potentially only able to identify associations between variables (e.g. prevalence of a condition in certain LTC populations), not true casual effects. The majority of studies could also be described as observational studies, not interventional studies. Noninterventional studies can only show associations that reflect assumptions about causality, unlike randomized controlled trials, which can demonstrate causality with more certainty. Prospective studies are preferred over retrospective designs because their designs can better account for potentially confounding factors.

Data

Primary data is preferred to secondary data

Details on the data sample and source, including whether the data came from a primary or secondary source, was considered. Designs using primary data are preferred because secondary data may involve significant biases from unmeasured factors, which may unknowingly affect observed differences in quality.

Many of the US studies used the Health Care Financing Administration's On-line Survey Certification and Reporting System (OSCAR) database, which is composed of information collected by state licensure and certification agencies, for staffing data as well as for resident risk adjustment data. Researchers have noted that the OSCAR data, though widely used, need to be done so with caution. The OSCAR staffing measures, based on information of staffing levels in the past 2 weeks, is self-reported by facilities on an annual basis, and is not audited, and there is currently no mechanism to ensure the accuracy of the data. If the OSCAR data is not properly cleaned for errors, it is not a reliable source of information for staffing levels, particularly for nursing assistants. For example, in the CMS Phase II Study, White, Walker and Feuerberg (US Centers for Medicare and Medicaid services [CMS], 2001) reported that the correlation between staffing figures from OSCAR and payroll data was relatively low. However, with the application of a series of decision rules, such as excluding from the sample population NHs that report nurse staffing of more than 12 hprd or less than 0.5 hprd, or NHs that report having more than 60 residents and no RN hours, the reliability and validity of the OSCAR data improves considerably. With regards to using OSCAR for risk adjustment data, Castle (2008) argues that "studies using OSCAR data may be especially biased in this area, as very few appropriate variables are included in this data for risk adjustment" (p. 394).

Sample

For quantitative studies, larger samples, with residents' characteristics similar to SK residents, are preferred to smaller samples and those with dissimilar residents

A large sample size is more likely to result in significant findings, although the effect sizes of these findings may be small (Castle 2008). Many US nursing homes care for both short-stay residents who are placed in the nursing home for sub-acute care and/or rehabilitation, as well as

long-stay residents, similar to Canadian long-term care residents. Studies included in the review either specifically measured the quality of care of long-stay residents or adjusted for the percentage of resident population who were short-stay.

Nurse staffing measure

A measure of staffing per resident (e.g. hours, FTE) is preferred to that of staffing per bed

The preferred measure of staffing levels is hours per resident day (hprd), followed by the number of FTE per resident or per occupied bed. The least preferred measure is FTE per bed (used by Castle & Myers, 2006) because it "can inaccurately reflect staffing due to fluctuations in facility census" (Bostick et al., 2006, p. 368). The use of Medicaid cost report data are considered quite accurate, and are preferred over OSCAR, which has been found to be a less reliable measure. Studies that used a proxy measure for staffing, such as staff cost per resident were not included because of the wage rate.

Resident Quality of Care Measures

Preferred measures are: sensitive to nurse staffing; measured at the resident-, not facility-level; and are incidence, not prevalence, measures.

A wide variety of variables are used to measure the quality of resident care. Donabedian's quality of care framework (1966, 1988), is widely applied by researchers (Castle, 2008; Collier & Harrington, 2008; Dellefield, 2000). Donabedian's framework classifies quality of care as being related to structural and process factors, which are linked to resident outcomes (see Appendix 3.1).

In the research, nurse staffing characteristics are primarily considered as structural measures, and, as discussed above, were measured as hours of different types or groups of nurses per resident, or numbers and types of nurses per residents. Process measures, referring to the treatments or interventions implemented by nursing staffing, were measured as, for example, ADL training, use of restraints or indwelling catheters, or records of assessments. Resident outcomes attributed to the nursing care residents received included, for example, incidence of pressure ulcers, hospitalization rates for ambulatory care sensitive reasons, or changes in functional status. Composite indicators, those that combine a mix of both process and outcome measures into one index, were used in several of the studies reviewed.

Furthermore, Donabedian indicates, that to use a quality measure as an indicator of the effectiveness of nurse staffing, the measure needs to be one that nurses might have the most influence over. Canadian researchers have established links between LTC nurse staffing and residents' functional status and symptom severity (i.e. pain and fatigue) (Doran et al., 2006). After a comprehensive review of quality indicators used in US nursing home research, Berg et al., (2002) recommended the use of the following measures: functional decline (e.g. decline in ADL, locomotion, etc.); prevalence of bowel and bladder incontinence, incidence of pressure ulcers, incidence for new or worsening pain, falls, and weight loss; use of physical restraints, feeding tubes, and indwelling catheters; decline in behaviour/mood; and use of antipsychotic

and anti-anxiety drugs. For comparison purposes, the indicator also needs to occur at a sufficiently high incidence rate such that the measure can be considered stable; and last, researchers need to be able to adjust for identifiable risk factors (discussed below).

Resident-level outcomes are preferred over facility-level outcomes because they are more sensitive measures of the quality of care. Examples of resident-level outcomes are pressure ulcers, level of functioning, and weight loss, whereas examples of facility-level outcomes are numbers of deficiency citations (US). Additionally, incidence measures of resident-level outcomes are preferred over prevalence measures (unless extra risk adjustments are applied), because the mere presence of a condition (e.g. pressure ulcers) may reflect admission of a more complex resident case mix (Centers for Medicare and Medicaid Services (CMS), 2004). However, incidences of these events (e.g. new pressure ulcers, new indwelling catheters, new restraints) are all possible measures of the quality of nursing care. (See Appendix 4.2b for details on the measures used in the studies reviewed.

Risk Adjustment Factors

The level of risk adjustment specificity employed in a research design is critical. *"Inadequate risk-adjustment may lead to erroneous identification of association between certain environments and higher quality problems when the true cause is difference in underlying patient risk for adverse events"* (Hillmer et al., 2005 p. 142). Studies that adjusted for resident, facility, market and state variables were ranked higher than studies that only adjusted for resident factors.

Resident Risk Adjustment

Resident-level risk adjustment preferred over facility-level risk adjustment.

Differences across LTC facilities in the average care level of their residents will affect the amount of nursing time needed to provide adequate care. Thus, LTC facilities with the same nurse staffing level, but different resident care needs, will vary considerably in how well they are able to meet residents' needs. Better studies are those that applied resident-level risk adjustments including demographic characteristics, detailed clinical diagnoses information, level of functioning, and the type of medications prescribed (i.e. psychoactive) because these are important measures of underlying risk.

Facility, State and Market Risk Adjustments

Inclusion of facility, state, and/or market adjustments preferred (over not including)

Facility risk adjustments include structural indicators (e.g. number of beds, for-profit or non-profit ownership, chain membership, presence of on-site special care units etc.), census indicators (e.g. percent Medicaid census, occupancy rates), staffing patterns, and others.
State risk adjustments are used to control for the influence state variations may have on the results (applicable to US studies).
Market risk adjustments include geographic location of the facility (urban, rural, etc.), and use of competition and/or economic control variables (e.g. Herfindahl-Hirschman Index).

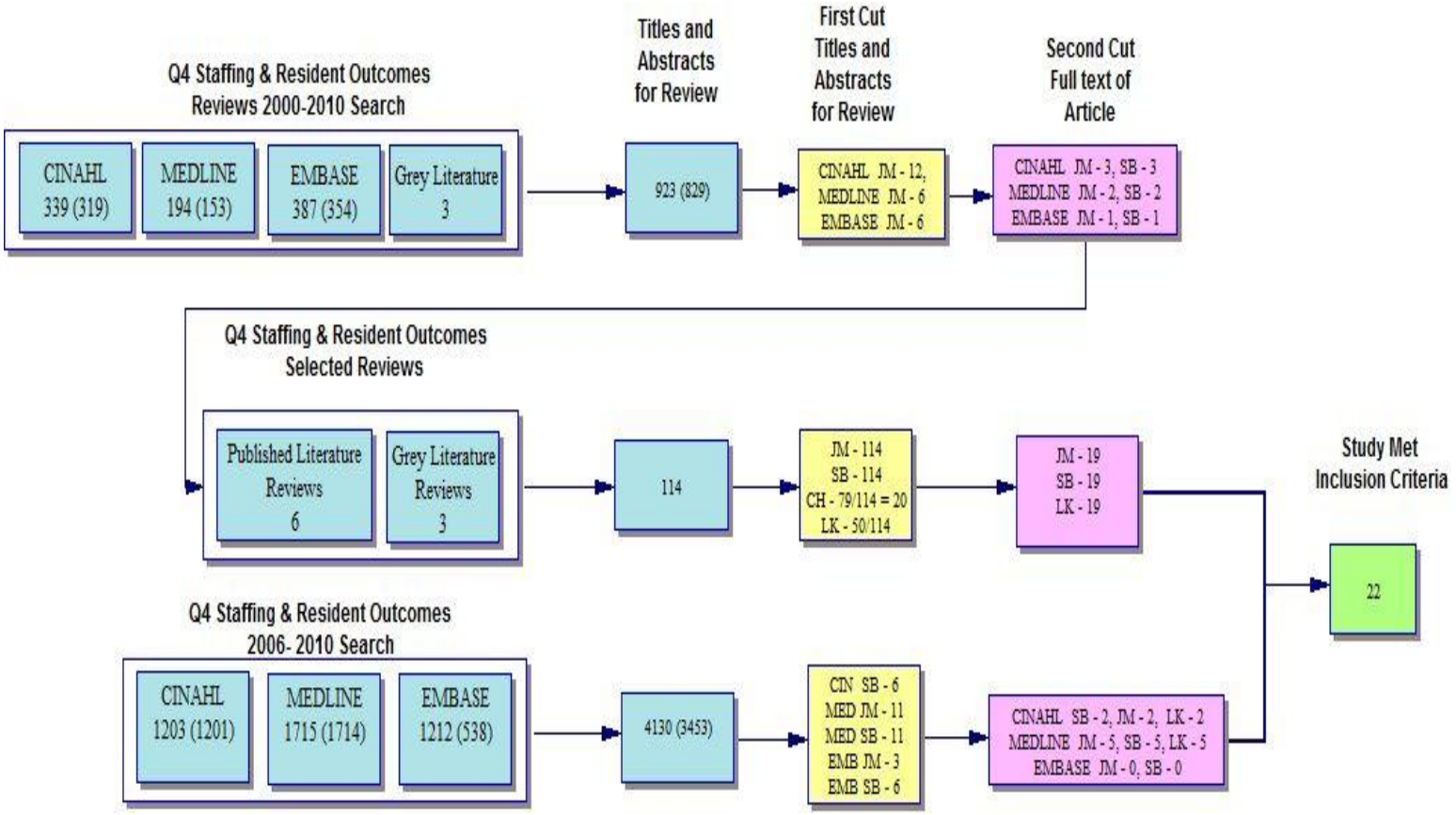
Statistical Analysis Methods

The statistical analyses used to evaluate the research questions of the studies were also reviewed. The studies differed by their study design, outcome measures, units of analysis, and regression models. Typically there is more than one appropriate method of analysis. The appropriateness of the statistical analyses considered whether the chosen methods corresponded to the nature of the data. Statistical analysis was ranked lower if the regression model did not correspond to the data type of the outcome. For example, ordinary least squares regression does not account for the non-negative nature of a count outcome (e.g. Harrington, Zimmerman, Karon, Robinson & Beutel, 2000). The hierarchical nature of the data is related to the unit of analysis. If the resident is the unit of analysis, residents in the same facility may have more similar outcomes than residents in different facilities. Statistical analysis was ranked higher if the analysis accounted for hierarchy, if present (e.g. Carter & Porell, 2005). If the study design was longitudinal, the statistical analysis was ranked higher if it accounted for correlations over time (e.g. Kim, Kovner et al., 2009). Statistical analysis was also ranked lower if there were concerns of multicollinearity since this could lead to unreliable estimates (e.g. Castle & Meyers, 2006).

Method of Analysis/Synthesis

The format in which the results are presented is dependent on the data and methodology used in each study. The studies used different variations of nurse staffing variables: five of the 22 studies examined nurse staffing mix; 19 of the 22 examined nurse staffing levels (two of these also measured staff mix); and three of the 22 studies examined nurse staffing levels used staffing thresholds. In addition, the studies utilized different measures of the quality of resident care, but because of the variety of staffing measures a summary of the results by resident outcome is not feasible, nor is a formal meta-analysis of the results. Hence, we have organized a summary of the studies and their findings by the staffing measures. Details on the application of inclusion criteria and quality assessment of the studies are provided in Appendix 4.2; and details on the methodologies of the studies are included in Appendix 4.3.

Figure 4.1 LTC nurse staffing mix and levels search



Results

Twenty-one studies published in peer-reviewed journals met our inclusion criteria, as well as one study (Kramer & Fish, 2001) published by the US government. Five of these studies examined the effect of the mix of RN staffing to other nurse staffing on resident outcomes; fourteen of the studies examined the effect of RN and/or LPN staffing levels on resident outcomes; and three of the studies used thresholds of staffing levels to examine the impact of nurse staffing on resident outcomes. An overview of the twenty-two studies is provided, including information on: study design, data source, sample, nurse staffing measure, resident quality of care measure, and risk adjustment. This is followed by a detailed analysis of the mix studies, then the staffing levels research, and last the staffing threshold studies. Additional details on these studies can be found in Appendices 4.2a, 4.2b and 4.3.

Study Design

None of the studies employed the gold-standard: randomized controlled trial design. The methods found included retrospective or prospective longitudinal designs and cross-sectional designs. Only two of the longitudinal study designs were prospective (Arling et al., 2007; Loeb et al., 2003), while eight used a retrospective longitudinal design (Carter & Porell, 2005; Castle, 2002; Grabowski & Castle, 2004; Horn, Buerhaus, Bergstrom, & Smout, 2005; Kim, Harrington et al., 2009; Kim, Kovner et al., 2009; Konetzka et al., 2008; and Kramer & Fish, 2001). The remaining twelve studies reviewed used a cross-sectional design, and of these twelve, only one was prospective (Castle & Engberg, 2008), the rest were retrospective. (See Appendix 4.2a)

Data

The majority of studies used secondary data: only five studies used the preferred primary data (Arling et al., 2007; Horn et al., 2005; Loeb et al., 2003; Castle & Engberg, 2007, 2008). Thirteen of the studies used the least preferred OSCAR database for staffing and/or risk adjustment measures, however, nine of these discussed applying some, if not all, the recommended rules for cleaning the OSCAR data (the four studies that use the OSCAR data and do not discuss cleaning the data are Castle, 2002; Grabowski & Castle, 2004; Intrator et al., 2004; and Konetzka et al., 2008). The nine studies that did not use the OSCAR data for staffing or risk adjustment measures are: Arling et al., 2007; Carter & Porell, 2005; Castle & Engberg, 2007, 2008; Horn et al., 2005; Kim, Harrington et al., 2009; Kim, Kovner et al., 2009; Kramer & Fish, 2001; and Loeb et al., 2003. (See Appendix 4.2a)

Sample

Studies included in the review varied in sample size ranging from 50 nursing homes (Loeb et al., 2003) to a national sample of 15,975 nursing homes (Grabowski & Castle, 2004). Other studies provided details on the number of residents included, and of those that did the figures ranged from 1,376 (Horn et al., 2005) to 399,206 (in Konetzka et al., 2008). Four of the studies reviewed used a single state sample (Bostick, 2004; Carter & Porell, 2005; Kim, Harrington et al., 2009; Kim, Kovner et al., 2009). (See Appendix 4.2a)

Nurse staffing measure

All of the studies included examined the level of RN staffing, and/or the mix of RNs to other nursing staff. Five of the studies examined the effect of a higher mix of RNs to other nursing staff and the mix ratio was measured in a variety of ways: RN/(LPN+NA); RNs/(RN+LPN); RN/LPN; and RN/(RN+LPN+NA).

Twenty of the studies measured individual staffing levels in relation to quality of resident care:

- 20 report results for RN staffing levels;
- 18 report results for LPN staffing levels; and
- 16 report results for NA staffing levels.

Three of the twenty staffing level studies used threshold measures of staffing levels (Horn et al., 2005; Kramer & Fish, 2001; and Zhang et al., 2006). Twelve of the staffing level studies used the preferred measure of staffing levels – hours per resident day (hprd) – while the remainder used a ratio of FTE per resident or per bed. Following the example of Lankshear, Sheldon & Maynard (2005), if a study measured staffing levels using nurse FTE per resident, we converted the staffing results into hprd by calculating the "*converted hours per patient day* (CHPPD)" (p. 164, emphasis in original) using the formula (FTEs x 1920 hours)/(resident census x 365 days)=CHPRD. (See Appendix 4.2a)

Resident Quality of Care Measures

A variety of measures were used to assess the quality of residents' care. The most frequently used were use of physical restraints (9 studies) and prevalence or incidence of pressure ulcers (9 studies) (see Appendix 4.2b for details on each study's measure definitions; and Appendix 3.1 for an explanation of the measures and information on which were used by the studies reviewed in this report).

Risk Adjustment Factors

The studies reviewed employed various resident risk adjustment variables in their research design. Most studies used a facility-level resident risk adjustment (case-mix score). Seventeen studies used a facility-level risk adjustment derived from aggregate resident data (e.g. ADL, incontinence, use of medications) obtained from the OSCAR database. Five studies applied resident-level risk adjustments (Arling et al., 2007, Dyck, 2007, Horn et al., 2005, and Intrator et al., 2004; Carter & Porell, 2005). (See Appendix 4.2b)

Twenty-one of the 22 studies reviewed adjusted for resident, facility, and state and/or market variables. Only one of the 22 studies adjusted for resident and facility characteristics and not for state or market characteristics (Horn et al., 2005).

Analysis

Description of Studies on Nursing Staff Mix

Five studies examining the effect of a higher ratio of RNs to other nursing staff met inclusion criteria for review (see Table 4.1). These studies measured the staffing mix ratio in different ways: RN/(LPN+NA); RNs/(RN+LPN); RN/LPN; and RN/(RN+LPN+NA). None of the studies reviewed measured the effect of the mix of LPNs to other nursing staff. The ratio of RNs to other nursing staff is intimately linked to levels. Kim, Harrington et al. (2009) and Intrator et al. (2004) did not measure individual staffing levels. Of these five studies, the research by Konetzka et al. (2008) could be considered the most robust (because of its longitudinal design, large sample, and use of appropriate statistical analysis methods) and relevant to the Canadian context (because it used incidence quality measures – PUs and UTIs – that are nursing sensitive). (See Appendices 4.2a, 4.2b and 4.3 for additional details on these studies.)

Table 4.1: Description of studies examining nursing staff mix

Study citation	Sample	Study design	Staff Measure	Measures of care quality
Konetzka, Stearns, & Park (2008)	399,206 resident assessments from 1,366 NHs in Ohio, Kansas, Maine, Mississippi, and South Dakota NHs	retrospective longitudinal (4 years)	% of total hours provided by RNs = 0.117 (also measured levels – reported in Table 4.3)	incidence of PU and UTI
Kim, Harrington, & Greene (2009)	412 California NHs	retrospective longitudinal panel data	*NHs meeting standard*: RN/total staff ratio = 0.14 RN/LPN ratio = 0.94 *NHs not meeting standard*: RN/total staff ratio = 0.09 RN/LPN ratio = 0.64	number of total & serious federal and state deficiency citations
Castle & Engberg (2008)	6,005 US NHs	prospective cross-sectional	RN/(LPN+NA)=0.25 (also measured levels – reported in Table 4.3)	% high risk and low risk residents with PU; % physically restrained; % with moderate to severe pain; % had a catheter inserted and left in bladder
Castle & Myers (2006)	12,690 US NHs	retrospective longitudinal (7 years)	RN/(LPN+NA)=0.16 (also measured levels – reported in Table 4.3)	number of deficiency citations for: 1) failure to include mental status in assessment; 2) providing appropriate treatment for residents with mental difficulties
Intrator, Zinn, & Mor (2004)	54,631 residents in 663 NHs in Maine, Kansas, New York, and South Dakota	retrospective cross-sectional	RNs/(RN+LPN)=0.37	deaths and hospitalization for ACS reasons and any other reasons

Findings of Studies on Nursing Staff Mix

Four of the five RN ratio studies reported mixed findings (positive, negative, and/or no change in outcomes), while one study (Castle & Myer, 2006) had non-significant findings with regards to the mix of RN staffing (see Table 4.2).

A higher RN staffing ratio was associated with improvements in some quality of care measures (UTIs, prevalence of PUs, restraint use, percentage of residents with pain, certain types of deficiency citations, and hospitalization for non-ACS reasons), but not other quality measures (incidence of PUs, use of indwelling catheters, certain types of deficiency citations, or hospitalizations for ACS reasons).

For example, Konetzka et al. (2008) found that a higher ratio of RN staffing had no effect on the incidence of pressure ulcers, but was associated with improvements in rates of UTI infections. In comparison, Castle and Engberg (2008) found that higher RN staffing ratio was associated with a lower prevalence of pressure ulcers among high and low risk residents. There may be a difference in the effect of rate of pressure ulcer rates due to the way they measured staff mix (the two studies used different denominators – see table 4.1), and/or the way they measured pressure ulcers (i.e., prevalence versus incidence – see Appendix 3.1 for a discussion on quality measures).

Table 4.2: Summary of findings on nursing staff mix

Study citation	Higher RN staffing ratio associated with:	
	significantly lower:	no significant effect on:
Konetzka, Stearns, & Park (2008)	UTI rate	incidence pressure ulcers
Kim, Harrington, & Greene (2009)	number of serious deficiency rate (in ‘well staffed’ homes); total deficiency rate (in ‘less well staffed homes)	number of serious deficiency rate (in ‘less well staffed’ homes); Total deficiency rate (in ‘well staffed’ homes)
Castle & Myers (2006)		likelihood of receiving mental health assessment or treatment deficiency citations
Castle & Engberg (2008)	percentage of: high or low risk residents with pressure ulcers; residents with moderate to severe pain; and percentage of restraint use	use of indwelling catheters
Intrator, Zinn, & Mor (2004)	hospitalization rates for non-ACS reasons	hospitalizations rates for ACS reasons

Description of Studies on Nursing Staff Levels

Seventeen studies examining the effect of staffing levels of RNs and/or LPNs on resident outcomes met inclusion criteria for review (the 17 studies includes 3 that were discussed above in the RN mix section: Castle & Engberg, 2008; Castle & Myers, 2006; and Konetzka et al., 2008). Only one of these studies (Loeb et al., 2003), includes Canadian LTC facilities in its sample; the remainder exclusively study resident outcomes in US nursing homes.

These studies measured staffing levels in different ways: hours per resident per day (hprd), or full time equivalent (FTE) staff numbers per residents or per beds (see Table 4.3). The first two measures are preferred over the last measure, "per beds" (used by Carter & Porell, 2005; Castle, 2000; and Castle & Myers, 2006). Bostick et al. (2006) explains that staffing measured by "some measure of hours per resident day...is preferable to a measure of hours per facility bed that can inaccurately reflect staffing due to fluctuations in facility census" (p. 368).

Of these seventeen studies, the research by Arling et al. (2007) could be considered the most robust because of its prospective longitudinal design, large sample, staffing measure of hprd, primary data and use of seven nursing sensitive quality measures. (See Appendices 4.2a, 4.2b and 4.3 for additional details on these studies.) The research by Konetzka et al. (2008), also discussed above in the RN mix studies, is arguably another of the strongest studies because of its longitudinal design (albeit retrospective), large sample, staffing measure of hprd, and use of two nursing sensitive quality measures. (See Appendices 4.2a, 4.2b and 4.3 for additional details on these studies.)

Table 4.3: Description of studies examining nursing staff levels

Study citation	Sample	Study Design	Staff Measure	Measures of care quality

Arling, Kane, Mueller, et al. (2007)	5,314 residents in 105 NHs from a 4-state sample	prospective longitudinal	hprd:
			licensed (RN+LPN)=1.01;
			unlicensed (NA+ activity)=2.1;
				physical restraints use, toileting program, range of motion training, ADL training; ADL decline; worsening incontinence, and worsening behaviour

Bostick (2004)	39,636 residents in 413 Missouri NHs	retrospective cross-sectional	hprd RN=0.22; LPN=0.61; NA=1.5	prevalence pressure ulcers, weight loss, ADL decline, behaviour problems and restraint use
Carter & Porell (2005)	525 Massachusetts NHs (19,802 residents with ADRD; 19,958 residents without ADRD)	retrospective longitudinal	FTE per occupied beds (124) RN=8.0; LPN=10.1	1) hospitalization for any ambulatory care-sensitive condition (re ICD-9-CM); 2) hospitalization for an infectious ACSH, 3) hospitalization for bacterial pneumonia, 4) hospitalization for gastroenteritis, and 5) hospitalization for kidney and/or urinary tract infection (UTI).
Castle & Engberg (2007)	1,071 NHs in Missouri, Texas, Pennsylvania, New York, Connecticut, New Jersey	prospective cross-sectional	FTE per 100 residents RN=14.7; LPN=16.6; NA=33.4	composite measure: combining the 11 quality indicators

Study citation	Sample	Study Design	Staff Measure	Measures of care quality
Castle & Engberg (2008)	412 California NHs	prospective cross-sectional	FTEs per 100 residents RN=11.7; LPN=15.6; NA=31.4	pain, prevalence of pressure ulcers (among low & high risk residents), restraint, catheterized (% high risk and low risk residents with PU; % physically restrained; % with moderate to severe pain; % had a catheter inserted and left in bladder)
Castle & Fogel (1998)	national (15,074 US NHs)	retrospective cross-sectional	FTEs per one resident Facilities with restraints: RN=0.07; LPN=0.12; NA=0.31 Restraint Free Facilities: RN=0.12; LPN=0.13; NA=0.28	use of restraints
Castle & Myers (2006)	national (6,005 US NHs)	retrospective longitudinal	FTE per 100 beds RN=5.5; LPN=9.1; NA=26.5	deficiency citations for 1) failure to include mental status in assessment; 2) providing appropriate treatment for residents with mental difficulties
Castle (2000)	national (12,193 US NHs)	retrospective, comparison (1992 and 1997)	FTE per 100 beds 1992: RN=6; LPN=11; NA=28 1997: RN=4; LPN=9; NA=27	change in physical restraint use between 1992 and 1997
Castle (2002)	national (14,042 US NHs)	retrospective longitudinal	FTE per 100 occupied beds RN=6.9; LPN=10.6; NA=32.5	deficiency citations for physical restraint use in two and three consecutive certification survey inspections

Study citation	Sample	Study Design	Staff Measure	Measures of care quality
Dyck (2007)	364,339 residents in 2,951 NHs in Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota	retrospective cross-sectional	hprd RN=0.35; LPN=0.63; NA=1.95	weight loss, dehydration
Grabowski & Castle (2004)	national (15,975 US NHs)	retrospective longitudinal	FTE per 92.5 residents RN=6.75; LPN=11.68; NA=36.2	prevalence pressure ulcers, use of restraints, feeding tubes and indwelling catheters
Harrington, Zimmerman, Karon, et al. (2000)	national (13,770 US NHs)	retrospective cross-sectional	hprd RN=0.59; LPN=0.67; NA=2.14	deficiency citations
Johnson, Cowles, & Simmens (1996)	1,639 NHs in 23 states	retrospective cross-sectional	hprd High Quality: RN=0.42, LPN=0.64, NA=2.11 Low Quality: RN=0.29, LPN=0.64, NA=2.11	prevalence of pressure ulcers, number of bedbound residents; restraint use, drug error rate
Kim, Kovner, Harrington, et al. (2009)	1,099 California NHs	retrospective longitudinal	hprd RN=0.35; LPN=0.61; NA=2.27	number of total deficiencies , quality of care deficiencies and the number of serious deficiencies
Konetzka, Stearns, & Park (2008)	399,206 resident assessments from 1,366 NHs in Ohio, Kansas, Maine,	retrospective longitudinal	hprd RN=0.35	incidence of pressure ulcers and UTI

Study citation	Sample	Study Design	Staff Measure	Measures of care quality
Loeb, Craven, McGeer, et al. (2003)	50 NHs (each with 100 beds or more): in Ontario - 7; Manitoba - 11; Saskatchewan - 9; Alberta - 6; Michigan - 5; Minnesota - 3; North Dakota - 6; and Montana - 3)	prospective longitudinal	FTE per 100 residents RN=8.8; LPN=9.0; NA=36.5	incidence of antimicrobial-resistant bacteria isolates, use of penicillin, antimicrobial soaps, use of IV therapy etc.
Zhang & Grabowski 2004	5,092 NHs in 22 states	retrospective longitudinal comparison	hprd 1987: RN=.26; LPN=.46; NA=1.61 1993: RN=.30; LPN=.60; NA=1.99	prevalence of pressure ulcers, physical restraints, and urinary catheters

Findings on Nursing Staff Levels and Resident Outcomes

The findings of the research on nursing staff levels and resident quality of care, while mostly positively related to increased RN staffing levels, and negatively related to increased LPN staffing levels, are nonetheless mixed for both staffing categories (see Table 4.4). As was noted above, only one of these studies includes Canadian LTC facilities in its sample, the remainder are American and the context of the US nursing home system should be considered when reviewing the results of these studies (see the discussion: "United States Experts' Opinions on LTC Licensed Nurse Staffing" in Chapter 2 of this report).

Of the seventeen studies reviewed that measured individual staffing levels in relation to quality of resident care:

- 17 report results for RN staffing levels:
  - 8 with only positive findings (Castle, 2000, 2002; Castle & Engberg, 2007; Castle & Fogel, 1998; Castle & Myers, 2006; Johnson et al., 1996; Konetzka et al., 2008; Loeb et al., 2003),
  - 6 with both positive and non-significant findings (Bostick, 2004; Carter & Porell, 2005; Castle & Engberg, 2008; Harrington, Zimmerman et al., 2000; Kim, Kovner et al., 2009; Zhang & Grabowski, 2004)
  - 1 with both positive and negative findings (Grabowski & Castle, 2004), and
  - 2 with non-significant findings (Arling et al., 2007; Dyck, 2007)
  (see Table 4.4);
- 15 report results for LPN staffing levels:
  - 1 with only positive findings (Castle, 2000),
  - 2 with both positive and non-significant findings (Castle, 2002; Castle & Engberg, 2008),
  - 1 with positive, negative and non-significant findings (Zhang & Grabowski, 2004)
  - 6 with both negative and non-significant findings (Bostick, 2004; Carter & Porell, 2005; Castle & Myers, 2006; Dyck, 2007; Grabowski & Castle ,2004; Kim, Kovner et al., 2009)
  - 2 with only negative findings (Castle & Engberg, 2007; Castle & Fogel, 1998)
  - 3 with non-significant findings (Arling et al., 2007; Harrington, Zimmerman et al., 2000; Johnson et al., 1996)
  (see Table 4.4);
- 11 report results for NA staffing levels (see Appendices 4.2a, 4.2b and 4.3 for more information on NAs).

Reviewing the methodologically strongest studies, the research by Arling et al., 2007, found that none of the four process quality indicators (restraints, toileting, range of motion, and ADL training), nor the three outcome incidence quality indicators (ADLs, incontinence, behaviour), were significantly affected by the RN or LPN minutes received by a resident. However, Konetzka et al., 2008, found that the likelihood of a resident having a pressure ulcer (PU) or a urinary tract infection (UTI), decreased with greater RN staffing levels.

The most prevalent measure of care quality used in relation to RN staffing was use of physical restraints (Arling et al., 2007; Bostick, 2004; Castle, 2000, 2003; Castle & Engberg, 2007, 2008; Castle & Fogel, 1998; Grabowski & Castle, 2004; Zhang & Grabowski, 2004). The majority of these studies, but not all (Arling et al.; Bostick), found that higher RN staffing levels were associated with a lower use of physical restraints.

Three studies found that higher levels of RN staffing were associated with decreased prevalence (Bostick, 2004; Castle & Engberg, 2008) and incidence (Konetzka et al., 2008) of pressure ulcers, while one study found that higher levels of RN staffing had a negative effect on the prevalence of pressure ulcers (Grabowski & Castle, 2004) and a second study found no effect on the prevalence of pressure ulcers (Zhang & Grabowski, 2004).

The majority of studies (9 of 15) found worsening resident care outcomes (pressure ulcers, ADL decline, restraint use, deficiency citations, etc.) were associated with increased levels of LPN staffing, although 4 of the 15 studies reviewed found that higher LPN staffing resulted in improved resident outcomes. Castle and Engberg (2008) reported improvements in some resident outcomes with higher LPN staffing levels (lower pressure ulcer prevalence among high-risk residents; lower indwelling catheter use; and lower physical restraints use), but no change in other resident outcomes (no change in: percentage of residents with moderate to severe pain; or prevalence of pressure ulcers among low-risk residents). In 2000, Castle found that higher LPN staffing levels were associated with decreased restraint use and in 2002, that higher LPN staffing levels were associated with lower odds of three consecutive deficiency citations for restraints (but were not related to lower odds of one or two consecutive citations for restraints).

Table 4.4: Summary of findings on nursing staff levels

Study citation	Higher staffing levels associated with significant positive outcomes:	Higher staffing levels associated with significant negative outcomes:	Higher staffing levels associated with no significant change in outcomes:
Arling, Kane, Mueller, et al. (2007)			RN and LPN: physical restraints use, toileting program, range of motion training, ADL training; ADL decline; worsening incontinence, and worsening behaviour
Bostick (2004)	RN: decreased prevalence of PU	LPN: increased prevalence of PUs; late loss ADL decline	RN and LPN: prevalence of physical restraints, weight loss, incontinence and behavioural problems
Carter & Porell (2005)	RN: decreased ACS hospitalizations among residents with ADRD for reasons of: infections, bacterial pneumonia, gastroenteritis, kidney/UTI RN: decreased ACS hospitalizations among residents without ADRD for reasons of: infections, bacterial pneumonia	LPN: increased ACS hospitalizations among resident with ADRD for reasons of: infections, LPN: increased ACS hospitalizations among residents without ADRD for reasons of: infections, and bacterial pneumonia	RN: ACS hospitalizations among residents without ADRD for reasons of: gastroenteritis, kidney/UTI LPN: ACS hospitalizations among residents with ADRD for reasons of bacterial pneumonia, gastroenteritis, or kidney/UTI LPN: ACS hospitalizations among residents without ADRD for reasons of gastroenteritis, or kidney/UTI
Castle & Engberg (2007)	RN: higher overall quality; and specifically with improvements in: need for help with daily activities; physical restraint use, indwelling catheter use, number bedfast, mobility	LPN: lower overall quality; and specifically with worsening outcomes among high risk residents with PUs	

Study citation	Higher staffing levels associated with significant positive outcomes:	Higher staffing levels associated with significant negative outcomes:	Higher staffing levels associated with no significant change in outcomes:
Castle & Engberg (2008)	RN: lower PU prevalence (high and low risk residents), pain levels, and physical restraint use LPN: lower PU prevalence (high risk residents), catheter use, and physical restraint use		RN: % of residents with a catheter inserted and left in bladder LPN: % of residents with moderate to severe pain; or pressure ulcer prevalence among low-risk residents
Castle & Fogel (1998)	RN: lower likelihood of restraint use	LPN: higher likelihood of restraint use	
Castle & Myers (2006)	RN: lower likelihood of receiving mental health assessment or treatment deficiency citation	LPN: increased likelihood of receiving mental health assessment deficiency citation	LPN: likelihood of receiving mental health assessment treatment deficiency citation
Castle (2000)	RN: decreased restraint use LPN: decreased restraint use		
Castle (2002)	RN: lower odds of one, two or three consecutive deficiency citations for restraints LPN: lower odds of three consecutive deficiency citations for restraints		LPN: odds of one or two consecutive deficiency citations for restraints
Dyck (2007)		LPN: increased risk of weight loss	RN: risk of weight loss or dehydration LPN: risk of dehydration
Grabowski & Castle (2004)	RN: physical restraint use	RN: prevalence PUs, feeding tubes, and indwelling catheters LPN: prevalence PUs, feeding tubes, catheters	LPN: physical restraint use
Harrington, Zimmerman, Karon, et al.	RN: fewer "total" and "quality of care" deficiencies		RN: number of "quality of life" and "other" deficiencies LPN: number of "total care", "quality

Study citation	Higher staffing levels associated with significant positive outcomes:	Higher staffing levels associated with significant negative outcomes:	Higher staffing levels associated with no significant change in outcomes:
(2000)			of care", "quality of life", or "other" deficiencies
Johnson, Cowles, & Simmens (1996)	RN: increased odds of providing high vs. low quality of care		LPN: odds of high vs. low quality of care
Kim, Kovner, Harrington, et al. (2009)	RN: fewer "total" and "quality of care" deficiencies	LPN: more "total" and "quality of care" deficiencies	RN: "serious" deficiencies LPN: "serious" deficiencies
Konetzka, Stearns, & Park (2008)	RN: lower incidence of PUs and UTIs (LPN not studied)		
Loeb, Craven, McGeer, et al. (2003)	RN: reduced risk of MRSA infection (LPN not studied)		
Zhang & Grabowski 2004	RN: decline in restraint use LPN: decline in prevalence PUs	LPN: higher catheter use	RN: prevalence PUs, catheter use LPN: restraint use

Description of Nursing Staff Threshold Studies

Three of the studies included in this review used threshold measures of staffing levels (Horn et al., 2005; Kramer& Fish, 2001; and Zhang et al., 2006). All of these studies had relatively large sample sizes, used the preferred staffing measure of hprd, and employed nursing sensitive quality measures including, among others, incidence of pressure ulcers. The highly cited Kramer and Fish (2001) study was published as part of the US Centers for Medicare and Medicaid Services (CMS) Phase II Report to Congress. This study was designed to explore the minimum nurse staffing thresholds necessary to achieve quality resident care and employed a longitudinal (albeit retrospective) research design. Kramer and Fish study separately the impact of RNs and NAs on resident outcomes, however, the impact of LPNs is not separately examined – LPNs are combined with RNs into one Licensed Staff measure. The study by Horn et al., (2005) also employed a retrospective longitudinal design and they studied the individual effect of thresholds for all three nursing staff categories (RN, LPN and NA). Zhang et al. (2006) used a less preferred retrospective cross-section research design.

Table 4.5: Description of studies examining nursing staff thresholds

Study citation	Sample	Study Design	Staff Measure	Measures of care quality
Horn, Buerhaus, Bergstrom et al. (2005)	1,376 residents of 82 NHs in 23 states	retrospective longitudinal	hprd – thresholds average: RN=0.27; LPN=0.51;NA=1.7	decline in ADLs, hospitalization (no discussion of reasons for hospitalization), UTI, weight loss, catheterization, administration of nutritional supplements; incidence pressure ulcers
Kramer & Fish (2001)	5,294 long-stay NHs in 10 US states	retrospective longitudinal	hprd - thresholds weighted average: RN=0.75; Licensed (RN+LPN)=1.3; NA=2.8; Total=4.1	weight loss, incidence of pressure ulcers, functional improvement
Zhang, Unruh, Liu, et al. (2006)	national (13,663 US NHs)	retrospective cross-sectional	hprd - thresholds average: RN=0.31; LPN=0.66; NA=2.06; Total=3.03,	facility level quality indicator derived from incidence of pressure ulcers, physical restraints, and urinary catheters

Findings from Nursing Staff Threshold Studies

Kramer and Fish (2001) found that RN thresholds required for improved quality of care ranged from 0.6 hprd for reduction in incidence of pressure ulcers, to 0.8 hprd for improvements in resident functioning (see Appendix 4.3 for detailed findings). The weighted average RN staffing levels for improved quality of care was 0.75 hprd (see Table 4.6). Kramer and Fish (2001) also

found that licensed staff (LPN and RN) levels thresholds, below which facilities were at increased likelihood of being in the worst 10% of facilities and above which there were no further benefits with respect to quality when additional staff were available, ranged from 0.95 to 1.55 hprd licensed nurse staffing (see Appendix 4.3), for a weighted average of 1.3 hprd (see Table 4.6). Specifically, a minimum nurse staffing level of 1.55 hprd licensed nurses impacted improvements in functional abilities, a minimum licensed nurse level of 0.95 licensed nurse hprd were needed to prevent weight loss, and 1.15 licensed nurse hprd were needed and for improvements in skin trauma (see Appendix 4.3).

Horn et al. (2005) found significant relationships with increased RN and LPN staffing and resident care outcomes (see Table 4.6). Residents who received 30 to 40 minutes of RN direct care per day were 84 per cent less likely to develop a pressure ulcer and 42 per cent less likely to experience deterioration in their ADL abilities than were residents in the reference group who received fewer than 10 minutes of RN direct care per day (see Appendix 4.3). Residents who received 45 or more minutes of LPN time were 42 per cent less likely to develop pressure ulcers (see Appendix 4.3).

Zhang et al. (2006) examined the minimum thresholds of RN and LPN staffing needed to achieve 50 per cent, 75 per cent, and 90 per cent levels of quality. The researchers identified that the minimum thresholds of RN time to achieve these three quality levels were respectively: 0.31, 1.83, and 3.3 hprd. The researchers could not statistically determine a minimum staffing level for LPNs at the 50 per cent or 75 per cent quality level, but identified that 8.4 LPN hprd were significantly associated with the 90 per cent quality level. Zhang et al.'s study suggests that the relationship between quality and staffing levels is best represented by an "S" curve, whereby the initial stage of improvement in quality care is exponential, then, as staffing rises, the improvement in quality slows, and at some point, improvement stops.

Table 4.6: Summary of findings on nursing staff thresholds

	Staff level thresholds associated with improved outcomes	**Quality measures**
Horn et al (2005)	RN 0.5 to 0.67 hprd LPN > 0.75 hprd CNA > 2.25 hprd	- ADLs, incidence PUs - Incidence PUs - Incidence PUs
Kramer & Fish (2001)	RN 0.75 hprd (weighted average) LPN+RN 1.3 hprd (weighted average) NA 2.8 hprd (weighted average)	- ADLs, incidence PUs - ADLS, weight loss - ADLS, weight loss
Zhang, Unruh, Liu, et al. (2006)	RN: 0.31 hprd associated with 50% quality level; 1.83 hprd associated with 75% quality level; 3.3 hprd associated with 90% quality level; LPN: 8.4 hprd associated with 90% quality level;	facility-level quality indicator derived from incidence of pressure ulcers, physical restraints, and urinary catheters

Chapter 5. Discussion and Conclusions

In terms of the regulatory requirement in Saskatchewan for 24-hour cover by an RN/RPN in special care homes, our research provides a taxonomy of policy alternatives (taken from existing arrangements in other jurisdictions in Canada or the US). These include:

- General guidelines for 'sufficient' staffing to meet resident needs, but no specific staffing levels or occupations;
- A minimum of on-call RN/RPN staffing, if an RN/RPN is not on duty;
- Licensed nurse staffing that varies depending upon the number of residents or beds in the LTC facility;
- Nurse staffing that allows for exceptions or waivers to the requirement for RN/RPN staffing; and
- 24 hours/7 days per week RN, RPN or LPN staffing (current US Federal Policy).

The policy challenge in the Saskatchewan context is whether to move away from the current 24-hour RN requirement to one or a combination of the alternatives listed or to keep the current regulation in place. The extensive literature search we conducted found no empirical study to inform a policy switch. However, it should also be emphasised that there is no empirical work that supports the current regulatory requirement. The only literature that discussed the question explicitly is expert panel reports in the US (IOM, 1996, 2001, 2004; Harrington, Kovner et al, 2000), all of which recommended 24-hour RN cover in nursing homes.

The policy challenge of whether 24-hour RN cover in LTC is necessary is one faced by all provinces and territories in Canada, as indicated in our communications with contacts across the country. Therefore, given the lack of any empirical research on this topic, future research that explicitly addresses this policy question would be of very high value.

The paucity of literature on the 24-hour RN question necessitated the expansion of the scope of the project to include broader literature on nurse staffing in LTC settings. This work is documented in Chapter 4 of this report. The hope had been, additionally, to review literature on reasons for, and frequency of, emergency transfers in LTC. The thinking here being that such literature might provide information on nurse staffing factors contributing to or reducing after-hour emergencies. However, time constraints prevented our review of the literature on emergency transfers but did allow for extensive exploration of the LTC nurse staffing literature.

Our focus initially was on research that looked at the mix of nursing staff in LTC settings (e.g. the number of LPNs relative to RNs) to allow the exploration of the substitution question (i.e. LPNs undertaking roles traditionally undertaken by RNs). Given that the 24-hour RN question concerns a substitution issue, it was considered appropriate to begin our broader review work looking at the staff mix literature. The research evidence on the mix of RN staff to other nursing staff in LTC settings is itself 'mixed'. Some studies indicate that reducing the RN ratio would have negative consequences on quality and outcomes. However, other studies do not find such

associations, indicating no quality reductions through such changes in the make-up of the nursing staff complement.

High quality studies that have explored the relationship between quality/outcomes and RN staffing levels predominantly indicate a positive relationship: higher levels of RN staffing are associated with better outcomes. The majority of the literature has explored the RN level question. Fewer studies have looked at the LPN level and its link to quality and outcomes. The policy conclusions from that literature are not as clear: positive relationships (more LPNs associated with better outcomes) are indicated for some resident outcomes but negative relationships are seen for other outcomes, even controlling for the number of RN staff. To be clear, a negative relationship indicates poorer outcomes associated with higher numbers of LPN staff.

The report has emphasised the relationships (e.g. more RNs associated with better outcomes) rather than giving estimates of the effect size. The main reason for this is that the effect size is very difficult to establish from many published studies given the nature of the statistical models estimated and the range of explanatory variables included. However, some studies reported an effect size. One of the highest quality papers we reviewed was Konetzka et al. (2008) who state that, all other things remaining equal, “For a 50% increase in RN hours per resident day, the rate of pressure sores is predicted to decline by about 66% and that of UTIs by about 45% for the average facility.”

The broader literature reviewed in this report on nurse staffing in LTC settings was heterogeneous. Perhaps the only common characteristic across all studies was an observational design, some using a longitudinal approach and others cross sectional. The outcomes or quality indicators varied considerably, some using resident-level outcomes such as incidence of pressure sores and others using facility-level measures such as citations or violations. Other aspects of variability include the staffing measures, type of staff examined, and data sources. Given the high degree of heterogeneity of the research it was considered inappropriate to pool the research in some form of meta-analysis.

None of the high quality research on nurse staffing mix and levels in LTC settings was undertaken in Canada; the vast majority of the research work cited in this report is from the US. Given the very different nurse training levels seen in Canada compared to the US, and the variability in resident populations in LTC settings between the two countries, the paucity of Canadian research on this issue is surprising. Future Canadian research exploring the relationship between nurse staffing and outcomes in LTC settings is an urgent priority.

Appendices: Chapter 2

Appendix 2.1 Provincial Long Term Care Regulations/Policies for Nurse Staffing (2009)

Province	Require 24 RN	Staffing Requirements related to Nursing
BC	no	**Management and supervisory staff** (2) The licensee must designate an employee, qualified by training and experience, to (a) supervise employees who provide care to persons in care, (b) coordinate and monitor the care of persons in care, and (c) manage unusual situations or emergencies. **Staffing coverage** 42 (1) A licensee must ensure that, at all times, the employees on duty are sufficient in numbers, training and experience, and organized in an appropriate staffing pattern, to (a) meet the needs of the persons in care, and (b) assist persons in care with activities of daily living, including eating, mobility, dressing, grooming, bathing and personal hygiene, in a manner consistent with the health, safety and dignity of persons in care.
AB	yes – minimum on-call	**Nursing services and personal service staff** 14(1) An operator shall have at least one nurse on duty at all times in his nursing home, and if at any time none of the nurses on duty are registered nurses or certified graduate nurses, the operator shall ensure that a registered nurse or certified graduate nurse is on call during that time. **Definitions** 1 In this Regulation, (l) "nurse" means a registered nurse, a certified graduate nurse, or a registered psychiatric nurse;
SK	yes – on duty 24/7	**4(a) Nursing care requirements:** (i) Intensive personal or nursing care accommodation. The care of the guests is to be carried out by or under the direction of a registered nurse or registered psychiatric nurse and supervision by the guest's personal physician or a nurse practitioner. The home shall employ at least one full time registered nurse or registered psychiatric nurse. Nursing care by a registered nurse or registered psychiatric nurse shall be provided on a 24-hour basis.
MB	yes – on duty 24/7 - but in the interim (until 2010), on-call	**5.0 POLICY** 5.1 The operator of a PCH shall take steps to ensure that a registered nurse or registered psychiatric nurse is on-site at the home to supervise the nursing care 24 hours per day, seven days per week. 5.2 If, after making best efforts to do so, the operator of a PCH is unable to secure a registered nurse or registered psychiatric nurse to be on-site at the home to supervise the nursing care for any period of time, as an interim measure only, the operator shall ensure that a registered nurse or registered psychiatric nurse is accessible and a licensed practical nurse is on site at the PCH during the entire time period.
ON	yes – on duty 24/7	**24-hour nursing care** (3) Every licensee of a long-term care home shall ensure that at least one registered nurse who is both an employee of the licensee and a member of the regular nursing staff of the home is on duty and present in the home at all times, except as provided for in the regulations. 2007, c. 8, s. 8 (3).
QC	yes – on site 24/7	Information obtained from Gina Bravo, Research Centre on Aging, Sherbrooke University Geriatric Institute, Quebec (December 10, 2009)
NB	yes – on duty 24/7 in NH with 30 beds or more	**PART III** **CARE SERVICES** 18 An operator shall ensure that (a) in nursing homes with thirty beds or more, the care of each resident is carried out

Province	Require 24 RN	Staffing Requirements related to Nursing
		by or under the supervision of a registered nurse as directed by the attending physician, or as directed by a nurse practitioner (b)in nursing homes with thirty beds or more, at least one registered nurse is on duty on the premises at all times,
PE	yes – on duty 24/7	27. (1) A registered nurse shall be on duty in a nursing home at all times.
NS	yes – on duty 24/7 in NH with 30 beds or more; on duty minimum 8 hr/day in NH with less than 30 beds	18. (2) In every nursing home and nursing care section of a home for special care where there are less than thirty residents, there shall be at least one registered nurse on duty for no less than eight hours every day, and in the absence of the registered nurse, there shall be a person on duty in the home who is capable of providing emergency care. (3) In every nursing home and nursing care section of a home for the aged where there are thirty or more residents, there shall be at least one registered nurse on duty at all times.
NL	yes – on duty 24/7	**Standard 2 - Nursing Service** 2.3 All nursing care provided to the resident is under the direction and responsibility of a registered nurse who is available on a 24 hour basis
YK	-	no act/regulation
NT	-	no act/regulation
NU	-	currently drafting regulations

Note: See the reference list for data sources in Appendix 2.2

Appendix 2.2 Data Sources for Long Term Care Regulations/Policies

British Columbia

Regulation: B.C. Reg. 96/2009, O.C. 225/2009, Community Care and Assisted Living Act Residential Care Regulation [includes amendments up to B.C. Reg. 6/2009, October 1, 2009] Retrieved November 9, 2009 at http://www.bclaws.ca/Recon/document/freeside/--%20c%20--/community%20care%20and%20assisted%20living%20act%20%20sbc%202002%20%20c.%2075/05_regulations/14_96_2009%20residential%20care%20regulation/96_2009.xml#section2
Retrieved May 4, 2010 at http://www.canlii.org/en/bc/laws/regu/bc-reg-96-2009/latest/bc-reg-96-2009.html

Alberta

Correspondence with Anita Paras, Senior Workforce Planner Manager, Health Workforce Planning Alberta Health and Wellness, October 23, 2009: required staffing information is provided in the Nursing Home Act, Nursing Homes Operation Regulation and Nursing Homes General Regulation on the Queen's printer web site. Alberta is very specific on the ratio as only minimum standards are in the regulation. Access the legislation at: http://www.qp.alberta.ca/570.cfm?frm_isbn=0779705394&search_by=link . Or at http://www.qp.alberta.ca/index.cfm (search laws, then under "n")
Regulation: Alberta Regulation 258/85, *Nursing Homes Act* Nursing Homes Operation Regulation. Retrieved November 9, 2009 at http://www.qp.alberta.ca/574.cfm?page=1985_258.cfm&leg_type=Regs&isbncln=9780779735518
Also available at http://www.qp.alberta.ca/570.cfm?frm_isbn=0779705394&search_by=link .
Information on physician coverage: *Continuing Care Health Service Standards* Retrieved November 9, 2009 at http://www.health.alberta.ca/documents/Continuing-Care-Standards-2008.pdf

Saskatchewan

Regulation: The Housing and Special-care Homes Regulations, Saskatchewan Regulations 34/66 (effective February 15, 1966) as amended by Saskatchewan Regulations 170/66, 287/66, 625/68, 94/69, 97/69, 274/69, 243/71, 61/73, 225/73, 82/74, 226/74, 69/75, 73/75, 265/75, 73/76, 83/76, 65/80, 134/81, 186/83, 97/85, 15/2000, 88/2000, 117/2003, 22/2004 and 132/2005. Retrieved November 9, 2009 at http://www.qp.gov.sk.ca/documents/English/Regulations/Regulations/SR34-66.pdf
Act: *The Housing and Special-care Homes Act* Chapter H-13 of The Revised Statutes of Saskatchewan, 1978 (effective February 26, 1979), as amended by the Statutes of Saskatchewan, 1979, c.31; 1979-80, c.M-32.01; 1980-81, c.59; 1982-83, c.16; 1983, c.11, 29 and 77; 1983-84, c.54; 1988-89, c.42, 46 and 52; 1989-90, c.5 and 15; 1996, c.9; 1997, c.37; and 2002, c.R-8.2. Retrieved November 9, 2009 at http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/H13.pdf

Manitoba

Correspondence with Liz Ambrose, Senior Policy Analyst, Workforce Policy and Planning, Manitoba Health, October 20 and 23, 2009, and with Lorene Mahoney, Long Term Care Consultant, Manitoba Health and Healthy Living, October 29, 2009, who sent two Manitoba Health policies with information on RN staffing requirements: "Personal Care Home Administrative Manual Nursing Services Guidelines. Policy Category/Number HCS 205.3", Approved July 27, 2005; and "Reporting to Manitoba Health Nursing Services Guideline for Personal Care Homes, Policy Category/Number HCS 205.2", Approved July 27, 2005. Also received was a spreadsheet prepared by Lorene Mahoney and Roxie Eyer, Program Consultant, "Attachment 22.4 PCH Staffing - Table National Comparisons Rev Aug 2009" with information provincial LTC nurse staffing levels/mix. Lorene noted "that no provinces have reported that the information provided for the PCH Staffing National Comparison has been made available publically."
Regulation: *Personal Care Homes Standards Regulation, THE HEALTH SERVICES INSURANCE ACT* (C.C.S.M. c. H35). Retrieved November 9, 2009 at http://www.canlii.org/en/mb/laws/regu/man-reg-30-2005/latest/man-reg-30-2005.pdf

Ontario

Correspondence with Vanessa Burkoski, Provincial Chief Nursing Officer, Ontario Ministry of Health and Long-Term Care, October 20, 2009: Access all current Ontario legislation and regulation at: http://www.search.e-laws.gov.on.ca/en/search/
Act: *Long-Term Care Homes Act*, 2007 S.O. 2007, CHAPTER 8. Retrieved November 9, 2009 at http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_07l08_e.htm#BK14

Quebec

Correspondence with Dr. Gina Bravo, Research Centre on Aging, Sherbrooke University Geriatric Institute, Quebec, December 10, 2009: in Quebec, all public long-term care facilities (called CHSLD, for Centre Hospitalier de Soins de Longue Durée), and private facilities that are linked by contract to the Ministry of Health and Social services, and would have a nurse on site 24 / 7. Such a requirement does not apply to private facilities not linked to the Ministry.

New Brunswick

Act: *CHAPTER N-11 Nursing Homes Act*. Retrieved November 9, 2009 at http://www.canlii.org/en/nb/laws/stat/snb-1982-c-n-11/latest/snb-1982-c-n-11.html
Regulation: *NEW BRUNSWICK REGULATION 85-187* under the Nursing Homes Act (O.C. 85-967). Retrieved November 9, 2009 at http://www.canlii.org/en/nb/laws/regu/nb-reg-85-187/latest/nb-reg-85-187.html

Prince Edward Island

Correspondence with Shelley Woods, Chief Nursing Officer, Department of Health, October 26, 2009; and Mary MacSwain, Community Care Facilities & Nursing Homes Consultant, Department of Health, October 27, 2009: Community Care and Nursing Homes Act and Regulations are on the Dept. of Health web. We also have standards of care services for the community care facilities.

Act: *Chapter C-13, Community Care Facilities and Nursing Homes Act*, R.S.P.E.I. 1988, c. C-13. Retrieved November 9, 2009 at http://www.canlii.org/en/pe/laws/stat/rspei-1988-c-c-13/latest/rspei-1988-c-c-13.html
Regulations: *Chapter C-13, Community Care Facilities and Nursing Homes Act Nursing Home Regulations*, P.E.I. Reg. EC10/88. Retrieved November 9, 2009 at http://www.canlii.org/en/pe/laws/regu/pei-reg-ec10-88/latest/pei-reg-ec10-88.html
Prince Edward Island Department of Health. *Operational and Care Service Standards for Community Care Facilities*. March 23, 2009. Retrieved March 17, 2010 at http://www.gov.pe.ca/photos/sites/health/file/February%205_09%20Final%20Standards_1.pdf

Nova Scotia

Correspondence with Janis Brown, Acting Nursing Policy Advisor, Department of Health, October 15, 2009; Carolyn Maxwell, A/Director, Service and Business Support, Department of Health, October 26, 2009; and Jo-Ann MacManus, Service Delivery Consultant, Continuing Care, Department of Health, NS, January 14, 2010. Received from Ms. MacManus program requirements for the new LTC beds being built, including information on some of the resources used. "Our standard for nursing RN and LPN in our new and current homes remains at .5 hours RN per resident per day and .5 LPN per resident per day, Our new building infrastructure supports smaller households 12 to 15 residents per house, each house (unit) has their own living and dining room and kitchen, all private rooms with private bathrooms, our new buildings are smaller in number (36 to 65 residents) - and promote a more home like quieter atmosphere. We have a very good program for training our Continuing Care Assistants and there is some info on our web site. We hope these changes will result in positive outcomes for our clients. We are in the process of making changes to the document attached and have also completed a document for a lighter level of care, Residential Care." Received January 14, 2010:
Nova Scotia Department of Health. *Long Term Care Facility Program Requirements, RFP No. 60131638 Appendix C Final*. July 25, 2007
Act: *Homes for Special Care Act*. R.S., c. 203, s. 1. Retrieved November 9, 2009 at http://www.canlii.org/en/ns/laws/stat/rsns-1989-c-203/latest/rsns-1989-c-203.html
Regulations: *Homes for Special Care Regulations*, N.S. Reg. 127/77. Retrieved November 9, 2009 at http://www.canlii.org/en/ns/laws/regu/ns-reg-127-77/latest/ns-reg-127-77.html

Newfoundland:

Correspondence with Anita Ludlow, Debbie Morris, NL Health and Community Services, November 10, 2009: In NL Nursing Homes (LTC) an RN is required "on duty at all times".
Long Term Care Operational Standards (November 2005). Retrieved December 1, 2009 at http://www.health.gov.nl.ca/health/publications/pdfiles/LongTermCareStandard.pdf

Yukon

Correspondence with Jan Horton, Health Human Resources Coordinator, Department of Health & Social Services, October 13, 2009, and Cathy Morton-Bielz, ADM, Continuing Care, Yukon Health and Social Services, October 20, 2009: Yukon currently has no regulations governing their LTC facilities. Yukon is in the process of developing legislation and regulations will follow,

but it will take 2- 3 years. All care facilities are owned and operated directly by the government and they have never been in the situation of not having 24-hour nursing in the facilities.

Northwest Territories

Correspondence with Donna Allen, Manager Primary Community Services, NWT Department of Health & Social Service, October 13, 2009: NWT currently has no regulations re LTC nurse staffing.

Nunavut

Correspondence with Frederic Montpetit, Chief Nursing Officer, Nunavut Territory, October 14, 2009: NWT is in the process of drafting regulations for LTC: "We are only opening our first LTC facilities in the next year. We will be staffing with LPNs (for which we are creating legislation to make LPNs [sic]) and unregulated healthcare workers."

United States

OBRA '87, Nursing Home Reform Act Nurse Staffing Standards retrieved December 1, 2009 at http://edocket.access.gpo.gov/cfr_2002/octqtr/pdf/42cfr483.30.pdf

Harrington, C., *Nursing Home Staffing Standards in State Statutes and Regulations,* 2008. Retrieved March 17, 2010 at http://www.pascenter.org/documents/Staffing_regulations_1_08.pdf

Tilly, J., & Harvell, J. *State Experiences with Minimum Nursing Staff Ratios for Nursing Facilities: Findings from the Research to Date and a Case Study Proposal.* U.S. Department of Health and Human Services. February 2003. Retrieved March 2, 2010 at http://aspe.hhs.gov/daltcp/reports/stateexp.htm

Tilly, J., Black, K., Ormond, B., & Harvell, J. *State Experiences with Minimum Nursing Staff Ratios for Nursing Facilities: Findings from Case Studies of Eight States.* U.S. Department of Health and Human Services. November 2003. Retrieved March 2, 2010 at http://aspe.hhs.gov/daltcp/reports/8state.htm

Appendices: Chapter 3

Appendix 3.1 Resident Quality of Care Indicators

A wide variety of variables are used to measure the quality of resident care. Donabedian's framework (1966, 1988), is widely applied by researchers (Castle 2008; Collier & Harrington 2008; Dellefield, 2000)

> The information from which inferences can be drawn about the quality of care can be classified under three categories: "structure," "process," and "outcome."[1, 10]
> **Structure.—**Structure denotes the attributes of the settings in which care occurs. This includes the attributes of material resources (such as facilities, equipment, and money), of human resources (such as the number and qualifications of personnel), and of organizational structure (such as medical staff organization, methods of peer review, and methods of reimbursement).
> **Process.—**Process denotes what is actually done in giving and receiving care. It includes the patient's activities in seeking care and carrying it out as well as the practitioner's activities in making a diagnosis and recommending or implementing treatment.
> **Outcome**.—Outcome denotes the effects of care on the health status of patients and populations. Improvements in the patient's knowledge and salutary changes in the patient's behaviour are included under a broad definition of health status, and so is the degree of the patient's satisfaction with care.
> This three-part approach to quality assessment is possible only because good structure increases the likelihood of good process, and good process increases the likelihood of a good outcome. It is necessary, therefore, to have established such a relationship before any particular component of structure, process, or outcome can be used to assess quality. The activity of quality assessment is not itself designed to establish the presence of these relationships. There must be pre-existing knowledge of the linkage between structure and process, and between process and outcome, before quality assessment can be undertaken. (Donabedian, 1988, p. 1745)

Quality Indicators Applied in the Studies Reviewed
The following indicators were used to measure the quality of resident care in the studies included in this review. After each indicator, the study that uses the measurement is cited.

Antibiotic Use and Resistance to Antimicrobial Agents: Process (antibiotic use) and outcome (resistance to antimicrobial agents) quality of care indicators. In an exploratory study, Loeb et al., used resident records of antibiotic use and susceptibility results and compared these outcomes with staffing levels.
Loeb et al., 2003: Antibiotic use and susceptibility to antimicrobial agents

Behaviour Symptoms Worsening: Outcome quality of care indicator. Worsening behaviour symptoms may be measured by increases in occurrence of verbal and/or physical abuse, or of disruptive/socially inappropriate behaviour. Insufficient staffing may result in behavioural

problems being ignored, leading to worsening symptoms (Bostick, 2004). Risk adjustments for this indicator include resident dementia diagnosis, anxiety disorder, etc. (Arling et al., 2007)
Arling et al., 2007: Worsening Behaviour Problems
Bostick 2004: Behavioural Problems

Catheterization – Indwelling Catheters: Process quality of care indicator. Refers to rate of use of indwelling urethral catheters; that is catheters inserted and left in the bladder to drain urine from the bladder. Urethral catherization may increase the risk of a resident acquiring a urinary tract infection, which may result in hospitalization. An increased risk for functional decline is associated with high use of urethral catheters (Castle & Engberg).
Castle & Engberg 2007, 2008: Indwelling Catheter
Grabowski & Castle 2004: Repeated (3+/5) Catheter Citations
Horn et al., 2005: Catheterization
Zhang et al., 2004, 2006: Catheterization

Deficiency Citations: Composite quality measure: both outcome and process quality indicators derived from inspection reports of US NHs. US federal deficiency audits measure 179 specific standards for care in 17 major categories (Harrington, Zimmerman et al, 2000). State and federal surveyors conduct inspections every 9 to 15 months. When a nursing home does not meet a standard, a deficiency citation is issued, especially when this results in poor quality care. A limitation of this quality of care measure is that the number of citations given varies from state to state. Consequently, the number of deficiencies that a facility receives in one state may not be directly comparable to those received by a facility in another state (Castle 2008). Furthermore, most studies do not account for the scope and severity of deficiency citations, and "simply counting deficiency citations can result in inappropriately comparing facilities with the most egregious deficiency citations with those providing acceptable care." (Castle 2008, p. 393).
Harrington, Zimmerman et al., 2000: Number Total Care Deficiencies, Quality of Care Deficiencies, Other Deficiencies
Kim, Harrington et al., 2009: Number Total Care Deficiencies, and Serious Deficiencies
Kim, Kovner, Harrington et al., 2009: Number Total Care Deficiencies, Quality of Care Deficiencies, Serious Deficiencies

Dehydration: Outcome quality of care indicator. Dehydration is an outcome related to inadequate fluid intake, and is highly prevalent in nursing homes (Dyck, 2007). Risk adjustment variables include use of parenteral feedings, infection, end of life, and oral problems (Dyck, 2007).
Dyck, 2007

Feeding Tube Use: Process quality of care indicator. Refers to rate of use of feeding tubes. "Tube feeding is often used as a labor-saving practice, and use is not always associated with well-documented clinical rationale. Lower levels of feeding tube use are generally regarded as beneficial (IOM, 2001)." (Grabowski & Castle, 2004, p. 96). Use of feeding tubes "can result in complications including self-extubation, infections, aspiration, unintended misplacement of tube, and pain" (DHCS, 2004, page 77).

Grabowski & Castle 2004: 3+/5 Feeding Tubes Citations

Functional Ability: Functional abilities of residents with regards to transferring (i.e. bed to chair, chair to toilet), locomotion (i.e. walking), dressing, eating, toilet use, and bathing are affected by nurse staffing. These activities are referred to as Activities of Daily Living or ADLs. Functional ability or status is measured in a variety of ways in the research, but risk factors to predict decline need to be accounted for. Cross-sectional measurement is used on most studies, which fails to account for any improvement or decline in a resident's ability that might be affected by nurse staffing. Longitudinal studies that examine changes in functional status are preferred.
Arling et al., 2007: ADL Decline, ADL Training
Bostick 2004: ADL Decline, Late loss ADL Decline
Castle & Engberg 2007: Mobility, Resistance to ADL Assistance
Horn et al., 2005: ADL Decline, Deterioration in ADL
Kramer & Fish, 2001: Functional Improvement

Hospitalizations for Ambulatory Care Sensitive (ACS) Reasons: Outcome quality of care indicator. "The ability of nursing homes to manage the increasing clinical complexity of the residents that they serve and to prevent the acute flare-ups of chronic conditions that trigger hospitalizations is integral to providing quality care...Hospitalized nursing home residents often develop nosocomial diseases. The elderly are also prone to relocation stress, which may adversely affect their health. Tremendous financial savings could result from only a small reduction in the hospitalization of nursing home residents" (Intrator, Castle & Mor, 1999, p. 229). But, for hospitalization to be used as a quality indicator, only potentially avoidable hospitalizations (such as CHF, electrolyte imbalance, respiratory infections, UTI, sepsis, anaemia) can reflect quality of care (Kramer & Fish, 2001). "Events such as stroke, myocardial infarction, elective surgeries, gastro-intestinal bleeding, and many other problems over which the nursing home has no control are not markers of nursing home quality. Second, risk adjustment is essential. Facilities that admit patients who are at greater risk for hospitalization are likely to have a higher hospitalization rate even when quality of care is high." (Kramer, Eilertsen, Lin & Hutt, 2000, p. 9-2)
Carter & Porell, 2005 measured hospitalization for:

- All ACS reasons (listed in the ICD-9-CM classifications: "The International Classification of Diseases, 9th Revision, Clinical Modification")
- Bacterial Pneumonia (included in ICD-9-CM)
- Gastroenteritis (included in ICD-9-CM)
- Infectious ACS reasons only (included in ICD-9-CM)
- Kidney/ urinary tract infection (included in ICD-9-CM)

Horn et al., 2005: Any reason (no mention of ACS reasons)
Intrator et al., 2004: All non-ACS reasons

Incontinence: Outcome quality of care indicator. Toileting programs can have a possible positive effect on incontinence problems, but are dependent upon sufficient staff to implement

them. Bowel incontinence could be the result of an illness, such as gastroenteritis, and may not be related to poor care or inadequate staffing.
Arling et al., 2007: Worsening Bowel or Bladder Incontinence
Bostick, 2004: Prevalence of Bladder or Bowel Incontinence

Mental/Psychosocial Assessments and Treatment: Process quality of care indicator.
Castle & Myers, 2006: Deficiency citation for failure to include mental/psychosocial status in resident assessment; and Deficiency citation for inappropriate treatment for residents with mental/psychosocial difficulties

Nutritional Supplements: Process quality of care indicator. Refers to administration of nutritional supplements, which has been found to be associated with reduced likelihood of pressure ulcer development (Horn 2005).
Horn et al., 2005

Pain: Outcome quality of care indicator. Management of resident pain is highly dependent upon the nurse's timely assessment of a resident's pain levels, and appropriate treatment and administration of medication.
Castle & Engberg, 2008: Moderate to Severe Pain

Physical Restraints: Process quality of care indicator. Physical restraints include physical or mechanical devices, material or equipment, which cannot be easily removed by residents, to restrict freedom of movement or normal access to one's own body. Physical restraint use may be defined "as any chest/vest, wrist, mitt, belt, crotch, suit, or harness restraint plus any sheet used as a restraint or a geriatric chair with fixed tray table" (Sullivan-Marx *et al.*, 1999, p. 344). Physical restraints are "an important quality indicator because they are associated with an increased risk of morbidity and mortality in nursing home residents (Phillips et al., 1993)" (Castle, 2003, p. 486).
Arling et al., 2007
Bostick, 2004
Castle, 2002
Castle & Engberg, 2008
Castle & Fogel, 1998
Johnson et al., 1996
Zhang et al., 2004, 2006

Deficiency citations for physical restraints: Process quality indicator derived from inspection reports of US NHs. "A deficiency citation for physical restraint use is issued when a physical restraint is used without: (1) a physician's order; (2) informed consent from the resident (or proxy); (3) a nursing care plan with the goal of restraint removal; (4) documentation that alternatives to restraints were tried; or (5) when restraint does not enable the resident to maintain their highest practicable level of functioning. This is listed in the OSCAR as deficiency #221. Variation in the use of nursing home deficiency citations is known to occur from state to state... [Researchers should] take into consideration this potential limitation by including

geographic control variables in the analyses... A resident is defined in the OSCAR as restrained when vests, belts, mittens, wrist, or ankle restraints are used. Chairs with locking trays (geri-chairs) are also included, whereas bed rails are not." (Castle, 2002, p. 870-871)
Grabowski & Castle, 2004: 3+/5 Physical Restraint Citations
Castle, 2000: comparison in citations 1992 and 1997

Pressure Ulcers: Outcome quality of care indicator; also called decubitus ulcers. "A pressure ulcer is a sore that develops as a result of ischemia (insufficient oxygen) in the skin tissue. Most often this is the result of prolonged pressure on one area of the body" (Castle & Engberg, 2005, p. 618). Incidence measures of pressure ulcers are preferred over prevalence measures, because it is difficult to differentiate between those present on admission and those acquired in the facility. Pressure ulcers are preventable in many cases, for example, by frequently changing residents' positions in their bed and/or chairs, and their incidence is an indicator of poor care practice (Horn et al. 2005), whereas the mere presence of pressure ulcers may reflect admission of a more complex resident case mix.
Kramer & Fish, 2001: Pressure Ulcer *Incidence*
Zhang et al., 2006: Pressure Ulcer *Incidence*
Grabowski & Castle, 2004: 3+/5 Pressure Ulcer Citations
Bostick 2004: Pressure Ulcer Prevalence
Castle & Engberg 2008: Pressure Ulcer Prevalence
Horn et al., 2005: Pressure Ulcer Prevalence
Johnson et al., 1996: Pressure Ulcer Prevalence
Konetzka et al., 2008: Pressure Ulcer Prevalence
Zhang & Grabowski, 2004: Pressure Ulcer Prevalence

Toileting Programs Incontinence: Process quality of care indicator. Fewer nurses and care aides can limit staffs' ability to provide needed toileting.
Arling et al., 2007: Toileting Program

Urinary Tract Infections (UTIs): Outcome quality of care indicator. UTIs are preventable in many cases with proper hydration and careful hygiene (Konetzka, et al., 2008). While these care procedures are primarily performed by nursing assistants, detection of UTIs and supervision of nursing care is the responsibility of the RN and/or LPN.
Horn et al., 2005: Incidence UTI
Konetzka et al., 2008: Incidence UTI

Weight Loss: Outcome quality of care indicator. "Inappropriate weight loss may be a sign of malnutrition and is frequently used as an indicator of poor nursing care."
Dyck, 2007
Horn et al., 2005
Kramer & Fish, 2001
Bostick, 2004

Other indicators used in studies not included in the final review

Discharge rates: Outcome indicator. Considered a questionable indicator of quality care because there are "good" reasons for discharge (e.g., return to home), and "bad" reasons for discharge (e.g., transfer to another nursing home for financial reasons).

Social Engagement: Outcome quality of life indicator. In one study, engagement included "any verbal interaction with residential care facility staff or other persons, presence in any group activity, or presence of residential care facility staff providing feeding assistance with associated interaction" (Bates-Jensen *et al.*, 2004, p. 933).

Contractures: Outcome quality of care indicator. "Contractures are an abnormal shortening and stiffening of muscle tissue that can decrease the range of motion at a joint…Contractures are frequently used as proxy measures of care quality as they are effectively postponed and corrected by exercise programs, massage, and physical therapy (Granger, Seltzer, & Fishbein, 1987)" (Castle, 2003, p. 486).

Psychoactive Medications: Process quality of care indicator. "Psychoactive drugs are defined as medications 'that affect psychic function, behaviour, or experience' (Harrington, Tompkins, Curtis & Grant, 1992, p. 823)…The general concern with these psychoactive drugs is that the rates of use may be excessive or clinically unjustified" (Castle, 2003, p. 486).

Mortality: Outcome quality indicator. Death or mortality rates are sometimes used as an indicator of quality of care. The limitation of this indicator is that death "is often an expected outcome for nursing home residents…[and] it is not always known whether the death was for reasons of poor care or because of clinical conditions that were not amenable to treatment" (Anderson *et al.*, 1998, p. 298).

Time in Bed: Outcome quality of care indicator. "Excessive time in bed has been associated with detrimental outcomes, including pressure ulcer development, pneumonia, under nutrition, urinary incontinence, infections and mortality" (Bates-Jensen *et al.*, 2004, p. 931).

Other Terms/Definitions:

Case-mix: An aggregate measure of resident acuity based on a combination of several resident characteristics and used as an estimate of the amount of staff effort needed to care for residents. The higher the facility case-mix, the more staffing required to provide adequate care. The RUG (Resource Utilization Group) resident classification system, which is derived from the Minimum Data Set (MDS) is the most frequently used measure of the intensity of care and services required for different types of residents. Other potential case-mix measures are: "ADL index, OSCAR case-mix variables, other MDS items related to resident staff time requirements, and facility characteristics" (Bostick et al., 2006, p. 375).

Minimum Data Set (MDS): The MDS is a national American database based on the collection of data on every nursing home resident at least every 90 days. **"**The Long Term Care Minimum Data Set (MDS) was developed in response to the OBRA 1987 legislation mandating the development of a national resident assessment system for nursing homes (Morris et al., 1990; U.S. Department of Health and Human Services, 1989)" (Dyck, 2004, p. 53).

Appendix 3.2 Data Extraction Form

Review Title: Regulation Requirement for 24-hr RN/RPN Availability in LTC

STUDY CHARACTERISTICS:

Author(s)	
Year Published	
Title	
Aim/Research Question	
Source (journal title; government agency; university, etc)	
Type of Source (peer-reviewed journal; government; academic)	
Notes:	

First Reviewer

Reviewer:	
Date Reviewed	
Study ID:	
Eligible? (Y/N) *Should this study be included in the final review?*	
Reviewer's Rating *(scale of 0-5 with 5 being best)*	

Second Reviewer

Reviewer:	
Date Reviewed	
Agreement with first reviewer? (Y/N)	

STUDY CHARACTERISTICS:

Location/organization	
• City; country; prov./state	
• Organization (i.e. Health Authority, Ministry, etc.)	
Facility:	
• Exclusive LTC? (if mix specify)	
• # of beds/facilities	
• Facility ownership (for-profit; lay;	

religious; government)	
• Facility affiliation vs. independence (for-profit: chain or independent) (not-for profit: service organization, religious organization, health authority/municipality/government; hospital affiliated, Veterans Affairs)	
• Care setting (urban, rural, mixed)	
• Other facility characteristics	
Residents:	
• # of residents; mean resident age	
• Other	
Staff:	
• # of RN/RPNs; LPNs; CA; Physicians	
• Education/Training of RN/RPN, LPN, CA	
• Other staff characteristics	
• economic data reported – Y/N	
Methodology:	
• Year(s) of Study (*Over what period did the data collection take place?)*	
• Length of Study (cross-sectional; longitudinal - # of months/years)	
• Type of Study (RCT, quasi-RCT, cohort, case control, time series)	
• Data Source (primary, secondary, sources)	
• Data cleaning	
• Inclusion Criteria	
• Exclusion Criteria	
Risk Adjustment Factors:	
• Having an adjusted analysis (Y/N)	
Resident Risk Adjustment Factors	
• Adjusting for age (Y/N)	
• Adjusting for severity of illness (comorbidities) (Clinical Information) (Y/N)	
• Adjusting for presence or absence or severity of dementia (Y/N)	
• Demographics (Y/N)	
• Level of Function (Y/N)	
• No. of Medication (Y/N)	
Facility and Market Risk Adjustment Factors	

• Adjusting for payment status of residents (government funded *v*s. privately funded) (Y/N)	
• Facility size	
• Facility non-profit/for-profit status	
• Chain affiliation	
• Occupancy Rate	
• Other	

Key Findings
Analysis
Study Limitations (methodology, sample size, response rate, data source, bias, etc.)
Study Strengths
Implications for policy
References to check out?

INTERVENTION: (indicate Y/N and provide details if Y):

Nature of intervention	
• Specified Staffing Mix (# of nurses; ratio of RN, LPN, CA)"	
• Specified Licensed Nurse Staffing Coverage (8 hours/day; 24-hr onsite; 24-hr on-call)	
• Specified Staffing Levels (hprd or staff-to-resident ratio)"	
• Specified Nursing Staff Skills/Training	
• Other Staffing Physician/NP Support	
Other notes:	

Resident Outcome Quality Indicators (Y/N measured)

Resident Outcome Quality Indicators: Adverse Event	
Resident Outcome Quality Indicators: Dehydration/Nutrition	
Resident Outcome Quality Indicators: Falls/Fractures	
Resident Outcome Quality Indicators: Hospitalizations/ED transfers	
Resident Outcome Quality Indicators: Infections	
Resident Outcome Quality Indicators: Mortality	
Resident Outcome Quality Indicators: Pressure Ulcers Incidence (preferred over prevalence)	
Resident Outcome Quality Indicators: Other	

Resident Process Quality Indicators: (Y/N measured)

Resident Process Quality Indicators: Catherization	
Resident Process Quality Indicators: Failure to Rescue/Treat	
Resident Process Quality Indicators: Psychoactive Drugs	
Resident Process Quality Indicators: Restraints	
Resident Process Quality Indicators: Toileting	
Resident Process Quality Indicators: Other	

Resident Process & Outcome Quality Indicators (Y/N measured)

Resident Process & Outcome Quality Indicator: US Federal Audit Deficiencies	

Appendix 3.3 24-Hour RN/RPN Search and Review

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Initial Search (14): First Cut: Janice – 0 (November 4, 2009); Jo – 0 (November 2009)		
24-hour Search (14): First Cut: Janice – 3 (November 4, 2009); Jo - 0; **Second Cut**: Janice – 0 (November 12, 2009); Jo – 0 (November 2009)		
Zoutman DE, Ford BD, Gauthier J. A cross-Canada survey of infection prevention and control in long-term care facilities. Am. J. Infect. Control 2009 06;37(5):358-363.		Only mentions 24-hour RN staffing in Canadian LTC in their sample description (91% of the facilities had 24-hr RN), don't further analyze the impact of 24-hour RN staffing.
Zolot JS, Nelson-Hogan D. Understaffing Places Nursing Home Residents at Risk. Am. J. Nurs. 2000 06;100(6):21		The article is misfiled and no original article is found on the web. Regardless, the piece is listed as being only 1 page in length and so it is likely an opinion/commentary piece and therefore ineligible.
Francese T, Mohler M. Long-term care nurse staffing requirements: has OBRA really helped? Geriatr. Nurs. 1994 05/01;15(3):139-141.		An opinion/commentary piece (only references US federal regulation requiring 24-hour licensed nursing including 8-hr/day of RN)
Can#1 MEDLINE Eng (130): First Cut: Janice – 3 (November 10, 2009); Jo – 6; **Second Cut:** Janice – 0 (November 12, 26, and 30, 2009); Jo - 0		
Ottem P, Overton C. RN and LPN accountabilities and responsibilities. Nurs. BC 2000 Jun;32(3):19-22.		The article only describes RN and LPN scope of practice in BC in 2000.
Anonymous. Evaluating nursing staff mix decisions in long-term care. Can. Nurse 2009 Feb;105(2):26-27.		Only discusses RN/LPN/CA mix (%)
Anderson. Implementing modular nursing in a long-term care facility. 1993.		Discusses modular nursing care and role of various nurses but not utilization of RN vs. LPN

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Berta. Observations on institutional long-term care in Ontario: 1996-2002. 2005.		Only provides information on nurse staffing hours per resident per day (RN, LPN, CA)
Morin. Less money, less care: how nurses in long-term care allocate hours of needed care in a context of chronic shortage. 2005.		Only on how nurses, when they are short staffed, assign care hours (e.g. which resident needs are unmet etc.)
Spee. Shaking shift report: is it possible? 2000.		Only on shift reports etc., not related to 24-hr nurse staffing
Can #1 MEDLINE Fr (9): First Cut Janice – 0 (November 16, 2009); Jo - 0		
Can#1 EMBASE Eng Fr (122): First Cut: Janice – 1 (November 16, 2009); Jo – 1. **Second Cut :** Janice – 0 (November 16, 2009)		
Berta W, Laporte A, Zarnett D, Valdmanis V, Anderson G. A pan-Canadian perspective on institutional long-term care. Health Policy 2006 Dec;79(2-3):175-194.		The research is primarily focused on ownership and the impact of ownership on staffing levels. They do not address 24-hr RN vs. LPN nurse staffing, and they do not include original research linking nurse staffing to resident outcomes. Furthermore, a problem with the data is that it includes all levels of LTC facilities in Canada (i.e. IC1 – low level care facilities which are probably more like assisted living although it doesn't state this), not just "heavy care" LTC.
Can #1 CINAHL Eng Fr (94): First Cut: Janice – 4 (November 23, 2009); Jo – 2. **Second Cut:** Janice – 1 (November 24, 2009); **Third Cut** (re: Sudbury & Gnaedinger study)**:** Research team – 0 (November 24, 2009)		
Hyun S, Gakken S, Douglas K, Stone PW. Evidence-based staffing: potential roles for informatics. Nurs.Econ. 2008 2008;26(3):151.		Only provides information on how information technology can assist nurse staffing decisions.
McGregor MJ, Cohen M, McGrail K, Broemeling AM, Adler RN, Schulzer M, et al. Staffing levels in not-for-profit and for-profit long-term care facilities: does type of		Does not study 24-hour nursing question. Finds that for-profit facilities have less staffing than not-for-profit. Information on staffing levels (hprd) provided.

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
ownership matter? CMAJ 2005 2005;172(5):645-649.		
Sudbury F, Gnaedinger N. Optimizing LTC nursing resources by redesigning staff mix and leadership model. CAN NURS HOME 2007 12;18(4):16-19	Although this report does not meet inclusion criteria, it may nonetheless be of interest to health care managers considering changes in LTC nursing staffing models and roles as the paper discusses several suggestions for implementation.	The study discusses the process of the staff changes and challenges etc. This study was closely reviewed by the research team because it was the only study that actually discussed the use of LPNs versus RNs on night shift. This article directly examines the outcomes (to residents & staff) from introducing LPNs vs. RNs in a BC LTC facility. The RNs all moved into care coordinator positions, and the staff nurse positions were filled by LPNs. When LPNs were alone on night shift, the DOC was on call, otherwise, an RN/RPN was on duty as well. However, the research team decided that the research was not robust enough to include this study in an empirical research review: The transferability of the study's findings to other settings is limited by the small sample, by the limited description of the resident population and the lack of resident and facility risk adjustments, and by the lack of information on the number, experience or education of the RNs, RPNs, LPNs, CAs, and other clinical staff involved. The reliability and validity of the findings are uncertain because of the lack of information on the research methodology used: no additional information is provided on the surveys, interviews, the human resource data used, or the resident care indicators used. No quantitative data or analysis of same is

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
		described and no description of the qualitative data analysis method is provided.
Shannon V, French S. The impact of the re-engineered world of health-care in Canada on nursing and patient outcomes. NURS INQUIRY 2005 09;12(3):231-239.		Examines hospital nurse staffing; it does not discuss 24-hr nurse staffing.
Can #1 Ageline (189): First Cut: Janice – 0 (November 23, 2009); Jo – 1; **Second Cut:** Janice – 0 (November 24, 2009)		
Wilson. Comparison of primary nursing and team nursing in a geriatric long-term care setting. 1989		Describes a study of the implementation of primary nursing versus team nursing on two units. No research on 24-hour nursing. This paper is also does not fit publication date criteria (1989).
Can #1 EMBASE Reviews (23): First Cut: Stirling – 0 (December, 2009)		
Can #2-3 MEDLINE Eng Fr (232): First Cut: Janice – 0 (November 24, 2009)		
Can #2-3 EMBASE Eng Fr (80): First Cut: Janice – 0 (November 24, 2009)		
Can #2-3 CINAHL Eng Fr (223): First Cut: Janice – 0 (December 7, 2009)		
Can #2-3 AgeLine Eng Fr (27): First Cut: Janice – 0 (December 7, 2009)		
Can #2-3 MEDLINE Reviews (21): First Cut: Stirling – 0 (December 2009)		
Can #2-3 EMBASE Reviews (21): First Cut: Stirling – 0 (December 2009)		
Can #2-3 CINAHL Eng/Fr Reviews (13): First Cut: Stirling – 0 (December 2009)		
Inter 24 Hr #1 AgeLine (1325): First Cut Janice – 0 (December 12, 2009)		

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Inter 24 Hr #1 CINAHL (1494): First Cut Janice – 0 (December 14, 2009); Stirling – 2 (January 5, 2010); **Second Cut:** Janice 0 (January 12, 2010); Stirling – 0 (January 18, 2010)		
Konetzka RT, Stearns SC, Park J. The staffing-outcomes relationship in nursing homes. Health Serv. Res. 2008 06;43(3):1025-1042.		Does not examine 24-hr RN staffing. *(Note: this paper was included in later review of LTC staffing levels/mix studies*)
Waltman RE. A night at the nursing home. FAM PRACT MANAGE 2008 05;15(5):46-46.		Does not examine the 24-hour question. Not empirical research, but commentary on value of visitors to NH residents in the evening/night.
Inter 24 Hr #1 EMBASE (1121): Janice – 0 (December 29, 2009)		
Inter 24 Hr #1 MEDLINE (633): First Cut: Janice – 0 (December 29, 2009)		
Inter 24 Hr #1 CINAHL Reviews (113): First Cut: Janice – 1 (December 19, 2009); Stirling – 5 (January 5, 2010); **Second Cut**: Janice – 0 (January 12, 2010); Stirling – 0 (January 18, 2010)		
Bostick JE, Rantz MJ, Flesner MK, Riggs CJ. Systematic review of studies of staffing and quality in nursing homes. J AM MED DIR ASSOC 2006 07; 7(6):366-376.		Does not examine 24-hr RN staffing. *(Note: this paper was included in later review of LTC staffing levels/mix studies*)
Collier & Harrington (2008). "Staffing Characteristics, Turnover Rates and Quality of Resident Care" *Research in Gerontological Nursing*. 2008. Vol. 1, No. 3: 157-170		Does not examine 24-hr RN staffing. *(Note: this paper was included in later review of LTC staffing levels/mix studies*) The authors include a section on 24-hour RN staffing, but they do not provide evidence to support this; they argue that "although empirical evidence to support this practice is lacking, it seems reasonable to hypothesize, based on the favorable effects of higher RN

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
		staffing."
Dellefield ME. The relationship between nurse staffing in nursing homes and quality indicators: a literature review. J. Gerontol. Nurs. 2000 06;26(6):14-28.		Does not examine 24-hr RN staffing. *(Note: this paper was included in later review of LTC staffing levels/mix studies*)
Munroe DJ. The influence of registered nurse staffing on the quality of nursing home care. Res. Nurs. Health 1990 08;13(4):263-270.		Does not examine 24-hr RN staffing. *(Note: this paper was included in later review of LTC staffing levels/mix studies*)
Wells JC. The case for minimum nurse staffing standards in nursing homes: a review of the literature. ALZHEIMERS CARE Q 2004 2004;5(1):39-51.		Does not examine 24-hr RN staffing. *(Note: this paper was included in later review of LTC staffing levels/mix studies*). Cites two reports that recommend 24-hr RN: Wunderlich et al., (1996) and Harrington et al., (2000). The Wunderlich chapter was reviewed 2-Dec-09, as recommended by Ms. Davis from Veterans Affairs Canada, and closer examination found "the committee concludes that a relationship between RN-to-resident staffing and quality of care in nursing facilities has been established. Although the committee did not uncover any research specifically testing 24-hour nursing presence in a controlled experiment..." (page 153). Similarly, closer review of the Harrington et al. paper found support, but no empirical evidence, for 24-hr RN coverage.
Inter 24 Hr #1 EMBASE Reviews (324): First Cut Stirling - 3 (January 5, 2010); **Second Cut** Janice – 0 (January 12, 2010); Stirling – 0 (January 18, 2010)		
Castle NG. Nursing home caregiver staffing levels and quality of care: A literature review. Journal of Applied Gerontology 2008 August;		Does not examine 24-hr RN staffing. *(Note: this paper was included in later review of LTC staffing levels/mix studies*)

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
27(4):375-405.		
Kane RS. Factors affecting physician participation in nursing home care. J. Am. Geriatr. Soc. 1993;41(9):1000-1003.		Does not examine 24-hr RN question. Studies reasons for lack of physician participation in LTC (e.g. lack of reimbursement, paperwork).
Weech-Maldonado R, Meret-Hanke L, Neff MC, Mor V. Nurse staffing patterns and quality of care in nursing homes. Health Care Manage. Rev. 2004 Apr; 29(2):107-116.		Does not examine 24-hr RN question. This study researches the direct and indirect effects of RN staffing mix (proportion of RNs relative to other staff) and full-time RN staffing (proportion of RNs who are full-time, permanent employees as opposed to part-time or contract RNs) on patient outcomes. *(Note: this paper was included in later review of LTC staffing levels/mix studies*)
Inter 24 Hr #1 MEDLINE Reviews (142): First Cut: Stirling – 0		
LTC Staffing Editorials CINAHL – (127): First Cut (re 24-hr RN question): Janice – 21 (note: many of these references did not have abstracts and this first cut was based on title and keywords) (January 31, 2010); **Second Cut:** Janice – 0 (based on review of full-text) (February 4, 2010)		
Questionable management practices... June issue of the Lamp... problems that the nurse experienced on permanent night duty in a nursing home. Lamp 1999 08;56(7):23-23.		Does not examine the 24-hour question.
Belrose DE. Letter from a Virginia RN. VA NURSES TODAY 2001 2001;9(4):14-14.		Does not examine the 24-hour question - commentary by individual nurse arguing for mandated staffing ratios
Buckwalter KC. Awareness is key. J.Gerontol.Nurs. 2000 06;26(6):3-3.		Does not examine the 24-hour question/
Chapman Y. Correction. Aust.Nurs.J. 2007 09;15(3):3-3.		Does not examine the 24-hour question.
Dellit K, Heath H. Clarity on care homes and employing registered nurses... Hazel		Does not research the 24-hour question, although reference is made that "...some

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Heath... (features November 15). Nurs.Stand. 2006 11/29;21(12):33-33.		providers are seeking to change the law requiring the 24-hour presence of a registered nurse in care homes (nursing)....The need for registered nurses (RNs) really is being questioned and anyone who believes that older people living in care homes (nursing) need a 24-hour RN presence cannot afford to be complacent." (p. 33)
Gage H, Knibb W, Evans J, Williams P, Rickman N, Bryan K. Nursing homes. More on quality of care. BMJ 2009 09/05;339:530-530.		Does not examine 24- hour question, but research related to nurse staffing mix.
Gelman LM. Legislative imposition of minimum staffing... editorial in the March/April edition of JAMDA on staffing ratios. J AM MED DIR ASSOC 2001 2001;2(4):200-201.		Does not discuss 24-hr question. Discusses that what, when and how well staff perform nursing tasks are important determinants of quality output.
Holthaus M. Long-term care: a test bed for coming reform: collaboration among medical professionals undergoes shakedown. Geriatrics 2009 07;64(7):7-8.		Does not discuss 24-hr RN or staff mix /level.
Kane RL. Commentary: nursing home staffing -- more is necessary but not necessarily sufficient. Health Serv.Res. 2004 04;39(2):251-255.		Does not discuss 24-hr RN or staff mix /level.
Kreil VI. Guest editorial. Adding more to the staffing equation. NURS HOMES LONG TERM CARE MANAGE 2006 02;55(2):8-8.		Does not discuss 24-hr RN or staff mix /level.
Lomax G. Ministry of Health brands article 'misleading'... Exemptions Compromise Patient Safety. KAI TIAKI NURS NZ 2000 11;6(10):4-4.		Does not discuss 24-hr RN

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Maltby V. Room for a middle level qualification... art&science April 28. Nurs.Stand. 2004 05/12;18(35):28-28.		Not about 24-hr or staffing mix/level – about HCA (care aide) education.
Mathew M. Nursing home staffing... "Addressing the dramatic decline in RN staffing in nursing homes" (Nursing counts, September). Am.J.Nurs. 2005 12;105(12):15-16.		No discussion of 24-hr RN – commentary on need for more RNs.
McGrath C, Mezey M, Carter D, Reinhard S, Remsburg R. RN staffing and long-term care... "RN staffing time and outcomes of long-stay nursing home residents" (Original research: a new look at the old, November 2005). Am.J.Nurs. 2006 03;106(3):15-15.		Not about 24-hr RN or staffing mix/level. Commentary by an LVN on decline of RNs in LTC and importance of LVNs and CNAs
Mueller C. Quality care in nursing homes: when the resources aren't there. J.Am.Geriatr.Soc. 2002 08;50(8):1458-1460.		Does not examine 24-hr nursing or specific nurse levels/mix. Suggests need for research on: use of technology, the work environment, and organization and delivery of nursing care.
Mueller CH. Guest editorial. Cautions about nurse staffing standards for nursing homes. J.Gerontol.Nurs. 1999 05;25(5):6-6.		Does not examine 24-hr nursing; discusses how staffing ratios need to be based on consideration of patient need/acuity (case-mix)
Rice RB. Guest editorial. Collaboration as a tool for resolving the nursing shortage. J.Nurs.Educ. 2003 04;42(4):147-148.		Does not examine 24-hr nursing or specific nurse levels/mix - discusses need for education
Schnelle JF. In this issue. Long-term care workforce and quality. ALZHEIMERS CARE Q 2004 2004;5(1):1-2.		Does not discuss 24-hr RN. Focus on the issue of nurse staffing numbers and quality
Scott C, West E. Editorial. Special issue on the nursing workforce and quality of care. J NURS MANAGE 2004 11;12(6):381-384.		No mention of 24-hr RN coverage

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
West D. President's message. ASBN UPDATE 2005 05;9(3):4-4		Does not examine 24-hr RN. Discusses legislation enabling the use of MAPs (Medication Assistance Personnel) in Arkansas NHs.
Yeaworth RC. Defining nursing... January editorial, "Blinded by degrees". Am.J.Nurs. 2009 06;109(6):13-13.		Does not discuss 24-hr RN or staff mix /level.
LTC Staffing Editorials EMBASE – (155): First Cut (re 24-hr RN question): Janice – 5 (note: many of these references did not have abstracts and this first cut was based on title and keywords) (January 31, 2010); **Second Cut:** Janice – 0 (based on review of full-text) (February 4, 2010)		
Chouinard J. 'Mine own countree': Quality of care in nursing homes. Can.Med.Assoc.J. 1999 18 May;160(10):1463-1464.		Does not discuss 24-hr RN or staff mix /level. Discusses quality of care in Quebec NHs.
Evans JM. Staffing ratios in Nursing facilities: Where do we stand? Journal of the American Medical Directors Association 2001;2(2):94-95.		Does not discuss 24-hr RN or staff mix /level. Discusses minimum nurse staffing legislation and its impact on care/bed numbers, payment systems, etc., in the US.
Kaldy J. AMDA house of delegates addresses surveys, staffing, and public image of nursing facilities. Journal of the American Medical Directors Association 2002;3(4 SUPPL):H44-H46.		Does not discuss 24-hr RN. Discusses importance/value of direct care staff (e.g. CNAs)
Sherman FT, Schwartz S. Nurses, nurses, nurses: You can't live without them!. Geriatrics 2002 01 Dec;57(12):7-8.		Does not discuss 24-hr RN or staff mix /level. Focus on need for more nurses in hospitals.
Zinn JS. Nursing home staffing, turnover, and case mix: Commentary. Medical Care Research and Review 2003 Sep;60(3):393-399.		Does not discuss 24-hr RN or staff mix /level. Focus of the commentary is on recruitment and retention.
LTC Staffing Editorials MEDLINE – (30): First Cut (re 24-hr RN question): Janice – 3 (note: many of these references did not have abstracts and this first cut was based on title and keywords) (January 31, 2010); **Second Cut:** Janice – 0 (based on		

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
review of full-text) (February 4, 2010)		
Bauer MC. Staffing ratios and research. J.Gerontol.Nurs. 2001 Jan;27(1):6.		Not relevant; discusses research agendas and need for consideration of staffing ratios.
Challis D, Hughes J. Residential and nursing home care--issues of balance and quality of care. Int.J.Geriatr.Psychiatry 2003 Mar;18(3):201-204.		Does not discuss 24-hr RN or staff mix /level.
Smith JP. Optimal skills mix for the institutional care of elderly people. J.Adv.Nurs. 1992 Feb;17(2):125.		Does not discuss 24-hr RN.
24-hour Grey Literature Web sites – (51): First Cut: Janice – 0 (February 2, 2010); Mimi – 0 (February 2, 2010)		
24-hour Grey Literature from Provincial Contacts (21): First Cut: Janice – 7 (Oct 2009 –Jan 2010); **Second Cut:** Janice – 0 (Oct 2009 –Jan 2010)		
Provincial Staff Mix Advisory Committee (NL). "Final Report of the Provincial Committee to Review Staff Mix in Long Term Care Settings." NL Department of Health and Community Services. 2006 November		Does not discuss 24-hr RN. This report provides recommendations for a new provincial staff mix ratio, for roles of RNs, LPNs, and CA in Newfoundland and Labrador LTC: Recommends one NP or CNS: 150 -200 residents; staff mix of RN 14-20%; LPN 53-40%; PCA 33 - 40% (p. 4)
Nova Scotia Department of Health. "Continuing Care Strategy: Long Term Care Facility Program Requirements, RFP No. 6013638 Appendix C Final." Author. July 25, 2007.		Does not discuss 24-hr RN. Provides information on minimum requirements for LTC services and resident care, including staffing: "1. All nursing homes must provide Registered Nurse coverage 24 hours per day, seven days per week. 2. Professional nursing staffing requirement equates to a minimum combined total of 1 hour of RN/LPN per resident per day." (p. 39)
Shirley Sharkey, "People Caring for People: Impacting the Quality of Life and Care of		Does not discuss 24-hr RN. The purpose of this report was "to provide

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Residents of Long Term Care Homes. A report of the Independent Review of Staffing and Care Standards for Long-Term Care Homes in Ontario" Ontario Ministry of Health and Long-Term Care. 2008 May.		advice on a comprehensive framework for determining human resources implications related to quality of care and quality of life of residents of LTC homes..." (p. 2). The literature on staffing and quality of care in LTC is reviewed, but does not include any research on the 24-hr RN question. *(Note: this report was included in later review of reviews of LTC staffing levels/mix studies*)
Cruikshank, S. & Blais, D. "Provincial Residential Services Staffing Model Project Preliminary Report." BC Ministry of Health. October 22, 2007. (First Draft)		This draft version mentions that since the introduction of 24/7 RN coverage in Ontario LTC, that the licensing infraction rate has reduced. However, no data source is provided nor was the report author able to recall the original Ministry of Health contact for this information. Attempts to confirm this information were exhaustively pursued by the C2E2 research team, but none of the contacts at the ON Ministry of Health or Ontario Health Services Strategy Division (HSSD) had information to confirm this finding. Furthermore, in the final draft of this report (May 29, 2008 – see following citations), this reference to Ontario is not included.
BC Ministry of Health, Home and Community Care. "Provincial Staffing Framework For Residential Care Facilities." Author. May 29, 2008. (Final Draft)		Does not discuss 24-hr RN. The purpose of this report was to develop and recommend a best practice care delivery model for Residential Services. And includes recommendations on factors to be considered when deciding RN and LPN staff mix (i.e. the acuity and complexity of resident care needs, available supports, health care providers, and

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
		resources, and the environment and organization).
Anonymous . "Nursing Directorate Report & Background Paper Comparison" BC Ministry of Health. February 2008		Does not discuss 24-hr RN. The purpose of this document was to compare the LTC staffing literature review prepared by Murphy (2006) for the BC Nursing Directorate, with the *Background Paper* (no author listed, but this background paper was presumably prepared for the report: "Provincial Staffing Framework For Residential Care Facilities.") *(Note: the Murphy (2006) report was included in the review of reviews of LTC staffing levels/mix studies*)
Wunderlich, G.S., Sloan, F.A., & Davis C.K. (Eds.). "Nursing Staff in Hospitals and Nursing Homes: Is it Adequate?" In Institute of Medicine. *Staffing and Quality of Care in Nursing Homes* (pages 128-168). US Institute of Medicine, National Academy Press. 1996.		Discusses need for 24-hour RN in LTC but reports there is no research to support this recommendation. This chapter reviews the research on nurse staffing in LTC. "The committee concludes that a relationship between RN-to-resident staffing and quality of care in nursing facilities has been established. Although the committee did not uncover any research specifically testing 24-hour nursing presence in a controlled experiment..." (page 153). Information on the implementation and impact of OBRA '87 (US Federal NH staffing standards) is provided.
ProQuest Dissertations and Theses – (400): First Cut: Mimi – 6 (February 9, 2010); **Second Cut:** Janice – 0 (February 10, 2010)		

Appendix 3.4 Search Example

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Database: Ovid MEDLINE(R) 1950 to Present with Daily Update
Search Strategy:
--------------------------------------------------------------------
1     Long-Term Care/ (18823)
2     Residential Facilities/ (3950)
3     nursing homes/ or intermediate care facilities/ or skilled
nursing facilities/ (27511)
4     Homes for the Aged/ (9233)
5     Geriatric Nursing/ (10685)
6     long term care.mp. (24391)
7     nursing home?.mp. (29475)
8     intermediate care.mp. (1164)
9     extended care.mp. (642)
10     Health Services for the Aged/ (12708)
11     complex care.mp. (280)
12     (resident$ adj3 care).mp. (4036)
13     special care.mp. (2937)
14     heavy care.mp. (27)
15     or/1-14 (80631)
16     aged/ or "aged, 80 and over"/ or frail elderly/ (1870417)
17     (aged or elderly or senior or old age).mp. (3276191)
18     or/16-17 (3276191)
19     nurses/ or nurse administrators/ or nurse clinicians/ or nurse
practitioners/ or nursing staff/ (64990)
20     nursing/ or exp specialties, nursing/ (158434)
21     nursing staff/ (14138)
22     Nursing, Practical/ (3265)
23     nurses' aides/ or psychiatric aides/ (3443)
24     Psychiatric Nursing/ (13769)
25     nurse$ aide$.mp. (3314)
26     psychiatric aide$.mp. (396)
27     care aide$.mp. (138)
28     care attendant$.mp. (57)
29     care assistant$.mp. (232)
30     clinical assistant$.mp. (95)
31     ((healthcare or health care) adj2 assistant$).mp. (220)
32     exp nurses' aides/ (3443)
33     nurs$ assistant$.mp. (928)
34     (licensed adj3 staff).mp. (57)
35     LVNs.mp. (46)
36     LPN.mp. (507)
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37      (nurse? or nursing).ti,ab. (263026)
38      vocational nurse?.mp. (86)
39      health personnel/ (15512)
40      or/19-39 (385591)
41      15 and 40 (34073)
42      "Personnel Staffing and Scheduling"/ (11689)
43      staffing.mp. (16166)
44      ((client or patient) adj1 ratio).mp. (253)
45      (staffing adj3 model$).mp. (150)
46      care model$.mp. (1781)
47      ((skill or care or rn or nurs$) adj3 mix).mp. (682)
48      staff ratio.mp. (45)
49      nursing care/og [Organization & Administration] (1152)
50      patient care team/ or nursing, team/ (44247)
51      nurs$ workforce.mp. (585)
52      Workload/ (11340)
53      ((full time or fulltime or part time or casual) adj3 (work or
employment)).ti,ab. (1410)
54      ((rn or nurs$ or staff$) adj3 mix).mp. (344)
55      (case adj3 mix).mp. (3046)
56      nursing care delivery system$.mp. (43)
57      (differentiated adj3 practi?e).mp. (90)
58      team nursing.mp. (265)
59      (staff$ adj3 mix).mp. (206)
60      (skill? adj3 mix).mp. (431)
61      ((nurse$ or staff$) adj3 ratio?).mp. (863)
62      (nursing adj3 delivery system$).mp. (89)
63      (functional adj3 nurs$).mp. (223)
64      (patient? adj3 ratio?).mp. (7815)
65      (nurs$ adj3 role).mp. (32274)
66      (staff$ adj3 level$).mp. (1611)
67      (nurs$ adj3 dose).mp. (88)
68      overtime.ti,ab. (869)
69      on call.mp. (1553)
70      night shift?.mp. (1049)
71      (nurs$ adj3 (coverage or presence or hours)).mp. (801)
72      ((RN or registered nurse) adj3 (coverage or presence or
hours)).mp. (48)
73      ((late-evening or evening or nighttime or night) adj3
(situations or nursing or care)).mp. (1356)
74      24 hour.mp. (26676)
75      (minute? adj2 (patient? or client? or resident?)).mp. (1920)
76      care time.mp. (282)
77      (time adj2 (patient? or client? or resident?)).mp. (13385)
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78      time/ (8539)
79      time factor/ (840410)
80      (hour? adj3 (client? or patient? or resident?)).mp. (9877)
81      (ratio adj3 hours).mp. (355)
82      ((staff or nurs$) adj3 ratio?).mp. (777)
83      (hours adj3 day).mp. (5152)
84      ((LPN or licensed practical nurse? or licensed nurse?) adj5
(coverage or presence or hours)).mp. (9)
85      nurs$ supply.mp. (69)
86      nurs$ shortage.mp. (1697)
87      Personnel Selection/ (9287)
88      Night Care/ (1172)
89      After-Hours Care/ (522)
90      or/42-87 (1016559)
91      15 and 40 and 90 (5073)
92      limit 91 to yr="1990 -Current" (4296)
93      comment/ or editorial/ or letter/ (986174)
94      92 not 93 (4146)
95      92 not 94 (150)
96      limit 94 to English language (3659)
97      limit 94 to French (182)
98      94 not (96 or 97) (307)
99      canada/ or alberta/ or british columbia/ or manitoba/ or new
brunswick/ or "newfoundland and labrador"/ or northwest territories/
or nova scotia/ or nunavut/ or ontario/ or prince edward island/ or
quebec/ or saskatchewan/ or yukon territory/ (96387)
100     (canada or alberta or british columbia or manitoba or new
brunswick or newfoundland or labrador or northwest territories or nova
scotia or nunavut or ontario or prince edward island or quebec or
saskatchewan or yukon territory).mp. (115648)
101     or/99-100 (115648)
102     15 and 40 and 90 and 101 (163)
103     limit 102 to yr="1990 -Current" (149)
104     limit 103 to English language (139)
105     limit 103 to French (12)
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Appendix 3.5 Regulatory, Association and Academic Nursing Contacts

Provincial Nursing Colleges and Associations:

The following provincial nursing colleges and associations were contacted by email for any information/reports/research/papers they could share related to the research question: the 24-hr RN/RPN availability in LTC: (Responses received are noted with a *)

Newfoundland
College of LPNs of Newfoundland & Labrador
Association of Registered Nurses of Newfoundland and Labrador

Prince Edward Island
Association of Registered Nurses of Prince Edward Island
Prince Edward Island Licensed Practical Nurses

Nova Scotia
College of Registered Nurses of Nova Scotia
College of Licensed Practical Nurses of Nova Scotia

New Brunswick
Association of New Brunswick Licensed Practical Nurses
Nurses Association of New Brunswick*

Québec
Order des infirmieres et infirmiers aux. du Quebec
Ordre des infirmières et infirmiers du Québec*

Ontario
Registered Nurses Association of Ontario
College of Nurses of Ontario*

Manitoba
College of Registered Nurses of Manitoba
College of Registered Psychiatric Nurses of Manitoba*
College of LPNs of Manitoba

Saskatchewan
Saskatchewan Registered Nurses' Association
Registered Psychiatric Nurses Association of Saskatchewan
Saskatchewan Association of LPNs

Alberta

College of Registered Psychiatric Nurses of Alberta*
College of LPNs of Alberta
College and Association of Registered Nurses of Alberta

British Columbia
College of Registered Nurses of British Columbia*
College of Registered Psychiatric Nurses of British Columbia
College of Licensed Practical Nurses of BC

Yukon
Yukon Registered Nurses Association *
Registrar of Licensed Practical Nurses*

Northwest Territories
Registered Nurses Association of the Northwest Territories and Nunavut

Nunavut
Nunavut Registrar Professional Licensing
Registered Nurses Association of the Northwest Territories and Nunavut

Other Key Contacts:

The following researchers were contacted by email and/or telephone for any information/reports/research/papers they could share related to the 24-hr RN/RPN availability in LTC question: (Responses received noted with a *)

Jeanne Besner, Director, Health Systems & Workforce Research Unit, Alberta Health Services*

Diane Doran, Associate Dean, Faculty of Nursing, University of Toronto

Sabrina Wong, University of British Columbia School of Nursing*

Dorothy Pringle, Professor Emerita, University of Toronto*

Linda O'Brien-Pallas, Professor, University of Toronto, CHSRF/CIHR National Chair, Nursing Health Human Resources

Linda McGillis Hall, Associate Professor, Associate Dean, University of Toronto

Gail Tomblin Murphy, Professor, School of Nursing, Dalhousie University

Justin Peffer, Senior Policy Analyst, Ministry of Health & Long Term Care, Ontario*

Sheila Driscoll, Manager, Ministry of Health & Long Term Care, Ontario*

Sudha Krishnan, Health Analytics Branch, Ministry of Health & Long Term Care, Ontario*

Stephanie Tousignant, Health Services Strategy Division, Ministry of Health & Long Term Care, Ontario

Maura MacPhee, Assistant Professor, University of British Columbia, School of Nursing*

André Lépine, Director Nursing Home Services, Province of New Brunswick*

Sheila Cruikshank, Director, Residential Services VIHA-Operated Sites Continuing Health Services, VIHA*

Appendix 3.6 Information Received from Provincial Nursing Contacts

Newfoundland

Correspondence with: Anita Ludlow, Chief Nurse, Policy & Planning Division, Department of Health and Community Services, Government of Newfoundland and Labrador

Document	***Summary***
Provincial Staff Mix Advisory Committee (NL). "Final Report of the Provincial Committee to Review Staff Mix in Long Term Care Settings." NL Department of Health and Community Services. 2006 November	This report provides recommendations for a new provincial staff mix ratio, for roles of RNs, LPNs, and CA (p. 8-9), as well as job descriptions (p. 18-52) for long term care facilities in Newfoundland and Labrador: Recommends one NP or clinical nurse specialist (CNS): 150 -200 residents; staff mix of RN 14-20%; LPN 53-40%; PCA 33 - 40% (p. 4) (note: in NL, LPNs work under the direction of RNs, not independently).

Prince Edward Island

Correspondence with: Shelley Wood, Patrice Drake's colleague, Nursing Policy Analyst, Department of Health, Charlottetown, PEI

Document	***Summary***
1: Association of Registered Nurses of Prince Edward Island (ARNPEI), the Licensed Practical Nurses Association of Prince Edward Island (LPNA) and the Prince Edward Island Health Sector Council (PEIHSC). "Exemplary Care: Registered Nurses and Licensed Practical Nurses Working Together." (May 15, 2009)	*1:* The purpose of this report is to clarify "some of the key differences between RNs and LPNs in clinical practice" (p. 2).
2: Shirley Sharkey's 2008 report "People Caring for People: Impacting the Quality of Life and Care of Residents of Long Term Care Homes. A report of the Independent Review of Staffing and Care Standards for Long-Term Care Homes in Ontario" (see Ontario)	*2.* See Ontario

Nova Scotia

Correspondence with: Janis Brown, A/ Nursing Policy Advisor, Nursing Advisory Services, NS Department of Health and; Carolyn Maxwell, A/Director, Service and Business Support Department of Health Continuing Care Branch and; Jo-Ann MacManus, Service Delivery Consultant, Continuing Care Department of Health

Document	***Summary***
Nova Scotia Department of Health. "Continuing Care Strategy: Long Term Care Facility Program Requirements, RFP No. 6013638 Appendix C Final." Author. July 25, 2007.	Provides information on minimum requirements for LTC services and resident care, including staffing: "1. All nursing homes must provide Registered Nurse coverage 24 hours per day, seven days per week. 2. Professional nursing staffing requirement

	equates to a minimum combined total of 1 hour of RN/LPN per resident per day." (p. 39) Ms. MacManus clarified that "Our standard for nursing RN and LPN in our new and current homes remains at .5 hours RN per resident per day and .5 LPN per resident per day" (email correspondence January 14, 2010).

New Brunswick

Correspondence with: Beth McGinnis, Acting Chief Nursing, Resources Advisor, Office of the Associate Deputy, Minister of Health Canada, Department of Health Canada, NB
Document: No information available.

Québec

Correspondence with: Sylvie Hains, Provincial Chief Nursing Officer, Québec
Response: email and phone messages were left (in English and French) and contact was made with Sylvie Hains' assistant, but no response or information was received from Mme Hains.

Ontario

Correspondence with: Vanessa Burkoski, Chief Nursing Officer, The Nursing Secretariat, Ministry of Health & Long Term Care, Ontario

Document	***Summary***
Shirley Sharkey, "People Caring for People: Impacting the Quality of Life and Care of Residents of Long Term Care Homes. A report of the Independent Review of Staffing and Care Standards for Long-Term Care Homes in Ontario" Ontario Ministry of Health and Long-Term Care. 2008 May.	The purpose of this report is "to provide advice on a comprehensive framework for determining human resources implications related to quality of care and quality of life of residents of LTC homes..." (p. 2). The literature on staffing and quality of care in LTC is reviewed, but does not include any research on the 24-hr RN/RPN question.

Manitoba

Correspondence with: Liz Ambrose, Senior Policy Analyst, Workforce Policy and Planning, and Lorene Mahoney, Manitoba Long Term Care Consultant, Manitoba Health

Document	***Summary***
1. Roxie Eyer, Program Consultant, Continuing Care, Personal Care Home Staffing Initiative "Response to: SK Ministry of Health CIHR Project: Research on the Regulation Requirement for 24-hour Registered Nurse Availability in LTC Facilities" Oct/09	*1.* Provides information on Manitoba's PCH Staffing Initiative and details of the implementation of increased nursing category hours of direct care per resident per day to 3.6 hours.
2: Manitoba Continuing Care. "Attachment 22.4 PCH Staffing - Table National Comparisons Rev Aug 2009." Author. 2009.	*2:* Spread sheet with Canadian provincial comparison of nurse staffing levels (hprd) and mix (%RN, %LPN, %NA)
3. Manitoba Health. "Personal Care Home	*3.* Policy for nursing services in Licensed

Administrative Manual Nursing Services Guidelines. Policy Category/Number HCS 205.3", Approved July 27, 2005	Personal Care Homes in Manitoba.
4. Manitoba Health. Reporting to Manitoba Health Nursing Services Guideline for Personal Care Homes, Policy Category/Number HCS 205.2", Approved July 27, 2005	*4.* Policy for nursing services in Regional Health Authorities in Manitoba.
5: Manitoba Health. "Manitoba Nursing Strategy: Eight-Year Progress Report." Author. April 2008. http://www.gov.mb.ca/health/nurses/docs/mbns.pdf	*5:* A review of the supply, utilization, development and working conditions of Manitoba nurses (RNs, RPNs, and LPNs).

Alberta

Correspondence with: Anita Paras, Senior Workforce Planner Manager, Health Workforce Planning, Alberta Health and Wellness
Response: No information available.

British Columbia

Correspondence with: Brenda Canitz, Senior Nursing Advisor, Health Authorities Division, BC Ministry of Health; Katie Hill, Director, Home & Community Care, Health Authorities Division, BC Ministry of Health Services; and Brenda Higham, Manager, Residential Services, Home and Community Care, Ministry of Health Services

Document	***Summary***
1: Cruikshank, S. & Blais, D. "Provincial Residential Services Staffing Model Project Preliminary Report." BC Ministry of Health. October 22, 2007.	*1:* The purpose of this report was to develop and recommend a best practice care delivery model for Residential Services. And includes recommendations on factors to be considered when deciding RN and LPN staff mix (i.e. the acuity and complexity of resident care needs, available supports, health care providers, and resources, and the environment and organization). Research literature is reviewed, and it is reported that since the introduction of 24/7 RN coverage in Ontario LTC, that the licensing infraction rate has reduced (no data source is provided nor was the report author able to recall the original MoH contacts for this information). Attempts to confirm this information were exhaustively pursued by the C2E2 research team, but none of the contacts at the ON Ministry of Health or Ontario Health Services Strategy Division (HSSD) had information to confirm this report.
2. BC Ministry of Health, Home and Community Care. "Provincial Staffing Framework For Residential Care Facilities", Draft. Author. May 29, 2008.	*2.* This report is the final draft version of the "Provincial Residential Services Staffing Model Project Preliminary Report." version October 22, 2007 (discussed above). In this version, the reference to Ontario licensing infraction rates has been removed.

3. BC Ministry of Health, Home and Community Care. Residential Services Staffing Model and Staffing Mix, Reference List, Author: November 2007	*3.* This document provides the references list for the "Provincial Staffing Framework For Residential Care Facilities" report, Draft May 29, 2008
4: Anonymous. "Nursing Directorate Report & Background Paper Comparison" BC Ministry of Health. February 2008.	*4:* The purpose of this document was to compare the content of the *Nursing Directorate Report* (Murphy, 2006) with the *Background Paper*
5: Email correspondence with Katie Hill, Director, Home & Community Care, Health Authorities Division, BC Ministry of Health Services, on the issue of 24-hour RN availability in LTC. October 26, 2009	*5:* Ms. Hill provided information on why BC has not established 24-7 RN as a regulatory requirement in BC LTC facilities: many facilities have less than 50 beds (and in some cases less than 20 beds); health authorities may configure nursing support to a facility that result in access to nursing care 24 hours per day, but not necessarily an RN on site; requiring 24/7 RN presence in a facility for more than 26,000 publicly subsidized residential care beds is not achievable in many cases; the mix of staff required to meet the needs of residents may vary depending on the profile of the resident population in a specific facility.

Yukon

Correspondence with: Jan Horton, Health Human Resources Coordinator, Department of Health & Social Services, Yukon Government
Response: No information available.

Northwest Territories

Correspondence with: Donna Allen, Manager, Primary Community Services; Vicki Lafferty, Director, Territorial Integrated Services; and with Yvette Deleff, Department of Health and Social Services

Document	***Summary***
1: HealthTech Consultants. "Resident Assessment Instrument Implementation for Home Care and Long Term Care." Government of the Northwest Territories; Department of Health and Social Services. 2009.	*1:* Not relevant to 24-hour RN/RPN question. Provides deployment strategy for implementation of the RAI Home Care, RAI Long Term Care and RAI Contact Assessment for all Home Care and Long Term Care services in the Northwest Territories (NWT).
2: "LPN and RCA ratio of direct care hours per resident per day." (re: Staffing model for new 28 bed-Territorial Dementia Facility which will be opening in spring 2010 in Yellowknife)	*2:* Information on dementia care clients (level 3 or 4, moderate to severe dementia), on proposed direct hours of care (3.7), and proposed staffing complement (1 LPN : 4.0 RCA, or 20% LPN : 80% RCA).
3: "Staffing Model Direct Patient Care" (re: Staffing model for new 28 bed-Territorial	*3:* Territorial Dementia Facility will be linked with Aven Manor which is also a 29 Long

Document	***Summary***
Dementia Facility which will be opening in spring 2010 in Yellowknife)	Term Care Facility. The RN will be shared between facilities- 24 hours coverage.
4: "Levels of Care – Definitions" (re: Staffing model for new 28 bed-Territorial Dementia Facility which will be opening in spring 2010 in Yellowknife)	*4:* Definition of NT "Levels of Care"
5: "Comparative Data on Levels of Care – Draft" Sept, 2009. (re: Staffing model for new 28 bed-Territorial Dementia Facility which will be opening in spring 2010 in Yellowknife)	*5:* Comparison of Data on Levels of Care in NT, NL and BC

Nunavut

Correspondence with: Frederick (Fred) Montpetit, Chief Nursing Officer, Dept of Health and Social Services, Government of Nunavut
Response: No information available.

Health Canada

Correspondence with: Sandra MacDonald-Rencz ED, Office of Nursing Policy, Health Policy Branch, HC
Response: No information available.

First Nations Health Inuit Branch

Correspondence with: Joyce Desjarlais, Executive Director, Office of Nursing Services, First Nations Health Inuit Branch
Response: No information available.

Canadian Forces

Correspondence with: Lieutenant-Colonel Gayle Quick, Chief of Nursing Services in the Canadian Forces
Response: No information available.

Veterans Affairs Canada

Correspondence with: Donna Davis, National Nursing Officer, Veterans Affairs Canada

Document	***Summary***
Wunderlich, G.S., Sloan, F.A., & Davis C.K. (Eds.). "Nursing Staff in Hospitals and Nursing Homes: Is it Adequate?" In Institute of Medicine. *Staffing and Quality of Care in Nursing Homes* (pages 128-168). US Institute of Medicine, National Academy Press. 1996.	This chapter reviews the research on nurse staffing in LTC. "The committee concludes that a relationship between RN-to-resident staffing and quality of care in nursing facilities has been established. Although the committee did not uncover any research specifically testing 24-hour nursing presence in a controlled experiment..." (page 153). Information on the implementation and impact of OBRA '87 (US

	Federal NH staffing standards) is provided.
Email correspondence with Donna Davis, National Nursing Officer, Veterans Affairs Canada, on the issue of 24-hour RN availability in LTC. October 14, 2009	Ms. Davis sent her opinion on the 24-hour RN staffing question: "*I am a strong advocate for staffing patterns that include a high complement of registered staff. In my view, the increasing acuity of residents in LTC (not Assisted Living where there is a higher degree of autonomy and functioning) merits the presence and intervention of more professional staff in direct care delivery. I will send you some info, but not on behalf of VAC, as my opinion may not always be that of the Department....I do hope Sask Health will maintain and even increase a robust complement of professional staff within LTC facilities (not just on - call - only so much can be delegated)*."

Appendix 3.7 History of Saskatchewan Practical Nursing Education

SIAST
SASKATCHEWAN INSTITUTE OF APPLIED SCIENCE AND TECHNOLOGY

History of SIAST Practical Nursing Program[15]

- Early 1970's- adopted the core curriculum model. During the first 8 months of the Diploma Registered Nursing, Psychiatric and Nursing Assistant programs, students were integrated in the same courses and worked together in common clinical assignments. After 8 months, a Certificate granted (CNA)
- 1988- the ACT respecting SALPN was assented to in June 1988. Own legislation and ability to work independently, LPNs are accountable and responsible for their decisions and actions.
- 1992- gov't approved an expanded scope for LPNs and this led to the addition of Administration of Medication course and the program was extended by one month. (9 months) .The program was changed to the Practical Nursing Program (PNP) at that time
- Major health reform occurred early 90's- Wascana institute, Kelsey, SIAST and College of Nursing of U of S began to develop a single Nursing Education Program for Saskatchewan which became known as (NEPS- 4 year Baccalaureate Degree program)
- As development progressed, it became clear that the core curriculum would cease to exist. That happened in 1996
- Curriculum development and change happened for the PNP at this time as well. In 1997, first class of revised program 11 months
- 2000- the program increased in length to 14 months. Curriculum development and change continued based on competencies and SALPN recommendations
- 2006 increased to 65 weeks over 2 academic years. 2008 first Diploma graduates.
    - The curriculum is 1776 hours
        - Theory- 704
        - Lab- 230
        - Clinical- 842
    - The program is organized in to four semesters.
        - Semester 1- courses introduces concepts of health promotion and illness prevention with a clinical focus on the older adult
        - Semester 2- course focus is in rehabilitative and supportive care, including exploring concepts in Mental Health and palliative care. Clinical focus primarily with individuals experiencing chronic health challenges. LTC, rehab units, medical units- less acute clients

[15] This history of the SIAST practical nursing program was written by Cindy Smith, Program Head of the SIAST Practical Nursing Program. (Email correspondence February 7, 2010)

    - Semester 3- concentrated theory and clinical associated with acute care- medical and surgical nursing. As well exploration of perinatal nursing and nursing of children and adolescents
    - Semester 4- transition from student to practicing LPN, looking more indepth in to leadership roles as well community focus, and enrichment experience.
  - Program has lectures, seminars, small group, simulation lab, clinical experience which are interspersed throughout semester and practicum- a consolidated clinical experience at the end of each semester.

Curriculum Courses:

- Health and Healing- focuses on concepts of health, fundamental nursing concepts related to health, and health care in Canada.
- Health challenges- the course focuses on the concepts of holistic nursing care related to specific health challenges of the adult. Using the primary health care approach, students explore chronic health challenges specific to various body systems across the life span.
- Nursing Arts- focuses on developing and applying nursing competencies of nursing competencies (skills) through the use of simulation labs and clinical experiences. Students learn theory related to skills.
- Personal & Professional Relationships- builds from an understanding self to working as an interdisciplinary team. Application of concepts from communication sciences and psychology to the practice of nursing is the focus. Trends and issues in nursing are explored as well as scope of practice and professional roles.
- Pharmacology- students study the basic concepts of pharmacology and related nursing responsibilities in the context of client safety. Studies focus on medication classifications, preparations, as well as medication interactions in the human body. Patient safety principles at the systems level and practitioner level will be introduced.
- Administration of medications- principles concerning safe administration of medications procedures and processes are learned
- Anatomy & Physiology- structure and function of the body
- Sociology- looks at norms and values, social issues, culture, role of family etc

Students in the Practical Nursing program apply their knowledge, skills, and abilities in the care of individuals in the following areas:

Clinical/Practicums

- Semester 1- older adult experience (25 hours). This is an independent experience guided by an instructor where students learn to develop a therapeutic interpersonal relationship and begin some basic assessments.
    - Practicum (70 hours) long term care
- Semester 2 – clinical (90 hours), long term care, rehab, palliative, less acute medical units
    - Practicum (110 hours), same
    - Admin of meds begins
- Semester 3- 4 weeks med/surg, 1 week peds, 1 week mother baby
    - 150 hours med/surg

    - 30 hours each pediatric and mother baby
- Semester 4- 4 weeks med/surg
    - 150 hours med/surg
    - 37 hours community
    - 150 hours preceptor experience with leadership component

Appendix 3.8 History of Nursing Education in Saskatchewan

(This following information is abridged from a document prepared by Professor Mary MacDonald, Assistant Dean Academic Affairs, retrieved March 22, 2010 at http://www.usask.ca/nursing/college/history.php)

The Nursing Education Program of Saskatchewan (NEPS) is the only nursing program in Saskatchewan leading to licensure as a Registered Nurse and Registered Psychiatric Nurse.

The College of Nursing at the University of Saskatchewan was established as a department in the School of Medical Sciences (later the College of Medicine) in 1938.

The first curriculum was five years in length with the first two and a half years being in the academic setting for pre-professional education.

In 1950 a revised program still five years in length was implemented. During this time, one year diploma programs were developed to offer additional education for nurses who wished to work in public health or in teaching and supervision. As well, programs were set up for diploma nurses to receive a baccalaureate degree and Advanced Psychiatric Nursing was offered as an additional specialty area.

A major revision of the curriculum in 1967 resulted in a four year program of study for the baccalaureate degree.

The curriculum was revised in 1976 but remained a four year program.

In 1990 the curriculum was revised and preparations began for degree as entry for professional practice.

September 1996 saw the first cohort of students enter the four year program at the Saskatoon and Regina site.

In 2000, a four-year degree became the requirement for entry to practice.

Organization of Courses:
(The following information is from the *Nursing Education Program of Saskatchewan Information Package.* © University of Saskatchewan, Saskatchewan Institute of Applied Science and Technology, and
First Nations University of Canada, p. 12-13, received via email from Shelley Bueckert, Academic Advisor & Admissions Officer, College of Nursing, University of Saskatchewan, April 7, 2010)

"The nursing courses are organized in streams, which flow across the years of the program. The streams in the nursing courses are as follows:
1. Personal and Professional Development: This stream involves learners as participants in human interactions focusing on the development of personal and professional self to facilitate individuals, families, groups, and communities in realizing their health goals.

- •Five courses, each 3 c.u.: One course in each of term of Year One and Year Two, and one in Term 1 of Year Three.

2. Professional Nursing and Research: This stream provides opportunities for exploration and development of understanding for the professional role of nursing and research based practice.

- •Four courses, each 3 c.u.: One course Term 1 Year 1, one in Term 2 Year 3, and two courses in Term 1 Year 4.

3. Health Challenges: This stream focuses on common health challenges of individuals, families, groups, and communities across the lifespan, using the Primary Health Care Framework in the holistic approach to nursing practice.

- •Seven courses, each 3 c.u.: One course Term 2 Year 1, two in each term of Year 2, and two in each term of Year 3.

4. Health: This stream provides opportunities for exploration and development of understanding of health and primary health care as they relate to individuals, families, groups, and communities throughout the lifespan.

- •Six courses, each 3 c.u.: One course in Year 1, Term 2. In Year 2, one course in term one, and two courses in term 2. In Year 3, one course in each term one. Two courses in Year 4, Term 1.

5. Life Sciences: This stream focuses on courses in the life sciences designed to provide learners with a scientific basis which is meaningful and relevant to nursing practice.

- •Five courses, each 3 c.u.: one in each term, Year 1. Year 2, two courses term 1, one course term 2.

6. Practicums: Clinical experience is integrated in clinical courses throughout the program. In addition there are the following practicums:

- • Eight week practicum (6 c.u.) in Year Two, Term 3.
- • Two practica in Year Four, Term 2; one 6 c.u. course focused on the community; one 6 c.u. course with a clinical focus chosen by the student (e.g.. rural, community, elderly, childbearing, etc.), with an emphasis on management and research.)

In addition to the nursing courses, students entering NEPS 2005-2006 will also take the following non-nursing courses.
Year One: English, 3 c.u., Term 1; Social Science elective, 3 c.u. Term 1; Nutrition 120.3
Year Three: Statistics .3, Term 1; Social Science .3. Term 2
Year Four: Open Elective .3, Term 1; Social Science .3, Term 1"

The theory/clinical hours in NEPS in 2008/09 was: 985 and 1870.5 hours respectively, for a total of 2846.5 hours. (Source: *Theory/Clinical Hours in NEPS 2008/09,* May 19, 2009, received via email from Shelley Bueckert, Academic Advisor & Admissions Officer, College of Nursing, University of Saskatchewan, April 7, 2010)

Appendix 3.9 Continuing Care Assistant Certificate Program

SIAST Continuing Care Assistant Certificate Program
The following information was retrieved from the SIAST website March 28, 2010 at http://www.siast.sk.ca/programs_courses_descriptions/CCACERT.shtml

Length: 30 weeks; 760 hours (lecture and other)

The program (formerly known as Home Care/Special Care Aide) provides knowledge and skill development in helping people help themselves in their homes and in special care facilities.

Admission Requirements

- Grade 12
- English Language Requirement

Program Courses and Hours
Semester 1

1. ANAT 100 Body Systems; 22.0 Lecture hours
2. COMM 198 Communication in the Workplace; 30.0 Lecture hours
3. COMM 291 Interpersonal Communications; 30.0 Lecture hours
4. DEMC 183 Dementia - Behaviour ;23.0 Lecture hours; 22.0 Lab hours
5. PRAC 101 Mid Practicum; 105.0 Other hours (has prerequisites)
6. PRAC 197 Mid Practicum; 30.0 Other hours (has prerequisites)
7. SFTY 194 P.A.R.T. Assault Response; 12.0 Other hours
8. SPCR 100 Transfers, Lifts and Repositioning (TLR); 8.0 Other hours
9. SPCR 180 Safe Environment; 15.0 Other hours
10. SPCR 182 Personal Care; 75.0 Other hours
11. SPCR 192 Personal Competence; 30.0 Lecture hours

Semester 2

12. COMM 197 Communications Skills; 19.0 Lecture hours
13. DEMC 280 Dementia - Family Care; 30.0 Other hours
14. HUMD 187 Human Growth and Development; 30.0 Lecture hours
15. NUTR 198 Nutrition; 30.0 Other hours
16. PRAC 199 Final Practicum; 30.0 Other hours (has prerequisites)
17. PRAC 206 Final Practicum; 90.0 Other hours (has prerequisites)
18. SANT 181 Food Safe Level 1; 9.0 Lecture hours
19. SPCR 184 Post Acute Care; 30.0 Other hours
20. SPCR 284 Special Needs 1; 45.0 Lecture hours
21. SPCR 285 Special Needs 2; 45.0 Lecture hours

Appendix 3.10 Hartford Panel Recommendations

Other staffing standards recommended by the Hartford Panel (Harrington, Kovner et al., 2000) included:

"Direct Care Staffing Standard

The minimum number of direct care staff must be distributed as follows:

- Minimum level direct care staff (RN, LVN/LPN, or CNA):
  - Day shift 1 FTE for each 5 residents (1.60 hr per resident day)
  - Evening shift 1 FTE for each 10 residents (0.80 hr per resident day)
  - Night shift 1 FTE for each 15 residents (0.53 hr per resident day)
- Minimum licensed nurses (RN and LVN/LPN) providing direct care, treatments and medications, planning, coordination, and supervision at the unit level:
  - Day shift 1 FTE for each 15 residents (0.53 hr per resident day)
  - Evening shift 1 FTE for each 20 residents (0.40 hr per resident day)
  - Night shift 1 FTE for each 30 residents (0.27 hr per resident day)
- Minimum total number of direct nursing care staff is 4.13 hr per resident day. Total administrative and direct and indirect nursing hours is 4.55 hr per resident day. Staffing must be ADJUSTED UPWARD for residents with higher nursing care needs.

Mealtime Nursing Staff

Direct care staff standards will take into account specific needs of residents at mealtimes. At all mealtimes there will be:

- 1 nursing FTE for each 2-3 residents who are entirely dependent on assistance
- 1 nursing FTE for each 2-4 residents who are partially dependent on assistance
- Nursing staff who assist with feeding should be CNAs who are adequately trained in feeding procedures and they should be supervised by licensed nurses.

Education and Training

All licensed nurses in nursing homes must have continuing education in care of the chronically ill and disabled and/or gerontological nursing (at least 30 hr every 2 years).

NAs should have a minimum of 160 hr of training, including training in appropriate feeding techniques.

Nurse Practitioners

Each nursing home is strongly urged (but not required) to have a part-time geriatric or adult nurse practitioner and/or a geriatric clinical nurse specialist on staff (full-time for 100 beds or more)."

(Source: Table 3. Hartford Panel Proposed Minimum Staffing for Nursing Homes*, Harrington, Kovner et al., 2000, p 10)

Appendices: Chapter 4

Appendix 4.1 LTC Nurse Staffing Mix and Levels Search and Review Results

LTC NURSE STAFFING MIX AND LEVELS SEARCH

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
LTC Staffing Reviews 2000-10 CINAHL – (319): First Cut: Janice – 12 (January 29, 2010); **Second Cut:** Janice – 3 (February 8, 2010); Stirling – 3 (February 9, 2010)		
Brooten D, Youngblut JM. Nurse dose as a concept. J. Nursing Scholarship. 2006 03;38(1):94-99.		Does not review LTC/NH nurse staffing and resident outcomes – focus on hospital and home care.
Collier E, Harrington C. Staffing characteristics, turnover rates, and quality of resident care in nursing facilities. RES GERONTOL NURS 2008 07;1(3):157-170.	Reviews findings from 71 studies and provides some discussion of methodology and quality and staffing measures. Also summarizes "expert opinions" including: Hartford Panel, IOM, and CMS report recommendations.	
Crossan F, Ferguson D. Exploring nursing skill mix: a review. J NURS MANAGE 2005 07;13(4):356-362.		Does not review staffing levels – but discusses mix and that some roles that can be transferred (potentially) to "unqualified staff". No studies cited appear to be conducted in a LTC setting.
Dellefield ME. The relationship between nurse staffing in nursing homes and quality indicators: a literature review. J. Gerontol. Nurs. 2000 06;26(6):14-28.	Reviews studies examining NH nurse staffing and resident care. Discusses	

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
	limitations of studies.	
Gittler J. Governmental efforts to improve quality of care for nursing home residents and to protect them from mistreatment: a survey of federal and state laws. RES GERONTOL NURS 2008 10;1(4):264-284.		Reviews and critiques US laws addressing NH quality of care and makes recommendations for implementing these laws. Cites Maas, et al. (2008 – Part 1) and Collier & Harrington (2008) for a review of the literature on nurse staffing and resident outcomes.
Levenson SA. The basis for improving and reforming long-term care, part 1: the foundation. J AM MED DIR ASSOC 2009 09;10(7):459-465.		Full text not available for review, but second review of search terms and abstract finds no mention of nurse staffing. The abstract discusses “whether care is safe, effective, and person-centered.”.
Maas ML, Specht JP, Buckwalter KC, Gittler J, Bechen K. Nursing home staffing and training recommendations for promoting older adults' quality of care and life: part 1. deficits in the quality of care due to understaffing and undertraining. RES GERONTOL NURS 2008 04;1(2):123-133.		Reviews findings of many studies showing poor quality care related to understaffing/training. Does not analyze studies cited.
Maas ML, Specht JP, Buckwalter KC, Gittler J, Bechen K. Nursing home staffing and training recommendations for promoting older adults' quality of care and life: part 2. Increasing nurse staffing and training. RES GERONTOL NURS 2008 04;1(2):134-152.		Does not review study methodology etc;. discusses other topics related to LTC staffing (i.e. turnover, leadership, etc.) Presents research supporting need for more and better educated LTC nursing staff (RN, LPN, CNA). Makes “expert” recommendations for LTC staffing levels.
Ridley RT. The relationship between nurse education level and patient safety: an integrative review. J. Nurs. Educ. 2008 04;47(4):149-156.		Does not review studies of LTC nurse staffing mix/level and resident outcome. Focus is on review of hospital-based studies. Finds that an increased RN dose and skill mix in acute care reduces adverse pt.

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
		outcomes sensitive to nursing care.
Spilsburgy K, Meyer J. Defining the nursing contribution to patient outcome: lessons from a review of the literature examining nursing outcomes, skill mix and changing roles. J. Clin. Nurs. 2001; 10(1):3-14.		Does not review studies of LTC nurse staffing mix/level and resident outcome. Reviews the evidence to define the nursing contribution to patient outcome. Focus on hospital or primary care, not LTC.
Wells JC. The case for minimum nurse staffing standards in nursing homes: a review of the literature. ALZHEIMERS CARE Q 2004;5(1):39-51.	**Limited applicability**: Does not analyze studies cited. Cites Spector & Takada (1991); Cherry (1991); Cohen & Spector (1996); Bliesmer et al. (1998); Harrington, Zimmerman, Karon, et al. (2000) ; Kayser-Jones & Schell (1997); Kayser-Jones et al. (1989, 1997, 1999); the HCFA/CMS Phase II report	
Van den Heede, K, Clarke SP, Sermeus W, Vleugels A, Aiken LH. International experts' perspectives on the state of the nurse staffing and patient outcomes literature. J. Nursing Scholarship. 2007 12;39(4):290-297.		Focus is on acute care nurse staffing and patient outcomes – no discussion of LTC.
LTC Staffing Reviews 2000-10 EMBASE – (354): First Cut: Janice – 6 (January 29, 2010); **Second Cut:** Janice – 1 (February 8, 2010); Stirling – 1 (February 8, 2010)		

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Bonner AF, Castle NG, Perera S, Handler SM. Patient safety culture: A review of the nursing home literature and recommendations for practice. Annals of Long-Term Care 2008 Mar;16(3):18-22.		Not applicable – reviews studies focusing on patient safety culture – no examination of nurse staffing mix or level.
Castle NG. Nursing home caregiver staffing levels and quality of care: A literature review. Journal of Applied Gerontology 2008 August; 27(4):375-405.	Reviews findings from 70 studies and analyzes limitations of studies include: sample sizes, methodology, quality and staffing measures.	
Comondore VR, Devereaux PJ, Zhou Q, Stone SB, Busse JW, Ravindran NC, et al. Quality of care in for-profit and not-for-profit nursing homes: Systematic review and meta-analysis. BMJ 2009 15 Aug;339(7717):381-384.		Focus of review is on quality of care related to ownership (FP vs. NFP), and although level of nurse staffing is measured in association with ownership, it is not directly studied in relation to care quality.
Gruneir,A.; Mor,V. Nursing home safety: Current issues and barriers to improvement. Annual Review of Public Health. 29(pp 369-382), 2008.		Full text not available for review, but second review of search terms finds no mention of nurse staffing. The abstract does not mention research on staff mix/levels.
Harrington C, Kovner C, Mezey M, Kayser-Jones J, Burger S, Mohler M, et al. Experts recommend minimum nurse staffing standards for nursing facilities in the United States. Gerontologist 2000;40(1):5-16.		**This article was summarized as "expert opinions"** Cites many studies on nurse staffing and outcomes – but does not review methodology in detail – use this paper as a cross-reference for studies to include?
Mueller C, Arling G, Kane R, Bershadsky J, Holland D, Joy A. Nursing home staffing standards: Their relationship to nurse staffing levels.		Not applicable – studies relationship between US staffing standards and staffing levels.

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Gerontologist 2006 Feb;46(1): 74-80.		
LTC Staffing Reviews 2000-10 MEDLINE - (153): First Cut: Janice – 6 (January 29, 2010); **Second Cut:** Janice – 2 (February, 8, 2010); Stirling – 2 (February 9, 2010)		
Bostick JE, Rantz MJ, Flesner MK, Riggs CJ. Systematic review of studies of staffing and quality in nursing homes. Journal of the American Medical Directors Association 2006 Jul;7(6): 366-376.	Reviews findings from 87 research articles and government documents and analyzes risk adjustment controls, quality measures and staffing measures	
Brown E. Why mandatory staffing levels are needed in aged-care. Nursing New Zealand (Wellington) 2002 Dec;8(11):31.		Not applicable – editorial comment on need for mandatory staffing levels
Currie LM. Fall and injury prevention. Annu.Rev.Nurs.Res. 2006;24:39-74.		Does not review the research per se – but cites studies finding “evidence of an association between low staffing ratios and an increase in the incidence of falls” Studies in hospital or other setting (not LTC).
Kovner C. The impact of staffing and the organization of work on patient outcomes and health care workers in health care organizations. Joint Commission Journal on Quality Improvement. 2001 Sep;27(9): 458-468.		Not a systematic review of the literature - focus is primarily on hospital setting, with little mention of nursing homes – discusses the Hartford Panel expert recommendations (Harrington et al., 2000).
Masterson A. Towards an ideal skill mix in nursing homes. Nursing Older People 2004 Jun;16(4): 14-16.		Provides an overview of the factors to consider when determining skill mix. Cites the HCFA/CMS Phase II report.
Scott-Cawiezell J, Vogelsmeier A. Nursing home safety: a review of the literature.	Reviews several studies examining staffing and	

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Annu.Rev.Nurs.Res. 2006 06;24:179-215.	resident outcomes.	
Shanley C. Falls and injury reduction in residential aged care: translating research into practice. Contemporary Nurse 2003 Aug;15(1-2):81-93.		Focus is on falls reduction programs and only reference to nurse staffing is "Taylor (2002) reports that nursing homes that were not able to consistently implement a falls prevention program were characterized by...chronic low staffing levels of nurses and nursing assistants." (p. 87)
Other LTC Staffing Reviews – Grey Literature (3): First Cut: Janice – 2 (January 29, 2010); **Second Cut:** Janice – 2 (February, 8, 2010); Stirling – 2 (February 9, 2010)		
Sharkey, S. "People Caring for People: Impacting the Quality of Life and Care of Residents of Long Term Care Homes. A report of the Independent Review of Staffing and Care Standards for Long-Term Care Homes in Ontario" Ontario Ministry of Health and Long-Term Care. 2008 May.	Reviews findings from 87 research articles and government documents and analyzes risk adjustment controls, quality measures and staffing measures	
Murphy, J. "Residential care quality: A review of the literature on nurse and personal care staffing and quality of care." BC: Nursing Directorate British Columbia Ministry of Health. 2006.	Reviews 32 empirical research studies and 2 "grey literature" documents. Review includes analysis of research design, data sources, risk adjustment, quality measures and staffing measures.	
California Department of Health Care Services (DHCS). "Literature Review: Development of	Reviews findings from 87 studies of staffing	

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
staffing quality measures – Phase 1." Author: February 17, 2004. Retrieved at http://www.dhcs.ca.gov/services/medi-cal/Documents/SNF%20Quality%20Workgroup/Phase%20I%20Literature%20Review.pdf	measures linked to quality outcomes	
Q4 Outcomes 2006-10 Medline – (1,715): First Cut: Janice – 11 (February 17-19, 2010); **Second Cut:** Janice – 5 (March 18, 2010); Stirling – 5 (March 18, 2010); Lisa – 5 (March 18, 2010)		
Decker, F. H. (2008). The relationship of nursing staff to the hospitalization of nursing home residents. *Research in Nursing & Health, 31*(3), 238-251. *(Cited by Collier & Harrington, 2008)*		No, quality measure is discharges, including hospitalizations, with no discussion of nurse-sensitive reasons for hospitalization
Degenholtz, H. B., Kane, R. A., Kane, R. L., Bershadsky, B., & Kling, K. C. (2006). Predicting nursing facility residents' quality of life using external indicators. *Health Services Research, 41*(2), 335-356. *(Cited by Castle, 2008)*		No - did not find an association between QOL and nurse staff levels and do not report results of nursing analysis
Dyck, M. J. (2007). Nursing staffing and resident outcomes in nursing homes: Weight loss and dehydration. *Journal of Nursing Care Quality, 22*(1), 59-65.	Yes (see Table 4.3 for details)	
Hutt, E., Radcliff, T. A., Liebrecht, D., Fish, R., McNulty, M., & Kramer, A. M. (2008). Associations among nurse and certified nursing assistant hours per resident per day and adherence to guidelines for treating nursing home-acquired pneumonia.		No - resident quality measure was adherence to guidelines for pneumonia care; and the sample was 16 NHs that are all members of one corporation - and 16% of the sample were residents in sub-acute care

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Journals of Gerontology Series A-Biological Sciences & Medical Sciences, 63(10), 1105-1111.		
Kim, H., Harrington, C., & Greene, W. H. (2009). Registered nurse staffing mix and quality of care in nursing homes: A longitudinal analysis. *Gerontologist, 49*(1), 81-90.	Yes (see Table 4.3 for details)	
Kim, H., Kovner, C., Harrington, C., Greene, W., & Mezey, M. (2009). A panel data analysis of the relationships of nursing home staffing levels and standards to regulatory deficiencies. *Journals of Gerontology Series B-Psychological Sciences & Social Sciences, 64*(2), 269-278.	Yes (see Table 4.3 for details)	
Konetzka, R. T., Stearns, S. C., & Park, J. (2008). The staffing-outcomes relationship in nursing homes. *Health Services Research, 43*(3), 1025-1042. *(Cited by Collier & Harrington, 2008)*	Yes (see Table 4.3 for details)	
Park, J., & Stearns, S. C. (2009). Effects of state minimum staffing standards on nursing home staffing and quality of care. *Health Services Research, 44*(1), 56-78.		No - study examines the effect of state standards on staffing and on QoC.
Stearns, S. C., Park, J., Zimmerman, S., Gruber-Baldini, A. L., Konrad, T. R., & Sloane, P. D. (2007). Determinants and effects of nurse staffing intensity and skill mix in residential care/assisted living settings. *Gerontologist, 47*(5), 662-671.		No - the study sample population is residential care/assisted living facilities - not NHs
Wan, T. T., Zhang, N. J., & Unruh, L. (2006).		No- only measures total nurse staff hprd, not hprd by

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Predictors of resident outcome improvement in nursing homes. *Western Journal of Nursing Research, 28*(8), 974-993. (*Cited by Castle 2008, and Collier & Harrington, 2008)*		staff category (i.e. RN, LPN, CA)
Zhang, N. J., Unruh, L., Liu, R., & Wan, T. T. (2006). Minimum nurse staffing ratios for nursing homes. *Nursing Economics, 24*(2), 78-85. (*Cited by Castle 2008, and Collier & Harrington, 2008)*	Yes (see Table 4.3 for details)	
Q4 Outcomes 2006-10 CINAHL – (1,203): First Cut: Stirling – 6 (February 24, 2010); **Second Cut:** Janice – 2 (March 18, 2010); Stirling – 2 (March 18, 2010); Lisa – 2(March 18, 2010)		
Arling, G., Kane, R.L., Mueller, C., Bershadsky, J., Degenholtz, H.B. Nursing effort and quality of care for nursing home residents. *Gerontologist*, 2007, 47(5): 672-682 *(Cited by Castle , 2008)*	Yes (see Table 4.3 for details)	
Brazil, K., Krueger, P., Bedard, M., Kelley, M.L., McAiney, C., Justice, C., Taniguchi, A. Quality of care for residents dying in Ontario long-term care facilities: findings from a survey of directors of care. *J. Palliative Care*, 2006, 22(1):18-25		No - no risk adjustment and measure of staffing was ratio of beds to RN and to CNA
Castle, N.G., Engberg, J. The influence of staffing characteristics on quality of care in nursing homes. *Health Serv. Res*., 2007, 42(5): 1822-1847 *(Cited by Castle , 2008)*	Yes (see Table 4.3 for details)	
Castle, N.G., Engberg, J., Men, A. Nursing home		No - measure of staffing is turnover, not levels

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
staff turnover: impact on nursing home compare quality measures. *Gerontologist*, 2007, 47(5): 650-661		
Keays, S., Wister, A.V., Gutman, G.M. Administrators and quality of care in long-term care facilities. *J Housing Elderly*, 2009, 23(3): 243-260		No - staffing measure is of administrators, not nursing staff
Pepper, G.A., Towsley, G.L. Medication errors in nursing homes: incidence and reduction strategies. *Journal of Pharmaceutical Finance, Economics & Policy*, 2007, 16(1): 5-133		Review, not original research
Q4 Outcomes 2006-10 EMBASE – (538): First Cut: Janice – 3 (March 5, 2010); Stirling – 6 (February 24, 2010); **Second Cut:** Janice – 0 (March 18, 2010); Stirling – 0 (March 18, 2010)		
Goodson, J., Jang, W., & Rantz, M. (2008). Nursing home care quality: Insights from a Bayesian network approach. *Gerontologist, 48*(3), 338-348.		No. While the model includes RN, CNA and total nurse staffing it does not report actual levels and does not include LPNs.
Menec, V. H., Nowicki, S., Blandford, A., & Veselyuk, D. (2009). Hospitalizations at the end of life among long-term care residents. *Journals of Gerontology - Series A Biological Sciences and Medical Sciences, 64*(3), 395-402.		Review of full text found examination of nurse staffing levels or mix
Temkin-Greener, H., Zheng, N., Norton, S. A., Quill, T., Ladwig, S., & Veazie, P. (2009). Measuring end-of-life care processes in nursing homes. *Gerontologist, 49*(6), 803-815.		No. Only examines RN, CNA and total nurse staffing; and the findings that facilities with better RN and CNA staffing ratios scored higher on selected care process, is based on the staff measure: DONs' perceptions of sufficiency of staff-to-resident ratios
Studies selected from the LTC Reviews *(Note: most of the studies were cited in at least two of the different reviews)***: Reviews**		

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
published in peer-reviewed journals: Bostick et al., 2006; Castle, 2008; Collier & Harrington 2008; Dellefield, 2000; Scott-Cawiezell & Vogelsmeier, 2006; Wells, 2004; **Grey Literature Reviews**: California DHCS (2004), Murphy (2006), Sharkey (2008) **First Cut:** Janice – 114 (February 28, 2010); Stirling – 114 (February 28, 2010); Charlene – 20 (January 25, 2010 – reviewed Castle 2008; and Collier & Harrington 2008) **Second Cut:** Janice – 19 (March 18, 2010); Stirling – 19 (March 18, 2010); Lisa – 19 (March 18 and 25, 2010)		
Arling, G., Kane, R.L., Mueller, C., Bershadsky, J., Degenholtz, H.B. Nursing effort and quality of care for nursing home residents. *Gerontologist*, 2007, 47(5): 672-682	Yes (see Table 4.3 for details)	
Bostick, J. E. Relationship of nursing personnel and nursing home care quality. Journal of Nursing Care Quality, 2004; 19: 130-136.	Yes (see Table 4.3 for details)	
Carter, M.W., & Porell, F.W. (2005). Vulnerable populations at risk of potentially avoidable hospitalizations: The case of nursing home residents with Alzheimer's disease. American Journal of Alzheimer's Disease and Other Dementias, 20, 349-358.	Yes (see Table 4.3 for details)	
Castle, N. G. Nursing homes with persistent deficiency citations for physical restraint use. Medical Care, 2002; 40(10): 868-878.	Yes (see Table 4.3 for details)	
Castle, N. G. & Myers, S. Mental health care deficiency citations in nursing homes and caregiver staffing. Administration and Policy in Mental Health, 2006; 3(2): 215-225.	Yes (see Table 4.3 for details)	
Castle, N. G. Differences in nursing homes with	Yes (see Table 4.3 for	

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
increasing and decreasing use of physical restraints. Medical Care, 2000; 38(12): 1154-1163.	details)	
Castle, N. G., & Engberg, J. Further Examination of the Influence of Caregiver Staffing Levels on Nursing Home Quality. The Gerontologist, 2008; 48(4): 464-476.	Yes (see Table 4.3 for details)	
Castle, N. G., and Fogel, B. Characteristics of nursing homes that are restraint free. The Gerontologist, 1998; 38(2): 181-188.	Yes (see Table 4.3 for details)	
Castle, N.G., & Engberg, J. (2007). The influence of staffing characteristics on quality of care in nursing homes. Health Services Research, 42(5), 1822-1847.	Yes (see Table 4.3 for details)	
Grabowski, D., & Castle, N. G. Nursing Homes with persistent high and low quality. Medical Care Research and Review, 2004; 61(1): 89-115.	Yes (see Table 4.3 for details)	
Harrington, C., Zimmerman, D., Karon, S.L., Robinson, J., & Beutel, P. (2000). Nursing home staffing and its relationship to deficiencies. Journals of Gerontology. Series B, Psychological Sciences and Social Sciences, 55, S278-S287.	Yes (see Table 4.3 for details)	
Horn, S., Buerhaus, P., Bergstrom, N., & Smout, R. RN staffing time and outcomes of long-stay nursing home residents: Pressure ulcers and other adverse outcomes are less likely as RNs spend more time on direct patient care. American Journal of Nursing, 2005; 105(11):58-70.	Yes (see Table 4.3 for details)	

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Intrator, O., Zinn, J., & Mor, V. Nursing home characteristics and potentially preventable hospitalizations of long-stay residents. Journal of the American Geriatrics Society, 2004; 52: 1730-1736.	Yes (see Table 4.3 for details)	
Johnson, J., Cowles, C., & Simmens, S. "Quality of care and nursing staff in nursing homes". In G. Wunderlich, F. Sloan, and C. Davis (Eds.), Nursing staff in hospitals and nursing homes: Is it adequate? 1996: (pp. 426-452). Washington, DC: National Academy Press.	Yes (see Table 4.3 for details)	
Konetzka, R.T., Stearns, S.C., & Park, J. (2008). The staffing-outcomes relationship in nursing homes. Health Services Research, 43, 1025-1042.	Yes (see Table 4.3 for details)	
Kramer, A.M., & Fish, R. (2001, December). The relationship between nurse staffing levels and the quality of nursing home care. In U.S. Centers for Medicare & Medicaid Services, *Appropriateness of minimum nurse staffing ratios in nursing homes. Report to Congress, Phase II* Final. Baltimore, MD: Centers for Medicare and Medicaid Services (CMS), 2001, (Chapter 2, pp. 1-26).	Yes (see Table 4.3 for details)	
Loeb, M.B., Craven, S., McGeer, A.J., Simor, A.E., Bradley, S.F., Low, D.E., Armstrong-Evans, M., Moss, L.A., and Walter, S.D. (2003). Risk factors for resistance to antimicrobial agents among nursing home residents. American Journal of	Yes (see Table 4.3 for details)	

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Epidemiology, 157(1), 40-47.		
Zhang, N., Unruh, L., Liu, R., & Wan, T. Minimum nurse staffing ratios for nursing homes. Nursing Economics, 2006; 24(2): 78-85, 93.	Yes (see Table 4.3 for details)	
Zhang, X., & Grabowski, D. C. (2004). Nursing home staffing and quality under the nursing home reform act. The Gerontologist, 44(1), 13-23.	Yes (see Table 4.3 for details)	
Aaronson, W., Zinn, J., & Rosko, M. (1994). Do for-profit and not-for-profit homes behave differently? *The Gerontologist, 34:* 775-786.		No Data: from 1987 (too old) Sample: limited to one state (449 Pennsylvania NHs) Staffing measure: ratio of RN to total care staffing and is measured per bed, not per resident QI: prevalence, not incidence, measure of PUs and restraint use
Akinci, F., & Krolikowski, D. Nurse staffing levels and quality of care in Northeastern Pennsylvania nursing homes. Applied Nursing Research, 2005; 18: 130-137.		No Methodology: no resident-level risk adjustments used Sample: small size and limited to one state (90 Pennsylvania NHs); mean RN levels comparatively high (0.88 RN hprd) - not representative of most NHs; includes hospital-based NHs (9% of sample and with much higher RN levels at 2.10 RN hprd); Staffing measure: use OSCAR data with no mention of any application of logical decision rules to increase the data reliability and validity
Anderson, R. A., Hsieh, P.-C. and Su, H.-F. Resource allocation and resident outcomes in nursing homes: Comparisons between the best		No Methodology: weak - assumption of a linear model (pattern scores)

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and worst. Research in Nursing & Health 1998; 21(4): 297-313		Data: from 1990 (borderline of being too old to be relevant to today's context); Sample: staffing levels of RNs comparatively low (.08 and .11 hprd) – not representative of average NH (sample limited to one state - Texas);. QI: the 11 outcome indicators are grouped together and analysis of the affect of staffing on individual indicators is not provided. The problem of this reporting method is evident when the authors explain that exceptions to the effect of highest levels of RN staffing on improved resident outcomes were verbal aggression, vest and wrist restraints, contractures and dehydration (p. 308), leading to further questions about the relationship of staffing to other indicators.
Anderson, R. A., Issel, M. L. & McDaniel, R. R. Jr. Nursing staff turnover in nursing homes: A new look. Public Administration Quarterly. 1997; 11: 69-95.		No QI: dependent variable is turnover, not quality of resident care
Anderson, R. A., Issel, M. L. & McDaniel, R. R., Jr. Nursing Homes as Complex Adaptive Systems: Relationship Between Management Practice and Resident Outcomes. Nursing Research. 2003; 52:12-21.		No Staffing measure: does not examine staff level/mix impact on resident outcomes – instead tests relationship between management practices and resident outcomes
Barry, T., Brannon, D., & Mor, V. Nurse aide empowerment strategies and staff stability: Effects on nursing home resident outcomes. The Gerontologist, 2005; 45(3): 309-317.		No Staffing measure: examines effect of staffing stability, not levels/mix

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Bates-Jensen, B.M., Alessi, C.A., Cadogan, M.P., Levy-Storms, L., Jorge, J., Yoshii, J., et al. (2004). The minimum data set bedfast quality indicator: Differences among nursing homes. Nursing Research, 53, 260-272.		No Staffing measure: nurse staffing is not a variable
Bates-Jensen, B.M., Schnelle, J.F., Alessi, C.A., Al-Samarrai, N.R., & Levy-Storms, L. (2004). The effects of staffing on in-bed times among nursing home residents. Journal of the American Geriatrics Society, 52, 931-938.		No Staffing measure: measure of nurse staffing is only of total staffing (licensed and unlicensed); not by RN, LPN, NA. Sample: small and limited to one state (34 California NHs)
Berlowitz, D. R., Anderson, J. J., Brandeis, G. H., Lehner, L. A., Brand, H. K., Ash, A. S., et al. Pressure ulcer development in the VA: Characteristics of nursing homes providing best care. American Journal of Medical Quality, 1999: 14(1): 39-44.		No Sample: not representative of average NH or CDN LTC - limited to VA nursing homes and hospitals (128 NHs, including 47 teaching NHs/hospitals), with higher than normal staffing levels (25.5 RNs/100 residents)
Bliesmer, M., Smayling, M., Kane, R., & Shannon, I. The relationship between nursing staffing levels and nursing home outcomes. Journal of Aging and Health, 1998; 10(3): 351-371.		No Data: 1977 to 1990 (too old - not relevant to current context) Sample: NHs had high discharge rates (40% in yr 1) thus population does not appear to be representative of CDN LTC; sample also limited to one state (440 Minnesota NHs) Staffing measure: does not examine the individual impact of RNs and LPNs (licensed=RN+LPN)
Bowers B.J., Esmond S. & Jacobson N. (2000):		No

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The Relationship between Staffing and Quality in Long-Term Care Facilities: Exploring the Views of Nurse Aides. Journal of Nursing Care Quality 14, 55-64.		Staffing measure: does not include RNs or LPNs, only NAs Sample: small (interviews/observations of 38 care aides from 6 midwest US NHs)
Bowers, B. & Becer, M. (1992). Nurse's aides in nursing homes: The relationship between organization and quality. The Gerontologist. 32 360-366.		No Data: date of data collection not provided, but publication date of 1992 suggests that the data is likely too old to be relevant to today's context; Staffing measure: does not include RNs or LPNs, only NAs Sample: small (3 NHs)
Brannon, D., J. S. Zinn, Mor V., & Davis, J. (2002). "An exploration of job, organizational, and environmental factors associated with high and low nursing assistant turnover." The Gerontologist 42(2): 159-68.		No Quality indicator: dependent variable not resident outcome but NA turnover
Braun, B.I. (1991). The effect of nursing home quality on patient outcome. *Journal of the American Geriatrics Society, 39* 329-338.		No QI: mortality and discharge are used as measures; suggests NH resident population that is sub-acute or post-surgery, and not representative of CDN LTC. Sample: small sample; not representative of average CDN LTC – 390 veterans discharged to 11 nursing homes were followed for 6 months
Brazil, K., Krueger, P., Bedard, M., Kelley, M.L., McAiney, C., Justice, C., Taniguchi, A. Quality of care for residents dying in Ontario long-term care facilities: findings from a survey of directors of		No Methodology: no risk adjustment Staffing measure: measure of staffing is ratio of RN and CNA to beds, not residents

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
care. J. Palliat. Care, 2006, 22(1):18-25 (CINAHL)		
Carter M.W. & Porell F.W. (2003): Variations in Hospitalization Rates Among Nursing Home Residents: The Role of Facility and Market Attributes. Gerontologist 43, 175-191.		No Staffing measure: uses proportion RN/LPN expenses as staffing measure
Castle, N. G., & Engberg, J. (2006). Organizational characteristics associated with staff turnover in nursing homes. The Gerontologist, 46(1), 62-73.		No QI: dependent variable is turnover, not resident outcome
Castle, N. G., & Engberg, J. Staff turnover and quality of care in nursing homes. Medical Care, 2005; 43(6): 616-626.		No QI: independent variable is staff turnover, not levels/mix
Castle, N.G., Engberg, J., Men, A. Nursing home staff turnover: impact on nursing home compare quality measures. Gerontologist, 2007, 47(5): 650-661 (CINAHL)		No QI: independent variable is staff turnover, not levels/mix
Cherry, R.L. (1991). Agents of nursing home quality of care: Ombudsmen and staff ratios revisited. The Gerontologist, 31, 302-308.		No Data: from 1984 (too old to be relevant to today's context) Sample: representativeness of sample to CDN LTC questionable - includes ICF (intermediate care) and mixed ICF/SNF (skilled nursing facilities); RN and LPN levels comparatively low (.13 and .38 hprd respectively); small limited size (134 Missouri NHs)
Cohen, J. W., & Spector, W. D. The effect of Medicaid reimbursement on quality of care in nursing homes. Journal of Health Economics, 1996; 15(1): 23-48.		No Data: from 1987 (too old to be relevant to today's context) Sample: representativeness of sample to CDN LTC

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
		questionable - includes facilities with 0 RNs and 0 LPNs to a maximum of 56 RNs and 87 LPNs per 100 residents
Decker, F. H. Nursing staff and the outcomes of nursing home stays. Medical Care, 2006; 44: 812-821.		No Quality indicator is discharges, including hospitalizations, with no discussion of ACS reasons for hospitalization Staffing measure: uses ratio of staff per bed, not resident
Degenholtz, H. B., Kane, R. A., Kane, R. L., Bershadsky, B., & Kling, K. C. Predicting nursing facility residents' quality of life using external indicators. Health Services Research, 2006; 41(2): 335-356.		No QI: the research objective was to "determine how well a set of variables theoretically related to QOL that are already collected and archived by CMS as part of the existing NF data infrastructure (i.e., MDS and OSCAR) are correlated with a measure of resident self-reported QOL (Kane et al. 2003)" (p. 337). Although the researchers tested to see whether a higher ratio of staff to residents results in more personal attention and opportunity for personalized care, thus increasing the likelihood of a resident experiencing a good QOL - they do not report results of nurse staffing analysis
Dellefield, M. E. Organizational correlates of the risk-adjusted pressure ulcer prevalence and subsequent survey deficiency citation in California nursing homes. Research in Nursing & Health, 2006; 29(4): 345-358.		No Methodology: weak (used linear regression for the residual of the prevalence of the PU outcome, which is not bounded by 0 and 1) Sample: includes NF (5%) which are not representative of CDN LTC; limited to one state

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		(California) Staffing measure: LPN and RN staffing levels added together to form one staffing level variable; for measure of mix calculated #RN/#LPN and #LPN/#CNA(hprd)
Dellefield, M.E. Predictors of quality of care in California nursing homes. *Dissertation Abstracts International,* 9943785. 1999.		No The findings in this dissertation are reported in the 2006 peer-reviewed publication (reviewed)
Donoghue, C., & Castle, N. G. (2006). Voluntary and involuntary nursing home staff turnover. Research on Aging, 28(4), 454-472.		No QI: dependent variable is turnover
Dorr, D.A., Horn, S.D. & Smout, R.J. (2005). Cost Analysis of Nursing Home Registered Nurse Staffing Times. Journal of American Geriatrics Society 53, 656-661.		No Staffing measure: only examines RN staffing QI: dependent variable is cost savings
Duffy, J. Quality care measurement: Not always what it seems. *Proceedings of South-western Academy of Management,*1988; 30: 260-264.		No Data: too old (1988) to be relevant to today's context.
Dyck M.J. (2004) Nursing Staffing and Resident Outcomes in Nursing Homes. In Nursing. University of Iowa, Iowa,		No The findings of this dissertation are reported in the 2007 peer-reviewed publication (reviewed)
Engst C., Chhokar R., Robinson D., Earthy A., Tate R. & Yassi A. (2004): Implementation of a scheduled toileting program in a long term care facility: Evaluating the impact on injury risk to care giving staff. Association of Occupational Health Nurses Journal 52, 427-435.		No Methodology: no risk adjustment Sample: too small - one BC LTC facility

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Feuerberg, M., White, A., Nursing staff turnover and retention in nursing homes. In: Appropriateness of Minimum Nurse Staffing Ratios in Nursing Homes, Report to Congress: Phase II Final, Chapter 4, Baltimore, MD: Centers for Medicare and Medicaid Services (CMS), 2001, pp. 4.1-4.77		No QI: resident outcomes are not the dependent variable
Goodson, J., Jang, W., & Rantz, M. (2008). Nursing home care quality: Insights from a Bayesian network approach. Gerontologist, 48(3), 338-348. (EMBASE)		No Staffing measure: discusses RN, CNA and total nurse staffing but does not report actual levels
Graber, D. & Sloane, P. (1995). Nursing home survey deficiencies for physical restraint use. *Medical Care, 33* (10): 1051-1063		No Data: reliability and validity of OSCAR data used for staffing measures limited as cleaning recommendations not applied Sample: not representative of CDN LTC as the same includes both SNF and ICF; sample from one state (195 North Carolina NHs)
Harrington, C., & Swan, J. H. Nursing home staffing, turnover, and case mix. Medical Care Research and Review, 2003; 60(3): 366-392.		No QI: the dependent variable is nurse staffing levels, not resident outcomes
Harrington, C., Woolhandler, S., Mullan J., et al. Does investor-ownership of nursing homes compromise the quality of care? Am J Public Health 2001; 91(9):1452-1455		No Staffing measure: staffing levels are used as a proxy measure of quality; and all that is reported is that nurse staffing was lower at investor-owned nursing homes for each RNs, LPNs and NAs.
Hendrix, T. J., & Foreman, S. E. (2001). Optimal		No

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long-term care nurse-staffing levels. Nursing Economics, 19(4), 164-175.		QI and staffing measure: uses costs of RN care and costs of PU as measures
Hickey, E. C., Young, G. J., Parker, V. A., Czarnowski, E. J., Saliba, D., & Berlowitz, D. R. (2005). The effects of changes in nursing home staffing on pressure ulcer rates. Journal of the American Medical Directors Association, 6, 50-53.		No Sample: too small and not representative of CDN LTC - the sample includes 35 VA NHs and the mean RN staffing was 0.72 hprd (range 0.52 to 1.98) which is considerably higher than the national average 0.5 hprd (30 minutes) (reported in Bostick, 2004)
Hicks, L., Rantz, M., Petroski, G., & Mukamel, D. Nursing home costs and quality of care outcomes. *Nurs Econ.* 2004; 22(4):178-192.		No QI measure: independent variable is cost of care including cost of nursing staff wages
Hughes C.M., Lapane K.L. & Mor V. (2000): Influence of Facility Characteristics on Use of Antipsychotic Medications in Nursing Homes. Medical Care 38(12), 1164-1173.		No QI: prevalence of antipsychotic drug use – questionable measure of resident care quality Staffing measure: measures number of RN FTEs + LPN FTEs as one group, i.e., nurses; measures staff FTE per 100 beds, not residents
Hutt E., Lin M. & Kramer A. (2000) Effects of nurse staffing on selected quality measures for long term residents derived from MDS. In Appropriateness of Minimum Nurse Staffing Ratios in Nursing Homes: Report to Congress, Phase I (Health Care Financing Administration, ed.). Health Care Financing Administration, Washington, DC, pp. 10.1-10.19.		No Analysis: generalizability limited by state specific analysis; difficult to interpret the results from the thresholds used.
Hutt, E., Fredrickson, E., Ecord, M., & Kramer, A. M. Associations among processes and outcomes		No Sample: not representative of CDN LTC - population

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
of care for Medicare nursing home residents with acute heart failure. Journal of the American Medical Directors Association, 2003; 4: 195-199.		is Medicare (not Medicaid) NH residents
Hutt, E., Radcliff, T. A., Liebrecht, D., Fish, R., McNulty, M., & Kramer, A. M. (2008). Associations among nurse and certified nursing assistant hours per resident per day and adherence to guidelines for treating nursing home-acquired pneumonia. Journals of Gerontology Series A-Biological Sciences & Medical Sciences, 63(10), 1105-1111.		No Sample: too small and not representative of CDN LTC - the sample was 16 NHs that are all members of one corporation - and 16% of the sample were residents in sub-acute care
Intrator O., Castle N.G. & Mor V. (1999): Facility Characteristics Associated With Hospitalization of Nursing Home Residents: Results of a National Study. Medical Care 37, 228-237.		No QI: Quality measure was death and hospitalization (and not for ACS reasons)
Jette, D. U., Warren, R. L., & Wirtalla, C. (2004). Rehabilitation in skilled nursing facilities. American Journal of Physical Medicine & Rehabilitation, 83(9), 704-712.		No Sample: not representative of CDN LTC - sample is skilled nursing facilities providing rehabilitation and reimbursed through Medicare Choice QIs: not applicable for comparison to CDN LTC context – use discharge and length-of-stay
Johnson C.E., Dobalian A., Burkhard J., Hedgecock D.K. & Harman J. (2004): Predicting Lawsuits against Nursing Homes in the United States, 1997-2001. Health Services Research 39, 1713-1732.		No QI: not applicable for comparison to CDN LTC context – use lawsuits
Johnson, C.E., Hedgecock, D.K., Oakley, M.L., Dobalian, A., Salmon, J.R., Hyer, K., et al. (2004).		No QI: not applicable for comparison to CDN LTC

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Predictors of lawsuit activity against nursing homes in Hillsborough County, Florida. Health Care Management Review, 29(2), 150-158.		context – use lawsuits
Johnson, Dobalian, Burkhard, Hedgecock & Harman (2004) Factors predicting lawsuits against nursing homes in Florida 1997-2001. The Gerontologist, 44: 339-347;		No QI: not applicable for comparison to CDN LTC context – use lawsuits
Johnson-Pawlson, J., & Infeld, D. Nurse staffing and quality of care in nursing facilities. Journal of Gerontological Nursing. 1996; 22(8): 36-45.		No Data: no mention of cleaning OSCAR data used for staffing measures; data from 1991/1992 (borderline of being too old to be relevant to today's context)
Kash, B., Castle, N. G., & Hawes, K. (2006). Staff turnover and staffing levels in nursing homes. The Gerontologist, 46(5), 609-619.		No QI: dependent variable is turnover not resident outcomes
Kayser-Jones J. (1997): Inadequate staffing at mealtime. *Journal of Gerontological Nursing, 23* (8): 14-21.		No Staffing measure: only provides staffing ratios for CNAs to residents; no information on RN or LPN staffing; Sample: small – 2 NHs
Kayser-Jones J. & Schell E. (1997): The effect of staffing on the quality of care at mealtime. Nursing Outlook 45, 64-72.		No Methodology: observational study of care processes required for improving nutritional care, no risk adjustment; Staffing measure: staff measure is FTE per bed not resident; Sample: small – 2 NHs
Kayser-Jones, J., Schell, E. S., Porter, C.,		No

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Barbaccia, J. C., & Shaw, H. (1999). Factors contributing to dehydration in nursing homes: Inadequate staffing and lack of professional supervision. Journal of the American Geriatrics Society, 47, 1187-1194.		Staffing measure: does not measure staffing levels or mix
Kayser-Jones, J., Schell, E., Lyons, W., Kris, A.E., Chan, J., Beard, R.L. (2003) Factors that influence end-of-life care in nursing homes: the physical environment, inadequate staffing, and lack of supervision. *Gerontologist* 43 (special issue II) : 76-84		No Staffing measure: does not measure staffing levels or mix
Kayser-Jones, J., Wiener, C.LI., Barbaccia, J.C. Factors contributing to the hospitalization of nursing home residents. *Gerontologist.* 1989; 29:502-510.		No Staffing measure: does not measure staffing levels or mix
Keays, S., Wister, A.V., Gutman, G.M. Administrators and quality of care in long-term care facilities. J Housing Elderly, 2009, 23(3): 243-260 (CINAHL)		No Staffing measure: measure is of administrators, not nursing staff
Kim, H., & Whall, A.L. (2006). Factors associated with psychotropic drug usage among nursing home residents with dementia. Nursing Research, 55(4), 252-258.		No Staffing measure: only examined RN staffing hours - no other nurse staffing QI: use of psychotropic drug as outcome measure associated with nurse staffing questionable Sample: small - 107 dementia patients residing in nine Michigan NHs
Kolanowski, A., Hurwitz, S., Taylor, L., Evans, L., &		No

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
Strumpf, N. (1994). Contextual factors associated with disturbing behaviors in institutionalized elders. *Nursing Research. 43* (2): 73-79.		Sample: too small (3 NHs); Staffing measure: ratio of licensed to unlicensed staff
Konetzka, R.T., Spector, W., & Limcangco, M.R. (2008). Reducing hospitalizations from long-term care settings. Medical Care Research and Review, 65, 40-66.		No This is a review of the research (55 peer-reviewed articles on NH residents' hospitalization)
Kramer A., Eilersten T., Lin M. & Hutt E. Effects of nurse staffing on hospital transfer quality measures for new admissions. In *Appropriateness of Minimum Nurse Staffing Ratios in Nursing Homes: Report to Congress, Phase I* (U.S. Department of Health and Human Services, ed.). Baltimore, MD: Centers for Medicare and Medicaid Services (CMS), 2000, pp. 9.1-9.22.		No Sample: not appropriate - use a Medicare (short-stay) admission sample to evaluate hospitalization rates for selected conditions within 30 days of admission to the NH
Kramer A., Eilersten T., Lin M. et al.. Synthesis of findings on effects of staffing on quality of care. In *Appropriateness of Minimum Nurse Staffing Ratios in Nursing Homes: Report to Congress, Phase I (*U.S. Department of Health and Human Services, ed.). Baltimore, MD: Centers for Medicare and Medicaid Services (CMS), 2000, pp. 12.1-12.15.		No This chapter synthesises evidence reported in ch. 9 (Kramer et al.), ch. 10 (Hutt et al.) and ch. 11 (Martau et al.)
Kutner, J. S., Kramer, A. M., Mortimore, E. F., & Feuerberg, M. A. Hospitalization of nursing home residents: A qualitative study. Annals of Long-Term Care, 1998, January; pp. 1-7.		No QI: study of hospitalization staffing-related issues Sample: too small – based on 45 interviews
Lapane, K. L., & Hughes, C. M. Which		No

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
organizational characteristics are associated with increased management of depression using antidepressants in US nursing homes? Medical Care, 2004; 42(10): 992-1000.		Staffing measure: LPN and RN are measured as one unit; staff measure is per 100 beds not per resident. QI: measure is Medication management
Linn, M., Gurel, L., & Linn, B. (1977). Patient outcome as a measure of quality of nursing home care. *American Journal of Public Health, 67*(4),:337-344.		No Sample: the sample is not representative of the general SK LTC population. Only male VA (veterans) patients (n=1000), average age 68, were studied.
Martau, J., Lin, M., Kramer, A., Effects of nurse staffing on nursing home quality measures, In *Appropriateness of Minimum Nurse Staffing Ratios in Nursing Homes: Report to Congress, Phase I* (U.S. Department of Health and Human Services, ed.). Baltimore, MD: Centers for Medicare and Medicaid Services (CMS), 2000, Chapter 11, pp. 11-1 to 11-13		No Data: staffing data source (OSCAR) was not cleaned as recommended; Sample: small (54 NHs in 17 US states)
Menec, V. H., Nowicki, S., Blandford, A., & Veselyuk, D. (2009). Hospitalizations at the end of life among long-term care residents. Journals of Gerontology - Series A Biological Sciences and Medical Sciences, 64(3), 395-402. (EMBASE)		No Staffing measure: does not measure nurse staffing levels or mix
Miller, S.C., Papandonatos, G., Fennell, M., & Mor, V. (2006). Facility and county effects on racial differences in nursing home quality indicators. Social Science & Medicine, 63(12), 3046-3059.		No Risk adjustment: no resident risk adjustment; Staffing measure: only examines licensed nurses (RN+LPN) as one category , not individually
Mitchell, S. L., Kiely, D. K., & Gillick, M. R. Nursing home characteristics associated with tube feeding		No Staffing measure: only examines licensed nurses

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
in advanced cognitive impairment. Journal of the American Geriatrics Society, 2003; 51: 75-79.		(RN+LPN) as one category - combines RN and LPN into one category "licensed"
Moseley, C. B., & Jones, L. Registered nurse staffing and OBRA deficiencies in Nevada nursing facilities. Journal of Gerontological Nursing, 2003; 29(3): 44-50.		No Methodology: weak (apply linear model - too simplistic) Sample: small and limited to one state (28 Nevada NHs)
Munroe, D.J. (1990). The influence of registered nurse staffing on the quality of nursing home care. Research in Nursing & Health, 13, 263-270.		No Data: 1987 (too old)
Park, J., & Stearns, S. C. (2009). Effects of state minimum staffing standards on nursing home staffing and quality of care. Health Services Research, 44(1), 56-78. (MEDLINE)		No Sample: questionable as staffing reported includes facilities with 0 RN or LPN hprd to facilities with over 10 RN hprd; QI: examines the effect of state standards on staffing and on QoC.
Pepper, G.A., Towsley, G.L. Medication errors in nursing homes: incidence and reduction strategies. Journal of Pharmaceutical Finance, Economics & Policy, 2007, 16(1): 5-133 (CINAHL)		No Not original research: this is a review synthesizing the evidence regarding incidence, types, severity, costs, and correlates of medication errors and adverse drug events (ADE) in long term care
Phillips, C. D., Hawes, C., Mor, V., Fries, B. E., Morris, J. N., & Nennstiel, M. N. Facility and area variation affecting the use of physical restraints in nursing homes. Medical Care, 1996; 34(11): 1149-1162.		No Staffing measure: only measures total nursing staff per bed
Porell, F., Caro, F. G., Silva, A., & Monane, M.		No

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
(1998). A longitudinal analysis of nursing home outcomes. Health Services Research, 33(4), 835-865.		Staffing measure: RN and LPN staffing are calculated from expenses
Ramsay, J. D., Sainfort, F., & Zimmerman, D. (1995). An empirical test of the structure, process, and outcome quality paradigm using resident-based, nursing facility assessment data. American Journal of Medical Quality, 10(2), 63-75.		No Staffing measure: measures licensed nurse staffing as RN+LPN – not individually
Rantz, M.J., Hicks, L., Grando, V., Petroski, G.F., Mehr, D.R., Conn, V., Scott, J., Perter, R., & Maas, M. (2004). Nursing Home quality, cost, staffing and staff mix. The Gerontologist, 44(1), 24-38.		No Staffing measure: staffing measure was calculated from costs
Rohrer, J. E., Momany, E. T., & Chang, W. (1993). Organizational predictors of outcomes of long-stay nursing home residents. Social Science & Medicine, 37(4), 549-554.		No Data: 1988 (too old); Sample: small (10 NHs)
Schnelle, J.F. & Simmons, S.F. (2001) Minimum Nurse Aide Staffing Required to Implement Best Practice Care in Nursing Facilities. In Appropriateness of Minimum Nurse Staffing Ratios in Nursing Homes: Phase II Final Report (U.S. Department of Health and Human Services, ed.). Health Care Financing Administration, Washington, DC, pp. 3.1-3.40.		No Staffing measure: only examine the contribution of NAs to resident outcomes.
Schnelle, J.F., Bates-Jensen, B.M., Levy-Storms, L., Grbic, V., Yoshii, J., Cadogan, M.P., et al. (2004). The minimum data set prevalence of		No Does not measure nurse staffing

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
restraint quality indicator: Does it reflect differences in care? The Gerontologist, 44, 245-255.		
Schnelle, J.F., Simmons, S.F., Harrington, C., Cadogan, M., Garcia, E., & Bates-Jensen, B.M. (2004). Relationship of nursing home staffing to quality of care. Health Services Research, 39, 225-250.		No Staffing measure: although RN and LPN hprd levels are measured/ reported individually, they are merged into one "licensed nurse" group for analysis purposes.
Simmons S.F., Osterweil D. & Schnelle J.F. (2001): Improving Food Intake in Nursing Home Residents With Feeding Assistance: A Staffing Analysis. J Gerontol A Biol Sci Med Sci 56, M790-794.		No Does not measure staff level or mix (measures how much CA staff time is required to provide feeding assistance to NH residents)
Simmons, S.F., Garcia, E.T., Cadogan, M.P., Al-Samarrai, N.R., Levy-Storms, L.F., Osterweil, D., et al. (2003). The minimum data set weight-loss quality indicator: Does it reflect differences in care processes related to weight loss? Journal of the American Geriatrics Society, 51(10), 1410-1418.		No Does not measure staff level or mix (measures differences on care process measures between low- and high-weight-loss NHs. Including assistance provided by NAs)
Spector, W.D., & Takada, H.A. (1991). Characteristics of nursing homes that affect resident outcomes. Journal of Aging and Health, 3(4), 427-454.		No Staffing measure: although NA, RN and LPN ratio/resident are measured/ reported individually, they are merged into one staffing measures (low, medium and high) for analysis purposes. Sample: questionable as staffing reported includes NHs with 0.0 ratio/resident of LPN and RN
Stearns, S. C., Park, J., Zimmerman, S., Gruber-Baldini, A. L., Konrad, T. R., & Sloane, P. D.		No - the study sample population is residential care/assisted living facilities - not NHs

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(2007). Determinants and effects of nurse staffing intensity and skill mix in residential care/assisted living settings. Gerontologist, 47(5), 662-671. (MEDLINE)		
Stevenson, D. G. (2005). Nursing home consumer complaints and their potential role in assessing quality of care. Medical Care, 43(2), 102-111.		No - complaints are used as a measure of quality of care
Stevenson, D. G. (2006). Nursing home consumer complaints and quality of care: A national view. Medical Care Research and Review, 63(3), 347-368.		No - complaints are used as a measure of quality of care
Sullivan-Marx E.M., Strumpf N.E., Evans L.K., Baumgarten M. & Maislin G. (1999): Predictors of continued physical restraint use in nursing home residents following restraint reduction efforts. Journal of the American Geriatrics Society 47, 342-8		No - combines RN and LPN in one category (licensed nurse) - and sample is very small (3 NHs)
Svarstad, B. L., & Mount, J. K. (2001). Chronic benzodiazepine use in nursing homes: Effects of federal guidelines, resident mix, and nurse staffing. Journal of the American Geriatrics Society, 49(12), 1673-1678.		No Staff measurement: Only staff measure is licensed nurses (LPN + RN). QI is prescribing and use of benzodiazepine in NHs.
Temkin-Greener, H., Zheng, N., Norton, S. A., Quill, T., Ladwig, S., & Veazie, P. (2009). Measuring end-of-life care processes in nursing homes. Gerontologist, 49(6), 803-815. (EMBASE)		No Staffing measure: provides staffing levels for RNs and total nursing staff, but analysis is of DONs' perceptions of sufficiency of staff-to-resident ratios
Tilly, J., Black, K., Ormond, B., & Harvell, J. (2003,		No - examines states experiences with minimum

Citation of First Cut Results (First cut selection is based on title &/or abstract)	Description and/or reason(s) why articles were kept after second review (based on review of full text)	Description an/d/or reason(s) why articles were NOT kept after second review (based on review of full text)
February). State experiences with minimum nursing staff ratios for nursing facilities: Findings from the research to date and a case study proposal. Retrieved June 11, 2008, from the U.S. Department of Health and Human Services Web site: http://aspe.hhs.gov/daltcp/reports/stateexp.htm		nursing staff ratios. (Appendix 2 provides overview of all US state standards)
Wan, T. T. H. Nursing care quality in nursing homes: Cross-sectional versus longitudinal analysis. Journal of Medical Systems, 2003; 27(3): 283-295.		No this is a study of methodology rather than of the relationship between staffing and quality of care Data: no mention of implementing recommended decision rules to clean the OSCAR data used for staffing measures
Wan, T. T. H., Zhang, N. J., & Unruh, L. Predictors of resident outcome improvement in nursing homes. Western Journal of Nursing Research, 2006; 28(8): 974-993.		No Only measures total nurse staff hprd
Weech-Maldonado, R., Meret-Hanke, L., Neff, M. C. and Mor, V. Nurse staffing patterns and quality of care in nursing homes. Health Care Management Review, 2004; 29(3): 48-60.		No Methodology: weak (use structural equation modelling - that model is assuming linear relationships between outcome and explanatory variables). Staffing measures: only measure mix of RNs to total nursing staff and the proportion of full-time RNs to total RNs (full-time, part-time, contract).
Weech-Maldonado, R., Neff, G., & Mor, V. The relationship between quality of care and financial performance in nursing homes. Journal of Health		No Does not measure nurse staffing

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Care Finance, 2003; 29, 107-116		
Zimmerman, S., Gruber-Baldini, A. L., Hebel, J. R., Sloane, P. D., & Magaziner, J. Nursing home facility risk factors for infection and hospitalization: Importance of registered nurse turnover, administration, and social factors. Journal of the American Geriatrics Society, 2002; 50: 1987-1995.		No Sample: not representative – staffing levels are comparatively extremely high (i.e. 75 NA FTEs/100 compared to average of 35 FTEs/100); NHs with sub-acute and rehab units are included in the sample as well. QI: the applicability of infection as the quality measure associated with LTC nurse staffing has not been established (research has studied link between infection and infection control nurses)
Zinn, J., Aaronson, W., & Rosko, M. (1993). The use of standardized indicators as quality improvement tools: An application in Pennsylvania nursing homes. *American Journal of Medical Quality, 8*(2): 72-78.		No Sample: not representative – sample is of Medicare NH facilities (e.g. short term sub-acute/transitional care)

Appendix 4.2a Application of Inclusion Criteria and Quality Assessment: Design, Data, Sample, Staff Measure

Study citation	Methodology: length of study cross-sectional; longitudinal	Design: prospective or retrospective	Data: primary/secondary/sources/year/cleaning if applicable	Sample Size: Number of NHs/residents	Sample Size: number of prov./states	Staff Measure per resident or bed
Arling, Kane, Mueller, et al. (2007)	longitudinal (follow-up assessments were on av. 90 days)	prospective	**Primary data:** staff members entered time into hand-held computers, nursing staff recorded time over a 48-hr period and ancillary staff over 7 days; **Secondary data**: MDS assessments 1998, 1999, 2001, 2004;	156 NHs; 5,314 residents	US: Colorado, Indiana, Mississippi, Minnesota	hprd
Bostick (2004)	cross-sectional	retrospective	**Secondary data**: OSCAR and MDS 1999-2000; cleaned OSCAR data used for staffing measures; excluded hospital-based nursing facilities which are more likely to have higher staffing and to have more Medicare patients; excluded facilities reporting zero staff or with implausibly high staffing levels	413 NHs; 39,636 residents	US: Missouri	hprd
Carter & Porell (2005)	longitudinal (3 year)	retrospective	**Secondary data**: Five data sources were used to construct a three-year panel data set of resident nursing home histories. Data from the Management Minutes Questionnaire (MMQ) served as the core data file to which the other three data sources were linked: ACSH admission rates and prior hospital use patterns from the Medicare Provider Analysis and Review (MEDPAR) (1990-1993); nursing home organizational and structural attributes from the Medicare Provider of Service files and cost reports from the Massachusetts Rate Setting Commission	525 NHs; 40,000 residents	US: Massachusetts	FTE per occupied beds

Study citation	Methodology: length of study cross-sectional; longitudinal	Design: prospective or retrospective	Data: primary/secondary/sources/year/cleaning if applicable	Sample Size: Number of NHs/residents	Sample Size: number of prov./states	Staff Measure per resident or bed
			(1991-1993); Massachusetts death registry file (1991-1993)			
Castle (2002)	longitudinal	retrospective	**Secondary data**: 1996-1999; no discussion of cleaning OSCAR data used for staffing measures	14,042 NHs	US: national	FTE per 100 occupied beds
Castle & Myers (2006)	longitudinal (7 years)	retrospective	**Secondary data**: OSCAR; ARF; State-level Medicaid reimbursement levels; 1997-2003; no discussion of applying all recommended rules for cleaning OSCAR data, but imputation was used to correct data entry errors identified by frequency distribution plots	12,690 NHs	US: national	FTE per 100 beds
Castle (2000)	longitudinal comparison (1992 and 1997)	retrospective	**Secondary data**: OSCAR; 1992 and 1997 (comparison); no discussion of applying recommended rules for cleaning OSCAR data, but used imputation to correct data entry errors identified by frequency distribution plots	12,193 NHs	US: national	FTE per 100 beds
Castle & Engberg (2008)	cross-sectional	prospective	**Primary data:** nursing home administrator surveys (2005) (first survey response rate 2,946; second survey response rate 3,939); interviews with 89 DONs and 87 NH administrators; **Secondary data**: OSCAR (2005); Area Resource File (ARF) (2006); Nursing Home Compare (2004)	6,005 NHs	US: national	FTEs per 100 residents
Castle & Fogel (1998)	cross-sectional	retrospective	**Secondary data**: OSCAR, ARF; 1995; no discussion of applying all recommended rules for cleaning OSCAR data, but imputation was used to correct data entry	15,074	US: national	levels FTEs per one resident

Study citation	Methodology: length of study cross-sectional; longitudinal	Design: prospective or retrospective	Data: primary/secondary/sources/year/cleaning if applicable	Sample Size: Number of NHs/residents	Sample Size: number of prov./states	Staff Measure per resident or bed
			errors identified by frequency distribution plots			
Castle & Engberg (2007)	cross-sectional	prospective	**Primary data:** survey of nursing home administrators conducted during March–June 2003 (staffing data); **secondary data**: the 2003 Nursing Home Compare (NHC) (quality indicators); OSCAR data (facility characteristics; and the 2005 Area Resource File (ARF) (market info).	1,071 NHs	US: Missouri, Texas, Pennsylvania, New York, Connecticut, New Jersey	FTE per 100 residents
Dyck (2007)	cross-sectional	retrospective	**Secondary data**: OSCAR and MDS data sets; applied recommended cleaning procedures for the OSCAR data	2,951 NHs; 363,895 residents	US: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota	hprd
Grabowski & Castle (2004)	longitudinal (9 years)	retrospective	**Secondary data:** OSCAR; ARF; State-level Medicaid reimbursement data; CMS hospital area wage indexes; 1991-1999; no cleaning of OSCAR data (used for staffing measures) is mentioned	15,975 NHs	US: national	FTE per Resident
Harrington, Zimmerman, Karon, et al. (2000)	cross-sectional	retrospective	**Secondary data**: OSCAR; 1995-1996; applied recommended rules to clean OSCAR data (used for staffing measures)	13,770 NHs	US: national	hprd
Horn, Buerhaus, Bergstrom et al. (2005)	longitudinal (12-weeks)	retrospective	**Primary data** collected as part of the National Pressure Ulcer Long-Term Study (NPULS); 1996, 1997 (medical records, MDS, other written records such as physician orders and medication logs)	82 NHs; 1,376 residents	US: National (23 states)	hprd
Intrator, Zinn, & Mor	cross-sectional	retrospective	**Secondary data**: OSCAR; MDS; ARF; 1997; no mention of applying	663 NHs; 54,631	US: Maine, Kansas, New	FTEs per 30

Study citation	Methodology: length of study cross-sectional; longitudinal	Design: prospective or retrospective	Data: primary/secondary/sources/year/cleaning if applicable	Sample Size: Number of NHs/residents	Sample Size: number of prov./states	Staff Measure per resident or bed
(2004)			recommended logical decision rules to the OSCAR data (used for staff measures)	residents	York, and South Dakota	residents
Johnson, Cowles, & Simmens (1996)	cross-sectional	retrospective	**Secondary data**: OSCAR, 1994; do not discuss applying all recommended rules for cleaning OSCAR data, but eliminated extreme staffing outliers	1,639 NHs	US (23 states)	hprd
Kim, Harrington, & Greene (2009)	longitudinal (5 years)	retrospective	**Secondary data**: California's long-term care annual cost report; and the Automated Certification and Licensing Administrative Information and Management Systems (ACLAIMS); OSCAR (chain affiliation data); 1999-2003	1,099 NHs	US: California	hprd
Kim, Kovner, Harrington, et al. (2009)	longitudinal (5 years)	retrospective	**Secondary data:** California's long-term care annual cost report; the Automated Certification and Licensing Administrative Information and Management Systems (ACLAIMS); OSCAR (chain affiliation data); MDS facility-level case mix index; US Bureau of Economic Analysis (count-level variables); 1999-2003	1,099 NHs	US: California	hprd
Konetzka, Stearns, & Park (2008)	longitudinal (4 years)	retrospective	**Secondary data:** MDS data; OSCAR staffing data; 1997-2000; no discussion of cleaning OSCAR data used for staffing measure.	1,366 NHs; 399,206 residents	US: Ohio, Kansas, Maine, Mississippi, South Dakota	hprd
Kramer & Fish (2001)	longitudinal (1 year)	retrospective	**Secondary data:** Medicaid Cost Report, Medicare Standard Analytic Files Part A, MDS 2.0; 1999	5,294 NHs	US: 10 states Massachusetts, Maine, New York, Illinois, Ohio, Texas, Iowa,	hprd

Study citation	Methodology: length of study cross-sectional; longitudinal	Design: prospective or retrospective	Data: primary/secondary/sources/year/cleaning if applicable	Sample Size: Number of NHs/residents	Sample Size: number of prov./states	Staff Measure per resident or bed
					Colorado, California, Washington	
Loeb, Craven, McGeer, et al. (2003)	longitudinal (1 year)	prospective	**Primary data:** Each nursing home's infection control practitioner completed the data collection form; 1998-1999.	50 NHs	Canada: Ontario, Manitoba, Saskatchewan, Alberta US: Michigan, Minnesota, North Dakota, Montana	FTE per 100 residents
Zhang, Unruh, Liu, et al. (2006)	cross-sectional	retrospective	**Secondary data:** OSCAR; 2002-2003; OSCAR data cleaned.	13,663 NHs	US: National	hprd
Zhang & Grabowski 2004	longitudinal comparison (1987 and 1993)	retrospective	**Secondary data:** national data (1987 Medicare/Medicaid Automated Certification System data [MMACS - the predecessor to OSCAR]; 1993 OSCAR; 1993 ARF); state data (1993 Medicaid reimbursement rates); cleaned the OSCAR data using two recommended decision rules .	5,092 NHs	US: 22 states	hprd

Appendix 4.2b Application of Inclusion Criteria and Quality Assessment: Resident Care Quality Indicator, Risk Adjustment, Analysis

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
Arling, Kane, Mueller, et al. (2007)	yes - Processes: physical restraints use, toileting program, range of motion training, ADL training; Outcomes: ADL decline; worsening incontinence, and worsening behaviour between the time study and 90-day follow-up; all adjusted for resident characteristics	resident- and unit-level measures derived from MDS data. Included 90-day change in: physical restraints use, toileting program, range of motion training, ADL training; ADL decline; worsening incontinence, and worsening behaviour.	4 process (restraints, toileting, ROM, & ADL training) and 3 outcome incidence QIs (ADL, incontinence, behaviour)	resident-level Used major categories from the Resource Utilization Group III (RUG-III were used as indicators of resident and unit acuity (ADL dependency index; Cognitive Performance Scale; Personal Severity Index)	facility and state	Good
Bostick (2004)	Yes PU, weight loss, incontinence, ADL decline, problem behaviour symptoms and restraint use	facility-level quality indicators derived from the MDS (resident data were aggregated at the facility level). Included prevalence PUs, incontinence, weight loss, ADL decline, behaviour problems and restraint use.	prevalence	facility-level Used MDS data for resident risk adjustment aggregated at the facility level.	facility and market	Okay
Carter & Porell (2005)	yes 1) hospitalization for any ambulatory care-sensitive condition (re ICD-9-	resident- and facility-level (ACSH and non-ACSH) used Medicare Provider Analysis and	incidence	resident-level Used data from the Management Minutes	facility and market	Good; Quarterly observations for each

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
	CM); 2) hospitalization for an infectious ACSH, 3) hospitalization for bacterial pneumonia, 4) hospitalization for gastroenteritis, and 5) hospitalization for kidney and/or urinary tract infection (UTI).	Review data		Questionnaire (MMQ), which is completed quarterly by nursing staff and includes resident-level demographic, diagnosis and degree of functional impairment data.		resident. Does not specify correlation structure across time. No confidence intervals reported for odds ratios. Difficult to interpret precision of effect size.
Castle (2002)	Maybe - "Deficiency citations for physical restraint use in two and three consecutive certification survey inspections are used as our measures of poor quality."	facility-level quality indicator (consecutive deficiencies for physical restraint use) derived from the OSCAR data (resident data aggregated at the facility level)	prevalence	facility-level Aggregate resident data (levels of ADL) obtained from OSCAR data	facility and state	Strong multinomial logistic regression
Castle & Myers (2006)	Maybe (questionable relationship to nurse staffing?) - 2 deficiency citations for mental health care: 1) failure to include mental status in assessment; 2) providing appropriate treatment for residents with mental difficulties	facility-level quality indicators (deficiency citations for mental health assessment/treatment) derived from the OSCAR data (resident data aggregated at the facility level)	prevalence	facility-level Aggregate resident data (levels of ADL) obtained from OSCAR data	facility and market	Good multivariate logistic regression and GEE; Despite report, multicollinearity is a concern. Cannot interpret independent effect of

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
						staffing levels. Staffing levels and staff mix are related (included # RNs, # LPNs, # NAs per resident in same model).
Castle (2000)	Maybe - Change in physical restraint use between 1992 and 1997	facility-level quality indicator (changes in physical restraint use) derived from the OSCAR data (resident data aggregated at the facility level)	incidence	facility-level Aggregate resident data (levels of ADL, urinary & bowel incontinence, use of psychoactive drugs) obtained from OSCAR data	facility and market (size, staff-to-patient ratios, special care units, occupancy rates, ownership, chain, census factors)	Strong multinomial logistic regression
Castle & Engberg (2008)	Yes - pain, PU (low & high risk), restraint, catheterized (% high risk and low risk residents with PU; % physically restrained; % with moderate to severe pain; % had a catheter inserted and left in bladder)	facility-level quality measures from Nursing Home Compare data. Included: % with moderate to severe pain; % low-risk residents with PUs; % high-risk residents with PUs; % physical restraint use; % indwelling catheter	prevalence	facility-level Used Nursing Home Compare data: "measures were counts of specific negative events per nursing home, each divided by the number of residents at risk for that negative event" (p. 469)	facility and market	Good negative binomial regression; model has interactions with "agency" and "stability" to estimate effect of staff mix; multicollinearity is a concern;

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
						cannot interpret independent effect of staffing levels. Staffing levels and staff mix are related.
Castle & Fogel (1998)	Maybe - use of restraints	facility-level quality indicator (physical restraint use) derived from the OSCAR data (resident data aggregated at the facility level)	prevalence	facility level Aggregate resident data (ADL, urinary & bowel incontinence, use of psychoactive drugs) obtained from OSCAR data	facility and market organizational characteristics (ownership, chain, special care units, Medicaid census, occupancy rates; market characteristics - urban location, Medicaid reimbursement policy, Herfindahl index (competition measure);	okay multivariate logistic regression; tercile cutpoints not reported; cannot apply results
Castle & Engberg (2007)	Maybe - composite index of quality for long-stay residents created by combining	facility-level quality measures from Nursing Home Compare data. For	prevalence	facility-level Used Nursing Home Compare data: risk	facility and market Yes, included organizational	Strong exploratory factor analysis, least squares

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
	the 11 quality indicators using exploratory factor analysis; quality measure difficult to interpret as it is an index developed using factor analysis	long-stay residents, used exploratory factor analysis and combined 11 quality indicators to create one index of quality.		adjustment included for 3 of 11 QI - % with moderate to severe pain; % more depressed or anxious; % ability to move in/around room got worse. No risk adjustment used for QI measures for PUs, restraint, ADL, incontinence or UTI	characteristics - size, ownership, chain, occupancy, % Medicaid, staffing levels, turnover, worker stability, and agency staff; and market characteristics	regression, negative binomial regression
Dyck (2007)	Yes - weight loss, dehydration	resident-level measures derived from MDS data (weight loss, dehydration)	incidence	resident-level Used MDS data for resident-level risk adjustment (eight variables were included for weight loss, and 3 for dehydration).	facility and state level variables	Strong random intercepts logistic regression, a variety of hierarchical modelling
Grabowski & Castle (2004)	Yes - PU (prevalence), restraints (use), feeding tube use and indwelling catheters	facility-level quality indicator (prevalence of PUs, use of restraints, feeding tube and indwelling catheters) derived from the OSCAR data (resident data	prevalence	facility-level Aggregate resident data (ADL, incontinence, use of medications) obtained from OSCAR data	facility and market characteristics	okay multivariate regression (using top and bottom quartiles in analysis); outcome is a

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
		aggregated at the facility level)				collapsed measure.
Harrington, Zimmerman, Karon, et al. (2000)	Maybe - composite measure - deficiency citations (total, quality of care, & other)	facility-level quality indicator (total, quality of care, & other deficiency citations) derived from the OSCAR data (resident data aggregated at the facility level)	prevalence	facility-level Aggregate resident data obtained from OSCAR data. Including: ADL index, mobility index, and % of residents with depression, dementia, behavioral symptoms, urinary incontinence, and PUs.	facility and state characteristics controlled for size; hospital-based (8.7%); nursing facility category (e.g. Cat. 4 - SNF for Medicare only (3.76%); Cat. 3 - NF for Medicaid with a distinct part for SNF care; Cat. 2 - NF certified dually for Medicaid & Medicare (Cat. 2,3 - 77.89%); Cat. 10 - NF for Medicaid only (18.35%)); ownership; Medicaid (66%)	okay linear and logistic regression models; count models were not used for count outcomes. Facilities with zero counts were excluded in some analyses.
Horn, Buerhaus, Bergstrom et al. (2005)	Yes - decline in ADLs, hospitalization (no discussion of reasons for	resident-level measures derived from MDS data (incidence of PU,	incidence & prevalence	resident-level The Comprehensive Severity Index	facility characteristics	good logistic regression analysis, and

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
	hospitalization), UTI, weight loss, catheterization, administration of nutritional supplements; incidence PU	decline in ADLs, hospitalization (no ACS reasons), UTI, weight loss, catheterization, administration of nutritional supplements)		(CSI) was used for resident-level risk adjustment		hierarchical modelling; appears cutpoints for categorization of staff times were data driven.
Intrator, Zinn, & Mor (2004)	Yes - rates of potentially preventable/avoidable hospitalization (for ACS reasons)	resident-level measures derived from MDS data (deaths and hospitalization for ACS reasons (re: ICD-9-CM) and any other reasons)	prevalence	resident-level Used MDS data for resident-level risk adjustment (demographic variables, DNR orders, cognitive performance scale, physical findings and BMI)	facility and state characteristics	Strong multilevel multinomial logistic regression; model has interactions with "agency" and "stability" to estimate effect of staff mix
Johnson, Cowles, & Simmens (1996)	Yes - number of residents with PU per number of bedbound residents; percent of residents in restraints, drug error rate	facility-level quality indicator (prevalence of PUs, % residents restrained, drug error rate) derived from the OSCAR data (resident data aggregated at the facility level)	prevalence	facility- level Aggregate resident data obtained from OSCAR data (ADL)	facility characteristics and geographic location	okay logistic regression analysis (lowest and highest quartile analysis)
Kim, Harrington, & Greene (2009)	Yes - composite measure - the number of total deficiencies and the number of serious	facility-level quality indicator (total & serious federal and state deficiency citations) derived from	prevalence	facility-level Aggregate resident case mix score obtained from cost reports	facility and market factors	Strong Poisson random effects model

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
	deficiencies	the ACLAIMS database (California)		submitted to the California Office of Statewide Health Planning and Development (COSHPD)		
Kim, Kovner, Harrington, et al. (2009)	Yes - composite measure - the number of total deficiencies , quality of care deficiencies and the number of serious deficiencies	facility-level quality indicator (total & serious federal and state deficiency citations) derived from the ACLAIMS database (California)	prevalence	facility-level Aggregate resident case mix score obtained from the Minimum Data Set (MDS)	facility and market factors	Strong Poisson random effects model with maximum likelihood estimators, probit random effects model with maximum likelihood estimators
Konetzka, Stearns, & Park (2008)	Yes - PU and UTI	facility-level quality indicators derived from the MDS (resident data were aggregated at the facility level). Included development of PU in last 14 days, and UTIs within last 30 days (outcomes were analyzed at the resident level to allow for resident-specific risk adjustment)	incidence	facility-level Aggregate resident case mix score obtained from the Minimum Data Set (MDS) including ADL functioning; index of skilled services provided, % of resident with dementia, depression, psychiatric diagnosis, etc.	facility factors	strong conditional logit models; linear probability models

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
Kramer & Fish (2001)	Yes - weight loss, incidence of PU, functional improvement	facility-level quality indicators derived from the MDS (resident data were aggregated at the facility level). Included incidence of PUs, change in ability to perform ADLs, weight loss; change in resisting assistance with ADLs	incidence	facility-level Aggregated resident-level risk score obtained from the Minimum Data Set (MDS)	facility and market	okay stepwise logistic regression, CART decision tree analysis, ordinary least squares
Loeb, Craven, McGeer, et al. (2003)	Maybe? Measured incidence of antimicrobial-resistant bacteria isolates, use of penicillin, antimicrobial soaps, use of IV therapy etc.	resident-level quality indicator derived from records of antibiotic use and susceptibility results that were linked to a unique identifier for each nursing home resident which consisted of a code for the facility, the resident's initials, the unit, and the room number.	incidence	facility-level Resident characteristics were collected using a questionnaire sent to each NH (included use of feeding tubes, use of urinary catheters, and proportion of residents confined to a bed or wheelchair). Also adjusted for facility-level antimicrobial use. "No data on individual-level factors such as functional status,	facility and state	okay logistic regression

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
				severity of illness, comorbidity, the presence of roommates, or medical devices (urinary catheters or feeding tubes) were collected" (p. 41)		
Zhang, Unruh, Liu, et al. (2006)	Y - incidence of pressure ulcers, physical restraints, and urinary catheters	facility-level quality indicator (incidence of pressure ulcers, physical restraints, and urinary catheters) derived from the OSCAR data (resident data aggregated at the facility level)	incidence	facility-level Aggregate resident data obtained from OSCAR data (ADL and special treatments index)	Yes, facility controls: case mix index, ownership, chain membership, size, and the percentage of Medicare residents (payer mix), presence of NA training program	okay linear and logistic regression, principal components analysis
Zhang & Grabowski 2004	Y - prevalence of pressure ulcers, physical restraints, and urinary catheters	facility-level quality indicator (prevalence of pressure ulcers, physical restraints, and urinary catheters) derived from the OSCAR data (resident data aggregated at the facility level)	prevalence	facility- level Aggregate resident data obtained from OSCAR data (ADL)	Yes, included facility and state controls; including payer source (% Medicare)	okay first difference regression; did not adjust for level at baseline in regression analysis including all facilities; could

Study citation	Resident QI: nursing sensitive?	Resident QI: resident- or facility-level variable?	Resident QI: incidence or prevalence	resident risk adjustment mechanism	other risk adjustments	analysis ranking
						be why they observed non-intuitive results.

Appendix 4.3 Details from included studies on staff mix or levels

Study citation	Summary of Findings	Staffing Measures & Results
Arling, Kane, Mueller, et al. (2007)	A 90-day follow-up of care processes (physically restrained, participated in a toileting program, or received range of motion or ADL training) and outcomes (ADL decline, worsening incontinence and behaviour) for both total sample population (N=5,314) and separately, long stay residents (>45 days, n=4,889), found that neither RN nor LPN minutes received by a resident was significantly related to either process or outcome quality indicators.	Mean (SD) unit staffing hprd: licensed (RN+LPN)=1.01 (0.47) unlicensed (NA + activity)=2.1 (0.76) total=3.12 (0.87) Mean (SD) "resident-specific time" (care and administrative time associated with specific residents) hprd: RN=0.21 (0.28) LPN=0.34 (0.19) unlicensed=1.29 (0.48) Mean (SD) "non-resident specific time" (time not be associated with specific residents): licensed staff (RN+LPN)=0.47 (0.23) unlicensed=0.81 (0.37)
Bostick (2004)	No significant associations were found between RN or LPN staffing hours and the prevalence of physical restraints, weight loss, incontinence and behavioural problems. A 6-minute increase in RN staff time was associated with a 3% decrease in the prevalence of pressure ulcers (RN OR=0.97, *P*=.03). Contrastingly a 6-minute increase in LPN staff time was associated with a 3% higher prevalence of pressure ulcers (OR=1.03, *P*=0.02) and a 2% higher prevalence late loss ADL decline (OR=1.02, *P*=03). A 6-minute increase in nurse aide staff time was associated with a 1% decrease in the prevalence of pressure ulcers (PU OR=0.99, P=0.05) and a 1% increase in the prevalence of incontinence (OR=1.01, *P*=.09).	Mean (SD) unit staffing hprd: RN=0.224 (0.195) LPN = 0.608 (0.301) NA=1.495 (0.724) Total=2.327
Carter & Porell (2005)	Findings suggest that the addition of one FTE RN per 100 residents will decrease the odds of experiencing ambulatory care sensitive hospitalization (ACSH) by between 3 and 5% for all reasons among both ADRD and non-ADRD populations (ADRD: Alzheimer's disease and related dementias). The addition of one FTE LPN per 100 residents was contrastingly, although not	ADRD population (Mean FTE per 124.493 occupied resident beds): RN=7.967 (CHPRD=0.34) LPN=10.173 (CHPRD=0.44) Non-ADRD population (Mean FTE per 123.910 occupied resident beds):

Study citation	Summary of Findings	Staffing Measures & Results
	consistently, associated with an increase in the odds of residents experiencing an ACSH by 1 to 2%. The number of RNs per occupied bed was associated with the following odds of experience an ACS hospitalization: For all ACSH, an OR=0.97; p=0.000 for residents with ADRD; and an OR of 0.98, p = 0.000 for non-ADRD residents. For all infectious ACSH, an OR=0.97; p=0.000 for residents with ADRD; and an OR of 0.98, p = 0.001 for non-ADRD residents. For Bacterial Pneumonia ACHS; an OR 0.97, p=0.001 for resident with ADRD; and an OR 0.98, p=0.019 for non-ADRD; For Gastroenteritis ACHS; an OR 0.97, p=0.004 for residents with ADRD; no association for non-ADRD residents For Kidney/UTI ACHS; an OR 0.95, p=0.000 for residents with ADRD; and an OR 0.96, p=0.001 for non-ADRD residents. The number of LPNs per occupied bed was associated with the following odds of experience an ACS hospitalization: For all ACSH, an OR=1.01; p=0.001 for residents with ADRD; and an OR of OR of 1.01, p = 0.001 for non-ADRD residents. For all infectious ACSH, an OR=1.01; p=0.023 for residents with ADRD; and an OR of 1.01, p = 0.018 for non-ADRD residents. For Bacterial Pneumonia ACHS; no association for resident with ADRD; and an OR 1.02, p=0.001 for non-ADRD; For Gastroenteritis ACHS; no association for ADRD or non-ADRD residents; For Kidney/UTI ACHS; no association for ADRD or non-ADRD residents.	RN=8.034 LPN=10.102 (The difference between the two populations staffing was not statistically significant)
Castle (2002)	The odds of poor resident care quality, measured by repeated deficiency citations for physical restraint use, was lower in nursing homes with higher RN and LPN staffing levels. Compared to NHs with less than 3.1 RN FTEs per 100 beds, in facilities with more than 7.3 RN FTEs/100 beds, the odds of one deficiency citation were 24% lower (OR=0.76, *P*≤.05), the odds of two deficiency citations were 21% lower (OR=0.79, *P*≤.01), and the odds of three consecutive deficiencies were 39% lower (OR=0.61, *P*≤.001). LPN	Mean (SD) FTE per 100 beds: RN=6.9 (9.1) (CHPRD=0.37) LPN=10.6 (9.8) (CHPRD=0.57) NA=32.5 (13.7) (CHPRD=1.75) Mean (SD) fourth quartile staffing FTEs/100 beds: RN=7.8 (10.1); LPN=11.6 (10.4); NA=32.2 (14.2)

Study citation	Summary of Findings	Staffing Measures & Results
	staffing was only significant associated with the decreased odds of a NH receiving three consecutive deficiencies. Compared to NHs with less than 7.7 LPN FTE/100 beds, in NHs with over 13.2 LPN FTEs/100 beds, the odds of a NH receiving three consecutive deficiencies were 16% lower (OR=0.84, *P*≤.01). The odds of one or two physical restraint deficiency citations were also lower for facilities with mean (SD) NA staffing of 32.2 FTEs/100 beds (SD 14.2) compared to those facilities with 29.8 NA FTEs per 100 beds (NA One OR=0.88, p≤.01; Two OR=0.90, p≤.05). Contrarily, the odds of three consecutive deficiencies were **higher** for facilities with NA staffing levels of 32.2 FTEs/100 beds compared to those facilities with NA staffing levels of only 29.8 (OR=1.17, p≤01).	Mean first quartile staffing FTEs/100 beds: RN=3.1; LPN=7.7; NA=29.8
Castle & Myers (2006)	Between 1997 and 2003, Castle and Myers found that approximately 15.9% of NHs (N=12,690) received a deficiency citation for (a) "failure to include mental/psychosocial status in resident assessment" and 7.9% received a citation for (b) "inappropriate treatment for residents with mental/psychosocial difficulties". Higher levels of RN staffing were significantly associated with a lower likelihood of a NH receiving a deficiency citation. With a 10% increase in RN staffing levels (mean 5.5 RN/100 beds), facilities were 5% **less** likely to receive either deficiency citation (AOR (a)= 0.941, 95% CI=0.91–1.00, *P*≤.01; AOR (b)=0.952. 95% CI=0.90-1.00, *P*≤.05). LPN staffing was only significantly associated with deficiency citation (a) "Failure to include mental/psychosocial status in resident assessment". With a 10% increase in LPN staffing levels, a NH was 5% **more** likely to receive a deficiency citation (AOR (a)=1.053, 95% CI=1.01–1.14, *P*≤.05) Similarly, with a 10% increase in NA staffing, a facility was 6.8% or 2.7% **more** likely (a and b respectively) of receiving a deficiency citation (AOR (a)=1.068, 95% CI=1.02-1.13, *P≤0.05;* AOR	Mean (SD) FTE per 100 beds RN=5.5 (7.2) (CHRPD=0.3) LPN=9.1 (6.7) (CHPRD=0.49) NA=26.5 (11.8) (CHPRD=1.42) Mean (SD) ratio of RNs to (LPNs + NAs) per 100 beds RNs/(LPN+NA)=0.16 (0.11)

Study citation	Summary of Findings	Staffing Measures & Results
	(b)=1.027, 95% CI=1.00-1.14, *P*≤.01). Staff mix (i.e., RNs/LPNs+NAs) was not significantly associated with the odds of a NH receiving either deficiency citation.	
Castle (2000)	Comparing nursing homes with increasing and decreasing use of physical restraints to facilities with stable restraint use, Castle found that higher RN and LPN staffing levels were associated with decreases in restraint use, but higher NA staffing was associated with increases in restraint use. Facilities with more FTE RNs per 100 beds were less likely to increase their use of restraints (adjusted odds ratio (AOR) for increase in restraint use = 0.12, 95% CI=0.03-0.58, *P*≤0.01). Similarly, facilities with more FTE LPNs per 100 beds were more likely to decrease their use of restraints (AOR for decrease in restraint use = 2.12, 95% CI=1.11-2.89, *p*≤0.05). However, facilities with more nurse aides per 100 beds were significantly more likely to increase their use of restraints (AOR for increase in restraint use=3.72, 95% CI=2.49-4.39, *P*≤0.001; and AOR for decrease in restraint use = 0.22, 95% CI=0.10-0.67, P≤0.01). The AOR is per 10-FTE increase per 100 beds.	Mean (SD) FTE per 100 beds: 1992: RN=6 (5) (CHPRD=0.32) LPN=11 (7) (CHPRD=0.59) NA=28 (13) (CHPRD=1.50) 1997: RN= 4* (6) (CHPRD=0.22) LPN=9 (7) (CHPRD=0.48) NA=27 (12) (CHPRD=1.45) *Paired *t* test significant at *P*≤0.05 (comparing 1992 with 1997 data)
Castle & Engberg (2008)	Among long-stay residents, an increase in one unit of log standardized professional staff mix was found to be statistically associated with (*p<.05; **p<.01; ***p <.001): 11% less restraint use (log professional staff mix reg coefficient = 0.889**, SE=0.048); 23% fewer residents with moderate to severe Pain (log professional staff mix reg coefficient = 0.773**, SE=0.082) 16% fewer low-risk residents with pressure sores (log professional staff mix reg coefficient = 0.836*, SE=0.086); 12% fewer high-risk residents with pressure sores (log professional staff mix reg coefficient = 0.878**, SE=0.053) Similarly, higher levels of RN, LPN and NA staffing were associated with better outcomes. An increase in one unit of log standardized RN staffing was	Mean (SD) FTE per 100 residents: RN=11.7 (9.54) (CHPRD=0.63) LPN=15.63 (8.55) (CHPRD=0.84) NA=31.41 (9.87) (CHPRD=1.69) Mean (SD) Mix RN/(NA+LPN)= 0.25 (0.42)

Study citation	Summary of Findings	Staffing Measures & Results
	significantly associated with: 32% less restraint use (log professional staff mix reg coefficient = 0.682*, SE=0.025); 23% fewer residents with moderate to severe Pain (log professional staff mix reg coefficient = 0.771**, SE=0.083) 16% fewer low-risk residents with pressure sores (log professional staff mix reg coefficient = 0.836*, SE=0.082); 12% fewer high-risk residents with pressure sores (log professional staff mix reg coefficient = 0.878**, SE=0.051) An increase in one unit of log standardized LPN staffing was significantly associated with: 17% less restraint use (log professional staff mix reg coefficient = 0.833*, SE=0.035); 14% fewer high-risk residents with pressure sores (log professional staff mix reg coefficient = 0.856***, SE=0.043) 7.5% fewer residents with a catheter inserted and left in their bladder (log professional staff mix reg coefficient = 0.925**, SE=0.033); Log NA staffing was significantly associated with: (1) Percent Physical Restraint Use (LSR) 0.935* (0.037) (2) Percent With Moderate to Severe Pain (LSR) 0.954*** (0.012) (3) Percent Low-Risk Residents With Pressure Sores (LSR) 0.932*** (0.024) (4) Percent High-Risk Residents With Pressure Sores (LSR) 0.940*** (0.017) (5) Percent Had a Catheter Inserted and Left in Bladder (LSR) 0.913*** (0.030);	
Castle & Fogel (1998)	Compared to nursing homes using physical restraints, facilities that were restraint free were more likely to have increased FTE RNs per resident, lower FTE LPNs per resident, and lower FTE nurse aides per resident. Restraint free facilities were: 30% more likely to have high versus low FTE RNs per resident (AOR 1.30, *P*≤0.01);	Mean (SD) FTE per one resident: Facilities with restraints (N=13, 911): RN=0.07 (0.50) (CHPRD=0.38) LPN=0.12 (0.62) (CHPRD=0.64) NA=0.31 (0.62) (CHPRD=1.66) Restraint Free Facilities (N=1,263): RN=0.12* (0.64) (CHPRD=0.64)

Study citation	Summary of Findings	Staffing Measures & Results
	24% less likely to have high versus low FTE LPNs/resident (AOR=0.76, *P*≤0.01); and 29% less likely to have high versus low FTE NA/resident (AOR 0.71; *P*≤0.01).	LPN=0.13 (0.70) (CHPRD=0.68) NA=0.28* (0.53) (CHPRD=1.5) *Paired t-test significant at *P*≤0.05 (comparing facilities with restraints and restraint free facilities)

Castle & Engberg (2007)	One index of quality care was created by combining the 11 quality indicators applicable to long-stay residents (i.e. those with a quarterly MDS assessment). Castle and Engberg found that for long stay measures, high RN levels were associated with higher overall quality (Log RN staffing coefficient = 0.700, SE=0.107, *P*<.01); whereas, a high number of LPNs were associated with lower overall quality (Log LPN staffing coefficient = -0.205, SE=0.100, *P*<.05), and NA staffing levels were not significant.
	Log RN staffing levels were associated with the following long-stay quality measures:
	increased need for help with daily activities (0.759, SE=0.064, *P*<.01);
	high-risk residents with pressure sores (0.808, SE=0.045, *P*<.05);
	physical restraint use (0.869, SE=0.059, *P*<.05);
	had an indwelling catheter (0.769, SE=0.058, *P*<.01);
	bedfast (0.827, SE=0.057, *P*<.01);
	ability to move in/around room got worse (0.826, SE=0.062, *P*<.05).
	Log LPN staffing levels were associated with one long-stay quality measure:
	high-risk residents with pressure sores (1.137, SE=0.055, P<.01);
		Mean (SD) FTE per 100 residents:
		RN=14.7 (9.3) (CHPRD=0.79)
		LPN=16.6 (8.1) (CHPRD=0.89)
		NA=33.4 (10.1) (CHPRD=1.79)

Dyck (2007)	Examining the relationships between nursing staffing and the nursing home resident outcomes, logistic regression analysis did not find any nursing staffing associated with the outcome of weight loss. General additive models suggested a nonlinear relationship, and to investigate this further, Dyck developed a second logistic model that included an indicator, "AID3Plus" (i.e. if a facility had 3 or more hours of NA time versus those that had less than 3 hours). With this model, Dyck found that residents who received at least 3	Mean (SD) hprd: RN=0.35 (0.21) LPN=0.63 (0.28) NA=1.95 (0.54) Total staff (RN, LPN, NA)=2.93 (0.73).

Study citation	Summary of Findings	Staffing Measures & Results
	hours of NA care per day had a 17% decreased likelihood of weight loss (OR=0.83, 95% CI=0.74-0.92, *P*=.0008). In the analysis, LPN hprd were marginally significant (*P*=.046) with an odds ratio of 1.09, indicating that an hour's increase in LPN time is associated with about a 0.9% increase in the odds of weight loss (95% CI=1.00-1.18). RN hprd were not statistically significantly associated with resident weight loss (OR=1.07, 95% CI=0.97-1.19, *P*=0.1726). Nurse staffing was not significant in further analysis of the relationship between staffing and the log-odds of dehydration.	
Grabowski & Castle (2004)	The regression results for persistent low quality show that higher RN staffing levels are associated with between a 1.6 and 3.1% increase in persistent low quality when measured by prevalence of pressure ulcers (OR 1.025, p<.001), feeding tubes (OR 1.016, p<.001), and indwelling catheters (OR 1.031, p<.001); but a decrease of 1.3% when measured by physical restraints (OR 0.987, p<.001). Similarly, higher LPN staffing levels are associated with an increase of 2.8 to 5% in persistent low quality when measured by prevalence of pressure ulcers (OR 1.028, p<.001), feeding tubes (OR 1.050, p<.001), and indwelling catheters (OR 1.037, p<.001). There was no significant relationship with LPN staffing and persistent low quality when measured by physical restraints. Higher NA staffing levels were also associated with an increase of 8% in persistent low quality when measured by physical restraints (OR 1.008, p<.001), but a decrease of 0.5% when measured by use of indwelling catheters (OR 0.995, p<.05). The Pseudo - R square for the model explained between 6% and 15% of the variance in persistent poor quality (i.e. physical restraints = 6%; PU=12%, feeding tubes and catheters =15%). Examining the results for persistent high-quality, the findings mirror the persistent low-quality estimates: higher RN staffing levels are associated with a decrease in persistent high quality when measured by pressure ulcers (OR 0.968, p<.001), feeding tubes (OR 0.975, p<.001), catheters (OR	Mean (SD) FTE per (x) residents: RN=6.75 (8.79) (CHPRD=0.39) LPN=11.68 (11.20) (CHPRD=0.68) NA=36.20 (28.01) (CHPRD=2.1) The authors don't specify what the ratio denominator is, but they provide the mean number (SD) of residents per NH number of residents=92.51 (63.45)

Study citation	Summary of Findings	Staffing Measures & Results
	0.976, p<.001), but an increase when measured by physical restraints (OR 1.020, p<.001). Similarly, higher LPN staffing levels are associated with a decrease in persistent high quality when measured by pressure ulcers (OR 0.952, p<.001), feeding tubes (OR 0.919, p<.001), catheters (OR 0.969, p<.001), there was no significant relationship with LPN staffing and persistent high quality when measured by physical restraints. Higher NA staffing levels were also associated with a decrease in persistent high quality when measured by physical restraints (OR 0.990, p<.001). There was no significant relationship with NA staffing and persistent high quality when measured by the other 3 variables. The Pseudo - R square for the model explained between 11% and 21% of the variance in persistent high quality (i.e. physical restraints = 11%; PU=12%, feeding tubes =21% and catheters =11%).	
Harrington, Zimmerman, Karon, et al. (2000)	Harrington et al. found that staffing hours alone predicted less than 1% of the total variance in deficiencies. Nonetheless, OLS (ordinary least squares) regression models showed that lower levels of RN hprd were significantly associated with more "total care" deficiencies (-0.184, SE=0.079, *P*<.05) and more "quality of care" deficiencies (-0.128, SE=0.049, *P*<.01) but not with "quality of life" deficiencies or with "other" deficiencies. Similarly, lower levels of nursing assistant (NA) staff were associated with more total care deficiencies (-0.127, SE=0.046, *P*<.01), more quality of care deficiencies (-0.072, SE=0.028, *P*<.05), and more quality of life deficiencies (-0.052, SE=0.019, *P*<.01), but not with other deficiencies. LPN hours were not related to deficiencies.	Mean (SD) hprd: RN=0.59 (0.73) LPN=0.67 (0.62) NA=2.14 (1.14) Total Nursing staff=3.40 (1.77)
Horn, Buerhaus, Bergstrom et al. (2005)	Horn et al. examined the time RNs, LPNs and CNAs spent in direct care (time was examined in 10-minute increments up to 30 to 40 minutes per day), and how staff time affected care outcomes of long-stay (i.e. length of stay > 14 days) NH residents. Compared to residents who received less than 10 minutes of RN direct care, long-stay residents who received 30 to 40 minutes of RN direct care per day were: 42% less likely to experience deterioration in their ability to perform	Mean time per resident per day RN=16 minutes (median 15.1, range 0.7 to 36.9) (16 mprd=0.267 hprd); LPN= 30.6 minutes (median 31.5, range = 0 to 122.0) (30.6 mprd = 0.51 hprd); CNA=1.7 hours (median = 1.9; range = 0.04 to 6.1) RN 0.27 hprd

Study citation	Summary of Findings	Staffing Measures & Results
	ADLs (OR= 0.58, *P*=0.046); and 84% less likely to develop pressure ulcers (OR=0.16, *P*<0.001). Residents who received more than 45 minutes of LPN time per day (median =51.8 minutes), were 42% less likely to develop PUs (OR = 0.58, *P*=0.007) than residents who received less than 45 minutes per resident per day. Compared to those residents who received less than 2 CNA hours of care per day, when CNA time was 2.25 hours or more per day (median = 3.1 hours), residents were 41% less likely to develop pressure ulcers (OR=0.59, *P*=.059; and those who received 2 to 2.24 hours (median = 2.1 hours) of CNA time per day were 31% less likely to develop PUs (OR=0.69, *P*=.045).	LPN 0.51 hprd CNA 1.7 hprd Improved outcomes were associated with the following hprd (varies depending on outcome): RN=0.5 to 0.67 LPN>0.75 CNA>2.25
Intrator, Zinn, & Mor (2004)	Facilities with a higher ratio of RN/(RN+LPN) (i.e. if the skill mix increased by 1 SD) were associated with a 4% decrease in hospitalizations for non-ambulatory care sensitive (ACS) diagnoses (AOR=0.96, 95%CI=0.92-1.00, p<.05). (That is, if skill mix increases from 37% RNs to 57% RNs, then hospitalization for non-ACS diagnosis decreases by 4% (95% CI 0%-8%), assuming other factors held constant.) There was no significant association between a higher skill mix and hospitalizations for ACS diagnosis (AOR 0.96, 95% CI= 0.90-1.02, p<1). Facilities with a higher nurse (RN+LPN)-to-resident ratio were associated with a higher likelihood of ACS hospitalizations (AOR = 1.13, 95% CI=1.04-1.23, P<.01), but not other hospitalizations.	Mean (SD) FTE Skill Mix: RNs/(RN+LPN)=0.37 (0.20) NA/(RN+LPN)=2.1 (0.6) Levels FTE per 30 residents: Nurses (RN+LPN)=5.6 (2.06)
Johnson, Cowles, & Simmens (1996)	RN, but not LPN or NA, staffing levels were significantly associated with the probability that a facility would provide high or low level quality care. A 15-minute increase in RN time per resident per day increased the odds of a facility providing high- versus low-quality care by 1.73 (95% CI 1.38-2.17, *P*<.0001).	Mean (SD) hprd High Quality NHs (N=1429) RN=0.42** (0.34) LPN=0.64 (0.40) NA=2.11 (0.66) total staff=3.16* (1.10), ; Low Quality NHs (N=210) RN=0.29 (0.19) LPN=0.64 (0.26)

Study citation	Summary of Findings	Staffing Measures & Results
		NA=2.11 (0.53) total staff=3.04 (0.75) ** significant at p<.0001*, significant at p<.05
Kim, Harrington, & Greene (2009)	A 1-unit increase of the RN to total staffing ratio did not change the number of total deficiencies in nursing homes meeting the standard, but it decreased by about 32.44 the number of total deficiencies in nursing homes that consistently failed to meet the standard over the 5 years. As for serious deficiencies, a 1-unit increase of the RN to total staffing ratio decreased by about 1.17 the number of serious deficiencies only in nursing homes that met the standards. Lastly, a 1-unit increase of the RN to LVN ratio (range 0.15 – 1.79) slightly but consistently decreased both deficiencies in both types of homes.	Mean (SD) hprd Nursing homes **meeting the state minimum nurse staffing standard** (n = 850) RN=0.57 (0.46) RN to total staff ratio = 0.14 (.07) (# RN hprd)/(# RN hprd + # LPN hprd + # NA hprd) RN to LPN ratio = 0.94 (1.29) (# RN hprd)/(# LPN hprd) Total staffing hours 4.01 (1.05) Nursing homes **not meeting the state minimum nurse staffing standard** (n = 910) RN=0.26 (0.13) RN to total staff ratio 0.09 (0.05) RN to LVN ratio 0.64 (0.74) Total staffing hours 2.79 (0.34);
Kim, Kovner, Harrington, et al. (2009)	Kim et al. studied the relationship between RN, LPN, NA and total nursing staffing nursing home (NH) total deficiencies, quality of care deficiencies, and serious deficiencies. Nursing homes with higher RN staffing received fewer total deficiencies (Coefficient=-0.066, SE=0.015, p < .001) and quality of care deficiencies (-0.087, SE=0.031, *P* =.005), and RN staffing was also marginally related to serious deficiencies (-0.245, SE=0.126, *P* = .051). In contrast, LPN staffing was positively related to total deficiencies (0.119, SE=0.012, *P*< .001) and to quality of care deficiencies (0.110, SE=0.024, *P*< .001), but not to serious deficiencies (0.121, SE=0.106, *P* = .254). NA staffing hprd were negatively related to all three deficiencies (total deficiencies -0.059, SE=0.008, *P*<.001; quality of care deficiencies -0.075; SE=0.016, *P*<.001; serious deficiencies -0.139, SE=0.071 *P*<.05).	Mean (SD) hprd: RN=0.35 (0.26) LPN=0.61 (0.27) NA=2.27 (0.41) Total staffing hours =3.23 (0.66)
Konetzka, Stearns, &	Greater RN staffing significantly decreases the likelihood of incidence of pressure sores and urinary tract infections. The	Mean (SD hprd) RN=0.350 (0.219)

Study citation	Summary of Findings	Staffing Measures & Results
Park (2008)	conditional logit model with residual inclusion IV yielded significant results for RN intensity for both UTI and PUs, but mix was only associated with UTI, not PU. The likelihood of a resident having a pressure sore decreases with greater RN intensity (-3.002 reg coef, SD=0.515, p=0.01); and the likelihood of a resident having a UTI also decreases with greater RN intensity (-1.556 reg coef, SD=0.411, p=0.01). Increasing skill mix only associated with reduced incidence of urinary tract infections (-1.661 reg coef, SD=0.495, p=.01), not rate of PUs. Estimated using an LPM (linear probability model) and incorporating the joint effects of an increase in RN staffing and skill mix: A 50% increase in RN hprd (from 0.35 to 0.525), which also means an increase in skill mix (from 0.117 to 0.163), is predicted to decrease the rate of PUs by about 66% and UTIs by about 45% for the average facility.	Skill mix (% of total hours provided by RNs) = 0.117 (0.064)
Kramer & Fish (2001)	Kramer et al. studied the relationship between nurse staffing levels and the quality of care in 5,294 long-stay and 3,632 short stay nursing homes in 10 US states. For the purposes of this report, only the results from the long stay NHs are discussed here. RN staffing thresholds, below which facilities were at increased likelihood of being in the worst 10% for long-stay quality measures and above which there were no additional improvements in quality, were 0.6 hours per resident day (hprd) for pressure ulcers (AOR 1.33, 95% CI=1.06-1.69, *P*≤*.05*); 0.8 hprd for functional improvements (AOR 1.54, 95% CI=1.04-2.27, *P*≤.05); and 0.75 hprd for resisting care improvement (AOR 1.68, 95% CI=1.18-2.39, *P*≤.05). Licensed (RN+LPN) staff levels thresholds, below which facilities were at increased likelihood of being in the worst 10% and above which there were no additional improvements in quality, ranged from 0.95 hprd for weight loss (OR 1.23, 95% CI=1.02-1.49, *P*≤.05), up to 1.55 hprd for functional improvement (OR 1.79, 95% CI=1.08-2.73, *P*≤.05). The weighted average threshold for total nursing staff levels, below	Mean (SD) hprd RN=0.40 (0.32) LPN=0.63 (0.29) NA=2.02 (0.58) Staffing thresholds, below which facilities were at increased likelihood of being in the worst 10% for long-stay quality measures and above which there were no additional improvements in quality, ranged between: RN 0.6 to 0.8 hprd (weighted average = 0.75) NA 2.4 to 3.1 hprd (weighted average =2.78) Licensed staff (LPN+RN) 0.95 to 1.55 hprd (weighted average = 1.30)

Study citation	Summary of Findings	Staffing Measures & Results
	which facilities were at increased risk of being in the worst 10% and above which there were no additional improvements in quality, were 4.1 total hours per day, including 2.8 care aide hprd and 1.3 licensed nurse hprd of which was 0.75 RN hprd.	
Loeb, Craven, McGeer, et al. (2003)	An increased number of RNs per 100 residents was associated with reduced risk of MRSA in nursing home residents (AOR = 0.79, 95% CI=0.72, 0.87; in the multivariate model assessing penicillin exposure). No other staffing levels (i.e. LPN or NA) are discussed in the analysis.	Mean (SD) FTE per 100 residents RN=8.8 (5.3) (CHPRD=0.47) LPN*=9.0 (10.1) (CHPRD=0.48) NA=36.5 (16.1) (CHPRD=1.96) * LPNs are referred to as "registered nurse aides"
Zhang, Unruh, Liu, et al. (2006)	In their review of staffing and quality of care indicators, Zhang et al. examined the minimum thresholds of RN, LPN and care aide staffing needed to achieve 50%, 75%, and 90% levels of quality. For RNs, minimum thresholds to achieve these quality levels were 0.31, 1.83, and 3.3 hours per resident per day, respectively. The researchers found that the relationship between quality and staffing levels was best represented by an “S” curve whereby the initial stage of improvement in quality care is exponential; then, as staffing arises, the improvement in quality slows, and at some point, improvement stops. LPN minimum levels could only be ascertained at the 90% level, at LPN 8.4 hprd. Minimum staffing levels could not be ascertained for NA staffing.	Mean (SD) hprd RN=0.313 (0.26) LPN=0.661 (0.25) NA=2.057 (0.51) total nursing staff = 3.031 (0.68) licensed (RN+LPN)=0.97 (0.32)
Zhang & Grabowski 2004	Although Zhang and Grabowski found a significant increase in nursing home staffing levels from 1987 to 1993, and a significant decrease in the proportion of residents with pressure ulcers, physical restraints, and urinary catheters, the increase in staffing was not directly related to the improvements in quality. The results from first-difference model were contrary to those expected: an increase in 1 RN hprd was significant associated with an increase in pressure ulcers (1.9 percentage points, p<.001), physical restraints (3.4 percentage points, p<.05), and catheters (1.8 percentage points, p<.01). Similarly, an increase in 1 LPN hprd was significantly associated with a 0.9 percentage increase in the pressure ulcer rate (p<.05), and a 1.6 percentage point	Mean (SD) hprd 1987 compared to 1993: RN hprd increased 18% from 0.26 (0.22) to 0.30 (0.25); LPN hprd increased 30% from 0.46 (0.23) to 0.60 (0.26); NA hprd increased 24% from 1.61 (0.69) to 1.99 (0.58)

Study citation	Summary of Findings	Staffing Measures & Results
	increase in the catheter rate (p<.01). An increase in 1 NA hprd was associated with a significant decrease in pressure ulcers (0.3 percentage points, p<.05) and physical restraints (1.1 percentage points, p<.05). Suspecting a nonlinear relationship between staffing and quality, the researchers isolated the model to nursing homes among the lowest quartile of the RN, LPN, or NA staffing measures. Within this model, they found that an increase in 1 RN hprd was associated with a 12.8 percentage point decline in the physical restraint rate (p<.01). Likewise, an additional 1 LPN hprd was associated with a 1.6 percentage point decline in pressure ulcers, (p<.1). However, an additional 1 LPN hprd was also associated with a 2.4 percentage point increase in the catheter rate (p<.05). Last, an additional 1 NA hprd was associated with a 5.7 percentage point decline in the physical restraint rate (p<.001).	

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