Examination of the Association between Voluntary Accreditation and Resident Safety in Ontario Long Term Care Homes

By

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A thesis submitted in conformity with the requirements for the degree of M.Sc
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Abstract

Objective: determine whether accreditation through Accreditation Canada is associated with more favorable resident safety in Ontario LTC homes and which facility characteristics are predictive of accreditation. Methods: logistic regression was used to determine predictors of accreditation. To examine the association between accreditation and safety, safety was operationalized as five MDS-RAI quality indicators: prevalence of falls, restraints, catheters, pressure ulcers, and infections. Separate multivariable models were developed for each indicator. Results: the odds of accreditation were approximately six times smaller for municipal (p < 0.001) and non-profit facilities (p < 0.001) relative to for-profits; three times greater for chains relative to non-chains (p < 0.001); and twice as large for urban relative to rural facilities (p = 0.04). Of the five quality indicators examined, only one (falls) was associated with accreditation. After adjusting for confounders, accredited homes were estimated to have 8% lower fall rates than non-accredited homes (p = 0.01).
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Chapter 1: Introduction

1.1 Importance of this Research

Recent studies and government reports have raised concerns regarding the adequacy of safety and risk prevention measures in Canadian health care institutions (Health Quality Ontario, 2011; Baker, Norton, Flintoft, Blais, Brown, Cox, et al., 2004; Husak, Marcuzzi, Herring, Wen, Yin, Capan, & Cernat, 2010; CIHI, 2008a; CIHI, 2008b; Baker & Norton, 2002; CIHI, 2004). Such risks are potentially greater in long term care (LTC) homes, where residents with impaired cognition and self-care abilities are less able to independently control their own safety (Handler, Wright, Ruby, & Hanlon, 2006; Institute of Medicine, 2004). In Canada, although only a small proportion of older adults reside in LTC homes (18% of those ≥ 80 years), the majority of these individuals have needs in multiple domains at severity levels generally well above those seen in community settings (McGregor et al., 2005; Hirdes, Mitchell, Maxwell, & White, 2011). As expected growth in the prevalence of dementia is projected to lead to a tenfold increase in the demand for LTC over the coming years (Alzheimer Society of Canada, 2011), safety concerns in this vulnerable population will likely remain prominent.

Among the primary barriers to success of quality and safety initiatives is the perceived lack of a consistent external force or driver for continuous improvement (Ferlie & Shortell, 2001). This study assesses whether voluntary accreditation through Accreditation Canada may represent this needed stimulus for improvement. As no previous studies have examined Accreditation Canada’s impact on health outcomes or in LTC institutions specifically, this research represents a novel contribution to the literature. Furthermore, examining the impact of accreditation is important, as many resources are expended in preparation for accreditation surveys and policy makers ought to assess whether the
process adds sufficient value to justify its associated costs. Such analyses can also inform accrediting bodies and facilitate their refinement of standards over time.

In addition to examining the five resident safety variables of interest, the present study seeks to determine whether select organizational variables (facility ownership, chain membership, location, and size) predict facility accreditation. Examination of these variables is important, as it could reveal disparities in LTC homes’ desire or ability to pursue accreditation. As previous studies in other jurisdictions have identified resource shortfalls as a barrier to pursuing accreditation for some organizations (Casey, & Klingner, 2000; Brasure, Stensland, & Wellever, 2000), such comparisons have important health policy implications. Indeed, one literature review concluded that significant challenges to attaining accreditation exist for many organizations that could likely benefit most from the process (Mays, 2004). To prevent inequalities in organizations’ capabilities of pursuing accreditation, policy makers may need to consider new initiatives that reduce barriers for facilities that lack sufficient resources.

1.2 Objectives

The objectives of this study were as follows:

Research Question I: To examine whether four organizational characteristics of interest (facility ownership, chain membership, location, and size) are predictors of LTC home accreditation in Ontario.

Research Question II: To examine whether voluntary accreditation (through Accreditation Canada) is associated with more favourable resident safety in Ontario LTC homes, represented by five areas of care: prevalence of falls, restraints, catheters, pressure ulcers, and infections.
1.3 Long-Term Care in Ontario

There are presently 634 LTC homes operating in the province of Ontario. These facilities provide services to individuals who require high levels of assistance with personal care, 24 hour nursing care, and supervision in a secure environment (Ontario Ministry of Health, 2012a). Services provided include restorative and palliative care, dementia care, and behavioural supports. Short-term respite and convalescent care are also available in a limited number of facilities, however the vast majority of LTC home beds in the province (97%) are for long stay residents (i.e. those with length of stay ≥ 90 days) (LTC Innovation Expert Panel, 2012). Most LTC home residents are frail elderly individuals nearing the end of life, with many having severely reduced physical function, behavioural problems, and impaired cognition. Levels of functional impairment have steadily increased over the past several years in this setting (Hillmer, 2008).

Individuals who receive care in LTC homes generally have lower levels of acuity than those receiving care in hospitals, although there is some overlap in the services provided. Individuals with greater care requirements categorized as “special care”, “extensive services”, or “clinically complex” in the Resource Utilization group III (RUG-III) system typically receive care in complex continuing care facilities or chronic units within hospitals rather than in LTC homes (Berta, Laporte, & Valdmanis, 2005). Individuals that need only moderate levels of personal support without 24 hour nursing care either reside in retirement homes or remain at home with assistance from home or community support services (Ontario Ministry of Health, 2012a).

Eligibility for LTC home placement is determined by single-entry assessments performed at community care access centres (CCACs) throughout the province. Wait times for placement are relatively lengthy – averaging over 2 months in many regions (Health Quality Ontario, 2012a). Although Ontario LTC facilities are generally stand-alone
institutions, some homes are affiliated with or located within hospitals. Approximately three quarters of homes in Ontario are part of either a chain or health system network (i.e. network of municipal homes or local health system). With respect to for-profit homes, there are 32 different for-profit chains operating in the province, with the largest 4 chains accounting for about half of all for-profit chain facilities (based on primary data collected by the author). In terms of staffing, the average home has a director of nursing care, an on-call physician who is medical director, and a core team of nurses, part-time allied health professionals and unregulated workers who provide much of the hands on care (LTC Innovation Expert Panel, 2012).

Each municipality in Ontario, either on their own or in partnership with a neighbouring municipality, is legally required to operate at least one LTC home (OANHSS, 2008). LTC facilities in Ontario may be owned by for profit-corporations, municipal governments, or non-profit charitable, religious, or lay organizations. Until recently, these different ownership types were subject to three separate acts of legislation governing their respective LTC facilities. Effective July of 2010, the Long Term Care Homes Act sought to harmonize these separate acts and introduce new standards of care. Compliance with this legislation and additional requirements laid out in the Long-Term Care Facility Program Manual is overseen by the Ministry through annual facility inspections (Berta, Laporte, & Kachan, 2010).

Ontario spends approximately $3.4 billion annually on care for close to 80,000 LTC home residents, accounting for 7.5% of the provincial health budget (LTC Innovation Expert Panel, 2012). LTC facility funds are stringently controlled through allocation into three rigid envelopes: nursing and personal care, programming and support services, and accommodation. Funds from the nursing and personal support envelope are restricted for use in direct care staffing salaries and the purchase of nursing supplies and equipment. The funding level for this envelope is adjusted according to the case mix within a facility. Funds from the programming and support services envelope are restricted for use in recreational
programs, physiotherapy, occupational therapy, and support services staff salaries. Finally, the accommodation envelope is intended to cover costs related to food and accommodation. This differs from the other two envelopes in that it is comprised of both government payments and resident co-payments (Ontario Ministry of Health, 2007b). At the end of each year a reconciliation takes place, such that any unspent funds in the nursing and personal care or programming and support services envelopes are returned to the Ministry. Conversely, any expenditure in these areas that exceeds the provincial envelope is not reimbursed by the province. The accommodation envelope represents the only area where facilities are permitted to retain surplus provincial funds. LTC facilities are permitted to charge residents for select services such as transportation, cable television, hairdressing, and telephones. Other sources of revenue include fundraising and supplemental funds from municipal budgets for municipally owned homes (Hillmer, 2008).

**1.4 Quality & Patient Safety in Long Term Care**

As LTC homes are responsible for both medical and social aspects of resident care, the concept of quality in LTC is considered to be multidimensional in nature (Morris, Moore, Jones, Mor, Angelelli, Berg, Hale, et al, 2003). Although the appropriateness of medical care is one of the most frequently studied aspects of quality in LTC (Sainfort, Ramsay, & Monato, 1995) other diverse areas, such as maximization of functional independence, maintenance of resident dignity, and provision of meaningful opportunities for social interaction are also important components of quality in this setting (Glass, 1991; Kane, Kling, Bershadsky, Kane, Giles, et al, 2003).

The concept of safety is a narrower construct that exists within the larger realm of quality, where safety in health care is generally defined as freedom from accidental injury (Institute of Medicine, 1999). When a patient experiences an unintended, undesirable
change in health caused by their care, this is known as an adverse event in the patient
safety literature (US Department of Health & Human Services, 2010; Davies, Hoffman, &
Hebert, 2003). Adverse events are considered preventable when they are due to a medical
error (Baker, Norton, Flintoft, et al, 2004), where a medical error can include failure to
recognize an early warning sign, failure to provide care that is consistent with the best
available evidence, or provision of care that is known to cause harm (Elder, Vonder Meulen,
& Cassedy, 2004; Leape, Lawthers, Brennan, & Johnson 1993). Safety related outcomes in
LTC are generally those considered to be largely preventable through close monitoring of
risk factors at critical points in resident care (Scott-Cawiezell & Vogelsmeier, 2006).
Therefore, a key dimension of safety in LTC is the use of a set of processes to identify,
evaluate, and minimize risk (Institute of Medicine, 1999). Five areas of resident care felt to
be amenable to such risk reduction in LTC include: (1) falls, (2) restraints, (3) catheters, (4)
pressure ulcers, and (5) infections. These measures have been studied extensively and are
generally felt to represent resident safety in LTC (Wagner & Rust, 2008; Scott-Cawiezell &
Vogelsmeier, 2006; Gruneir & Mor, 2008; Health Quality Ontario, 2011; Canadian Patient
Safety Institute, 2012; WHO, 2009; MacLaurin & McConell, 2011; The Joint Commission,
2012; Accreditation Canada, 2012a).

1.5 Accreditation & Patient Safety

As accreditation is a multi-component intervention, it has the potential to influence
care practices within institutions through a variety of different mechanisms. Some aspects of
accreditation are thought to function as control systems (Paccioni, Sicotte, & Champagne,
2008; Touati & Pomey, 2009), where these systems create alignment around organizational
goals among the many parts of the organization (Wilkes, Srinivasan, & Flamholtz, 2005).
Such control systems can therefore promote coordination across departments and are
ultimately meant to reduce errors through enhancing communication (Stoner et al., 1995; Turner & Makhija, 2006; Veliyath, Hermanson, & Hermanson, 1997). There are two types of control systems thought to be involved in accreditation programs: a type of formal control, known as bureaucratic control, and an informal type of control known as cultural control (Ouchi, 1979; Paccioni, Sicotte, & Champagne, 2008; Touati & Pomey, 2009). Bureaucratic controls include the standardization of operating procedures, formalization of rules, clear articulation of job responsibilities, and development of client record systems that control the collection of information on clients served and the nature of services provided (Jaeger & Baliga, 1985; Nonaka & Takeuchi, 1995; Sitkin & Roth, 1993; Broskowski, 1984). These control systems have the potential to minimize safety risks in LTC through reducing variation in care processes and standardizing communication through documentation.

Accreditation involves aspects of cultural control that have the potential to influence resident safety to the extent that these practices promote a "culture of safety" within organizations, where an organization’s members deem safety to be important and efforts to improve safety are encouraged. It is believed that patient safety improvements can only be successful in organizations where such a pre-existing culture exists (Institute of Medicine, 2001). Cultural controls involve a socialization of individuals within the organization by promoting a set of uniform cultural values and expectations (Ouchi, 1979). Socialization is the learning process through which organizations inculcate their members with values, beliefs, and norms. The nature of these relationships and the strength of group pressures for compliance can be strong forces in shaping behaviour (Tosi, 1983). Accreditation Canada standards require accredited organizations to employ these strategies through the explicit dissemination of organizational values that include patient safety as a strategic priority (Accreditation Canada, 2011b; Accreditation Canada, 2011a). Furthermore, a safety culture survey that assesses the overall priority given to patient safety within an organization is administered regularly in accredited institutions (Accreditation Canada, 2011a).
Accreditation also has the potential to influence resident safety through organizational learning. There is empirical evidence to suggest that accreditation promotes this type of learning (Pagliarulo, 1986; Baldi, 2000; Gluck, 2001; Grachek, 2002; Montagu, 2003; Shaw, 2003; Mays, 2004; Pomey, 2005; Newhouse, 2006; René, 2006; Beaumont, 2008; Greenfield & Braithwaite, 2008; Touati & Pomey, 2009; Hahn Severance, 2009). Specifically, a “spill-over effect”, has been observed in some studies, whereby the accreditation of one service helps to improve the performance of other service areas (Peter, Rotz, Blair, Khine, Freeman, & Murtagh, 2010; Baskind, Kodorowicz, & Chaplin, 2010).

Accreditation is known to introduce continuous quality improvement (CQI) processes into organizations (Pomey et al., 2010), which are thought to facilitate learning about the link between operating processes and organizational performance (Oliver, 2009; Anand, Ward, Tatikonda, & Schilling, 2009; Linderman, Schroeder, Zaheer, Liedtke, & Choo, 2004). It is likely that LTC homes could benefit from such capacity building, as one review noted there has been minimal CQI activity in most LTC homes to date (Scott-Cawiezell & Vogelsmeier, 2006). Although there has been little research on CQI in LTC, one US study reported that LTC homes with active CQI programs demonstrated better performance in some resident safety outcomes (Rantz, Hicks, Grando, Petroski, Madsen, Mehr, et al, 2004).

Studies to date have characterised the organizational climate in many LTC homes as a “culture of blame and distrust”, where staff may fear being ridiculed or punished when speaking openly about errors (Scott-Cawiezell, 2006; Kapp, 2003). This type of environment is not believed to be conducive to learning from past failures (Tucker & Edmonson, 2003; Deming, 1982). Promotion of the analysis of adverse events and “near misses” is a means through which organizational learning approaches in accreditation are likely to influence patient safety. Accreditation Canada standards require institutions to implement procedures establishing the reporting of adverse events and near misses, the creation of an interdisciplinary group to investigate adverse events, and the use of findings from these
investigations to inform improvements in care (Accreditation Canada, 2011c). The promotion of a non-punitive response to error represents an important distinction between accreditation and traditional regulatory approaches to improving quality and safety in health care. While a non-punitive response to error is considered to facilitate improvements in patient safety (Institute of Medicine, 1999), the more punitive response to error that characterizes traditional regulatory compliance approaches is thought to be counterproductive (Gruneir & Mor, 2008; Kapp, 2003). When continuous quality improvement is enforced rather than voluntarily adopted, it risks being perceived as a mechanism for external control rather than an opportunity for organizational learning (Pomey, François, Contandriopoulos, Tosh, & Bertrand, 2005).

1.6 Accreditation in Ontario Long-Term Care Institutions

There are presently two organizations that accredit LTC homes in Ontario: Accreditation Canada (AC) and the Commission on Accreditation of Rehabilitation Facilities (CARF); and one organization that accredits retirement homes in Ontario: the Ontario Retirement Communities Association (ORCA) (note that Accreditation Canada alone is the focus of this research - information on other accreditors is provided for context). Accreditation Canada (formerly known as the Canadian Council on Health Services Accreditation) is an independent non-profit organization that has been granting accreditation to health care institutions since 1958 (Accreditation Canada, 2012b). LTC facilities represent the single largest category of institution undergoing accreditation through Accreditation Canada (Accreditation Canada, 2010a). Like other accreditation organizations, the Accreditation Canada process is an external peer review system that assesses service quality through evaluating institutions’ compliance with a series of evidence based standards. The decision to grant or withhold accreditation takes place in three year cycles, during which
organizations perform self-assessments against accreditation standards and are provided with supports to assist in developing required processes. These activities culminate in an on-site survey lasting 3 to 5 days, where external assessors evaluate an organization’s compliance with the accreditation standards and their progress towards meeting self-identified areas for improvement (Accreditation Canada, 2012c). On-site surveys typically involve direct observation of operations, review of written policies and procedures, review of administrative and clinical records, and interviews with employees and clients (Mays, 2004).

Patient safety is an integral component of the Accreditation Canada program, as AC has had a particularly strong focus on patient safety in recent years and sets specific patient safety goals that all accredited organizations are intended to meet (Accreditation Canada, 2009; Accreditation Canada, 2012d). These goals include the cultivation of a culture of safety within organizations, improvement of the effectiveness and coordination of communication among providers, and reducing the risk of health care acquired infections (Accreditation Canada, 2012a). In addition to enforcing standards that directly address patient safety, Accreditation Canada has included a number of patient safety areas in its “Required Organizational Practices” (ROPs), where compliance with these ROPs is intended to have a direct impact on whether a facility is granted accreditation status. Required organizational practices include adverse events reporting and disclosure procedures, application of verification processes to high risk activities, and the implementation of risk assessment processes for selected clinical conditions, including falls and pressure ulcers (Accreditation Canada, 2011a). Furthermore, the accreditation standards require an institution’s leaders to identify patient safety goals for the organization and provide the resources necessary to achieve those goals. Organizations are directed to develop a client safety plan, assign responsibility for implementing the plan, and provide their governing body with regular reports on patient safety (Myers, 2012).
The Commission on Accreditation of Rehabilitation Facilities (CARF) is an independent, non-profit accreditor of healthcare providers and networks of various types of rehabilitation programs. In addition to medical rehabilitation programs, CARF also accredits nursing homes along with dementia and stroke care specialty programs (CARF, 2012). Facilities seeking CARF accreditation are required to meet program specific standards as well as more general organizational standards pertaining to accessibility, information management, performance improvement, and human resources (Robinson, 2006). Standards primarily reflect structure and process aspects of programs and services (DeLisa, Gans, Walsh, et al., 2005), however providers are required to measure patient care outcomes as a means of assessing service quality (Robinson, 2006). In general, organizations are expected to promote patient involvement in care and placement related decisions and learn to self-evaluate their practices through the accreditation process (Hare, 2009; DeLisa, Gans, Walsh, et al., 2005). To receive and maintain accreditation, homes must undergo on-site surveys every one to three years conducted by medical rehabilitation specialists currently working in the field (CARF 2012; Robinson, 2006). Surveyors generally tour the facility and review documentation, looking for consistency in policies, procedures, protocols, and programs and how these coincide with CARF standards and care outcomes. Patients and families are interviewed to assess how standards are applied (Hare, 2009).

The Ontario Retirement Communities Association (ORCA) is a non-profit voluntary professional association that sets professional operating standards and accredits retirement homes in Ontario (ORCA, 2012). ORCA presently accredits approximately 70% of retirement homes in the province. Although the organization was established in 1977, it has only been accrediting retirement homes since 1992. Unlike the other two LTC accreditors in the province, ORCA also serves a dual role as advocate for the retirement home industry. Areas of focus in ORCA’s accreditation standards include: quality of care, safety and security, emergency planning, building and property maintenance, and recreation.
Compliance with standards is assessed through a peer review inspection system (similar to CARF and Accreditation Canada) (ORCA, 2010). A major current focus of ORCA is to support retirement homes in implementing the requirements of the recently enacted Retirement Homes Act (ORCA, 2012).

1.7 Previous Research on Accreditation Canada

Although Accreditation Canada has been accrediting Canadian health care institutions for over 50 years (Accreditation Canada, 2012b), to date there have been no studies examining its impact on health outcomes or in LTC institutions specifically. An initial series of studies on Accreditation Canada in Quebec hospitals observed that the introduction of revised AC standards in 1995 appeared to facilitate a shift in the focus of quality programs from “quality assurance” to “continuous quality improvement” [Lozeau (1996, 2002) and Francois (2001) in Pomey, Contandriopoulos, Francois, & Bertrand, 2004]. Further research on Accreditation Canada in acute care institutions noted that accreditation was associated with improvements in some communication processes, as well as the setting of institutional goals and performance measurement activities - although the utility of many performance measures produced was questioned [Beaumont (2002) in Pomey et al., 2004; Lemieux-Charles, McGuire, Champagne, Barnsley, Cole, & Sicotte, 2003; Lemieux-Charles, Gault, Champagne, Barnsley, Trabut, Sicotte, & Zitner, 2000]. Some improvements in select clinical practices were also noted, albeit to a lesser extent than in other areas [Beaumont (2002) in Pomey et al., 2004]. A subsequent 2008 study in primary care institutions revealed that although the Accreditation Canada process appeared to foster consultation activities in self-assessment teams, it had little effect on the perceptions of employees not directly involved in the process (Paccioni, Sicotte, & Champagne, 2008). Finally, the most recent study on Accreditation Canada, examining hospitals and regional health authorities, noted...
that the accreditation process assisted with introducing continuous quality improvement programs to newly accredited organizations – although motivation to introduce accreditation related changes declined over time (Pomey, Lemieux-Charles, Champagne, Angus, Shabah, & Contandriopoulos, 2010).

1.8 Previous Research on Accreditation in Long Term Care

Relatively little research has examined accreditation in the LTC setting – most studies that have done so examined accreditation by the Joint Commission in US LTC homes. Two of these studies noted that Joint Commission accredited LTC homes had fewer government inspection citations (Wagner, McDonald, & Castle, 2012a; LTQ Inc., 2002). One Australian study reported that providers in Australian LTC homes were generally supportive of accreditation as opposed to the previous government inspection system, however there were some concerns regarding a perceived lack of consistency among surveyors and insufficient guidance provided by the accrediting agency (Grenade, 2003). Another study examining patient safety culture in LTC found that Joint Commission accredited LTC homes had a more favourable safety culture than did non-accredited homes (Wagner, McDonald, & Castle, 2012b). Finally, three US studies examining care processes and outcomes found that residents in Joint Commission accredited LTC homes were less likely to be prescribed inappropriate medications, hospitalized, physically restrained, or develop pressure ulcers, (Lau, Kasper, Potter, & Lyles, 2004; Kang, Meng, & Miller, 2011; Wagner, McDonald, & Castle, 2012c).

Based on these studies, there is clearly potential for accreditation to improve resident safety in Ontario LTC homes. However, there are some important differences between how LTC is funded, delivered, and governed in Ontario compared to other jurisdictions that may affect the outcomes of accreditation programs. Similarly, accreditation standards and
enforcement practices differ between Accreditation Canada and other accreditors. Therefore, it cannot be assumed that the effects of accreditation in Ontario LTC homes will be the same as those observed in other regions.

1.9 Theoretical Framework

This research uses Donabedian’s model for quality of care as a theoretical framework. Donabedian (1966) proposed that quality could be measured in terms of structures, processes, and outcomes. Structural measures are the organizational characteristics associated with the provision of care. Process measures are aspects of procedures done to or for patients. Outcome measures are the desired states that one would (or would not) aim to achieve for a patient. Donabedian theorized that quality in structural measures will influence or determine quality in process measures – which in turn will influence or determine the quality of outcomes observed (Donabedian, 1988). Others have extended this reasoning to conclude that; for a model intended to measure quality to be sufficiently comprehensive, it should include measures from all three of Donabedian’s categories (Sainfort, Ramsay, & Monato, 1995; Zimmerman & Karon, 1997; Ramsay, Sainfort, & Zimmerman, 1995). In the present study, structural measures are represented by the organizational variables facility ownership, chain membership, location (e.g. urban vs. rural), and size; process measures are represented by the variables catheter use and restraint use; and outcome measures are represented by the variables falls, pressure ulcers, and infections. Rationales for the selection of these variables are provided in the following paragraphs.
1.10 Rationale for Selection of Organizational Characteristics

In addition to accreditation status, several organizational characteristics that are properties of the environment or of LTC homes themselves have the potential to influence resident safety outcomes. There is a general consensus in the US literature that for-profit LTC homes tend to provide lower quality of care (on average) than non-profits (Comondore, Devereaux, Zhou, Stone, Busse, Ravindran, Burns et al., 2009; Amirkhanyan, Kim, & Lambright, 2008; Aaronson, Zinn, & Rosko, 1994; Harrington, Woolhandler, Mullan, Carrillo, & Himmelstein, 2001; Castle, Handler, Engberg, & Sonon, 2007). Ownership status has not been studied extensively in Canada, although existing studies have noted that Canadian for-profit LTC homes had higher hospitalization rates for some conditions, lower staffing levels, and lower quality scores on a measure of aggregate quality than other ownership categories (Hillmer, 2008; McGregor, Tate, McGrail, Ronald, Broemeling, & Cohen, 2006; Bravo, De Wals, Dubois, & Charpentier, 1999; McGregor, Cohen, McGrail, et al, 2005).

Observed disparities in quality between for-profit and non-profit institutions are often attributed to the fact that for-profit institutions have strict return on investment criteria, and thus are less likely to permit the allocation of resources to areas that are not perceived to be profitable (Guggenheimer, 1988; Hillmer, 2008). This could potentially involve restrictions on patient safety related investments, if such investments are not perceived to be profitable. In contrast, non-profit institutions are not accountable to investors seeking a financial return (Seay & Vladeck, 1988) and are thought to serve broad societal interests (Guggenheimer, 1988), which would be expected to include patient safety. However, differences between the operating practices of for-profit verses non-profit LTC homes are likely less pronounced in Ontario than in most US states, as the Ontario Ministry of Health has rigid funding envelopes dictating which areas distributed funds can be spent in and each facility receives
the same level of funding per resident according to case mix (Ontario Ministry of Health, 2010; Ontario Ministry of Health, 2012).

As non-profit LTC homes can often rely on volunteer workers to provide care in conjunction with regularly paid staff, such operational efficiencies may enable the staff in these homes to direct more time and effort towards the provision of higher quality care (Berta, Laporte, & Kachan, 2010; Cherry, 1993). Indeed, staffing levels in Canadian LTC homes are known to differ according to facility ownership (McGregor et al, 2005, OANHSS, 2010). There is thus potential for the resident safety variables of interest (most of which are considered to be nursing care sensitive) to differ between facility ownership types (Ouslander & Schnelle, 1995; Smith, Bennett, Bradley, et al, 2008).

With respect to municipal homes, municipalities are mandated by Ontario provincial legislation to operate at least one LTC home (OANHSS, 2008). While this may not present much difficulty for municipalities with sufficient resources, other less availed municipalities may struggle to support the costs of operating a LTC home. Beyond provincial payouts, revenue sources for municipalities are limited to property taxes, business taxes, licence fees, and development charges (Donkersgoed, 2003). Reports in the media have claimed that some municipalities (especially rural municipalities) are over-extended and under-resourced (Brennan, 2005; Donkersgoed, 2003; Walls, 2001; Wright, 2007). To the extent that quality of care is dependent on financial resources, municipal LTC homes may be at a disadvantage. Indeed, one recent study of Ontario LTC homes found that municipal homes were less likely to be engaged in quality improvement activities (Wodchis, Burns, Berta, McGilton, Tourangeau, Ceccato, Montgomery, et al., 2010).

Literature examining the relationship between chain membership and quality of care in LTC homes is less consistent, thus there does not appear to be a consensus on the effect of chain membership (Wagner, McDonald, & Castle, 2012d; Castle, Wagner, Ferguson, & Handler, 2010; Mueller, Arling, Kane, Bershadsky, Holland, & Joy, 2006; McDonald, Wagner,
& Castle, 2013; Castle & Fogel, 1998). It has been proposed that chain members may be able to achieve greater economies of scale, by which the purchasing of equipment and supplies may become less expensive (Amirkhanyan et al., 2008). These cost savings may then be transferred to support other objectives which could involve patient safety, such as the purchase of special mattresses that help prevent pressure ulcers or the hiring of additional staff. It is possible that LTC homes with more capital may be able to produce superior resident safety outcomes if those outcomes are cost-dependant. There is empirical evidence to support the contention that chain members tend to have lower operating costs (Kitchener, O’neill, & Harrington, 2005; McKay, 1991), although others have found that this is not always true (McKay, 1991). Alternatively, it has been proposed that chain LTC homes have different business models from non-chain homes, where chaining is a practice used by firms to implement the “shareholder value” concept of control. This concept involves prioritizing increasing returns on assets to escalate profits and stock prices while subjugating all other goals (presumably including resident safety) (Kitchener, O’Meara, Brody, Lee, & Harrington, 2008).

Although some studies have found that LTC homes in rural locations provide lower quality care than homes located in urban areas, there is generally no consensus in the literature about the effect of rural location. (Towsley, 2007; Kang, Meng, & Miller, 2011; Buchanan, Wang, Zhu, & Kim, 2004; Phillips, C., Holan, S., Sherman, M., Williams, M., Hawes, C., et al., 2004; Challa, Sharkey, Chen, & Phillips, 2007; Sawyer, Lillis, Bodner, & Allman, 2007). As residents in rural homes tend to have less access to specialized services (Mitka, 2003; Buchanan, Wang, Zhu, & Kim, 2004; Dobalian, Tsao, & Radcliff, 2003), it is possible that rural location may have a negative impact on resident safety domains that rely on specialized services. There is potential for nursing home residents residing in rural homes to experience a greater number of falls if there is less access to rehabilitation and physiotherapy services in rural areas, as it has been suggested that such services may help
prevent falls in the elderly (Gruneir et al., 2010). Similarly, if access to nutritionist professionals is reduced in rural areas, residents in rural homes may be at greater risk for pressure ulcers and other infections, which are known to be associated with poor nutrition (Smith, Bennett, Bradley, et al., 2008; Rosenthal, Williams, & Naughton, 2006). Many rural areas in Canada also tend to have shortages of health professionals (Tepper, Schultz, Rothwell, & Chan, 2006; CIHI, 2002), which may make it more difficult for rural LTC homes to provide safe resident care (Berta, Laporte, & Kachan, 2010).

With respect to facility size, in hospitals larger size has been associated with a less favourable patient safety culture and higher rates of some adverse events (Thornlow & Merwin, 2009; Sorra, Famolaro, Dyer, et al, 2010; Sorra, Famolaro, Dyer, et al, 2009). Smaller LTC home size has been associated with less deficiency citations and better care outcomes in many studies (McDonald, Wagner, & Castle, 2012d; Rantz, Hicks, Grando, Pertoski, Madsen, Mehr, et al, 2004; Wagner, McDonald, & Castle, 2012). However, there are other studies that have found the opposite effect (Feng, Hirdes, Smith, Finne-Soveri, Chi, Du Pasquier, et al, 2009; Zinn, Mor, Feng, & Intrator, 2009; McDonald, Wagner, & Castle, 2013).

Increased complexities in multidisciplinary communication among a greater number of providers in large institutions may predispose such institutions to poor safety outcomes. Similarly, patient contact with a greater number of staff in larger institutions may cause greater exposure to infectious agents (Thornlow & Merwin, 2009). Alternatively, some researchers have theorized that smaller LTC homes are able to provide superior care through placing a greater emphasis on quality of communication, sense of teamwork, and specific expectations of staff members (Lucas et al., 2007). Others have reasoned that small LTC homes may be better at creating more intimate, nurturing environments that facilitate interaction between staff and residents (Amirkhanyan, Kim, & Lambright, 2008; Lucas et al., 2007; Berta, Laporte, & Kachan, 2010). It is possible that this type of setting may produce
better safety outcomes through promoting more individualized care and greater resident-staff interaction.

1.11 Rationale for Selection of Process Measures of Quality

Although physical restraints have been used for many decades in LTC, it has been known for some time that these devices are associated with substantial risks. Among other ill health effects, restrained residents have an increased likelihood of physical decline and the development of pressure ulcers (Engberg, Castle, & McCaffrey, 2008; Castle & Engberg, 2009). Moreover, physical restraint use in older adults has been associated with adverse events such as falls and even death through strangulation (Hamers & Huizing, 2005; Castle & Engberg, 2009). Although established alternatives to restraints have been developed, many providers still lack an understanding of such alternatives and have not received formal training on their application (Hoffmann, 2010). One recent international study found that the use of physical restraints had a higher prevalence in Canadian LTC institutions than in any other country examined (Feng, Hirdes, Smith, Finne-Soveri, Chi, Du Pasquier, et al., 2009). The prevalence of residents who are restrained daily in Ontario LTC homes is currently estimated to be approximately 17% (Health Quality Ontario, 2012a).

Urinary tract infections are common in older adults and may lead to more severe infections, decreased functional status, and delirium (Richards, 2004; Nicolle, Bradley, Colgan, Rice, Schaeffer, Hooton, et al, 2005; Ouslander & Schnelle, 1995). Indwelling urinary catheters are the greatest risk factor for such infections in institutionalized older adults, thus guidelines recommend limiting their use (Nicolle, 2009; Gardam, Amihod, Orenstein, Consolacion, & Miller, 1998; Nicolle, Strausbaugh, & Garibaldi, 1996; Smith, 1985; Smith, Bennett, Bradley, Drinka, Lautenbach, Marx, Mody, et al, 2008). It is thought that some facilities may apply catheters for nonclinical reasons, such as perceived labor cost
savings (Arling, Karon, Sainfort, Zimmerman, & Ross, 1997). Although catheters are often used to manage incontinence in LTC, continence management programs and bladder training are considered effective alternatives to the chronic use of urinary catheters (Richards, 2007; American Medical Directors Association, 2006; Ouslander & Schnelle, 1995). The prevalence of residents with a long term urinary catheter in Ontario LTC homes is currently estimated to be approximately 3% (over a duration of 3 months) (Health Quality Ontario, 2012a).

1.12 Rationale for Selection of Outcome Measures of Quality

Falls may lead to injuries, fractures or death and are the most frequent reason for emergency department visits in Ontario LTC home residents (Gruneir, Bell, Bronskill, Schull, Anderson, & Rochon, 2010). Although previously considered an inevitable consequence of declining functional ability, falls are now viewed as the result of multiple potentially modifiable risk factors (American Geriatrics Society, 2010; Morse, 2006). Several studies have demonstrated reduced fall rates in LTC homes through multifactorial interventions involving targeted risk assessment, medication review, exercise programs, environmental modification, and the use of mobility aids (Neyens, Dijks, Twisk, Schols, van Haastregt, van den Heuvel, & de Witte, 2009; Jensen, Nyberg, Gustafson, et al, 2003; Becker, Kron, Lindemann, Sturm, Eichner, Walter-Jung, & Nikolaus, 2003). A recent study in Ontario LTC homes noted that many residents with a history of falls either had no fall prevention interventions documented in their care plan or these planned prevention activities were never carried out (Wagner, Dionne, Zive, & Rochon, 2011). The prevalence of Ontario LTC residents with a recent fall (within the past 30 days) is reported to be 14% and Health Quality Ontario reports that the number of emergency department visits for falls among
residents have changed little in recent years (Health Quality Ontario, 2011; Health Quality Ontario, 2012a).

Complications from pressure ulcers are associated with considerable morbidity in older adults, including pain, infection, and in extreme cases death (Rosenthal, Williams, & Naughton, 2006; Smith, Bennett, Bradley, et al., 2008). It has been well established that pressure ulcers can be prevented through appropriate nutrition, incontinence care, pressure relieving mattresses, and the use of periodic re-positioning (Smith, Bennett, Bradley, et al., 2008). Although guidelines for the prevention of pressure ulcers exist, several studies have found that their implementation is not widespread in LTC homes (Wipke-Tevis, Williams, Rantz, Popejoy, Madsen, Petroski, & Vogelsmeier, 2004; Cullum, McInnes, & Bell-Syer, 2004; Saliba, Rubenstein, Simon, Hickey, Ferrel, Czarnowski, et al., 2003; Berlowitz, Young, Hickey, Saliba, Mittman, Czarnowski, et al., 2003). The prevalence of new stage two or greater pressure ulcers among Ontario LTC residents is estimated to be around 3% (over a 3 month period) (Health Quality Ontario, 2012a).

As part of the aging process, older adults have weakened immune systems that make them more vulnerable to pathogens, hence infections are a major cause of illness and death in long-term care (Castle, 2000; Strausbaugh & Joseph, 2000). Infections are an outcome measure that encompasses a wide range of infectious agents that are associated with different aetiologies and strategies for prevention. Recommended measures to prevent outbreaks of respiratory infections include surveillance activities, appropriate use of barrier precautions, and careful environmental cleaning (Simor, 2010; Smith, Bennett, Bradley, et al., 2008). A recent randomized controlled trial demonstrated that hand hygiene related interventions can also be effective at substantially reducing the incidence of such infections in LTC (Yeung, Tam, & Wong, 2011). With respect to urinary tract infections, there is evidence that provision of adequate fluid intake, consumption of cranberry products, regular voiding, daily perineal cleansing, and the use of appropriate incontinence absorbent
products can be effective in preventing these infections in older adults (Newman, 2006; Buhr, Genao, & White, 2011; Warren, 2001; Smith & Nicolle, 2001; Eckford, Keane, Lamond, Jackson, & Abrams, 1995). Previous research suggests that Canadian LTC facilities have widely varying infection prevention and control programs, which have generally been considered insufficient according to expert suggested resource and intensity levels (Wilkinson, Gravel, Taylor, McGeer, Simor, Suh, Moore, et al, 2011; Zoutman, Ford, & Gauthier, 2009; Morrison, 2004).

A recent study in Ontario found that pneumonia and urinary tract infections were the most frequent potentially preventable reasons for resident visits to emergency departments (Gruneir et al., 2010). There is currently no publicly available estimate on the prevalence of infections in Ontario LTC homes, although one study noted that nearly 300 respiratory infection outbreaks were reported by Ontario homes over a six month period (Eshaghi, Gubbay, Jamieson, Longtin, Low, & Marchand-Austin, 2010). The prevalence of urinary tract infections in Ontario LTC homes is estimated to be about 5% (over a duration of 3 months) (Health Quality Ontario, 2012a).

1.13 Hypotheses

**Research Question I: Which Organizational Characteristics are Predictive of Ontario LTC Home Accreditation?**

With respect to facility ownership, one previous study in a US sample of LTC homes found that accredited facilities were more likely to have non-profit ownership as opposed to for-profit ownership (Wagner, McDonald, & Castle, 2012a). This is consistent with the contention that for-profit facilities are more motivated to cut costs than to implement quality improvement innovations (Eggleston & Zeckhauser, 2002; Amirkhanyan, Kim & Lambright, 2008). In contrast, not-for-profit facilities are thought to prioritize care and reinvest revenues back into their facilities (Amirkhanyan, Kim & Lambright, 2008; Harrington, Zimmerman,
Karon, Robinson & Beutel, 2000), which may include investment in accreditation.

Furthermore, some non-profit organizations are able to raise additional revenue through fundraising (Banaszak-Holl, Zinn, & Mor, 1996), thus there is the possibility that this additional revenue may be used to pursue accreditation. With respect to municipal LTC homes, it has been contended that there are additional cost pressures on these homes (as discussed in the Theoretical Framework section) that do not act with the same degree of stringency on other ownership types. However, such cost-related effects are not likely to be as pronounced in Canada as in the US LTC sector*. Nevertheless, it is hypothesized that:

H1: Accreditation will be positively associated with non-profit ownership
H2: Accreditation will be negatively associated with for-profit and municipal ownership

To our knowledge there has not been any research studying the association between chain membership and accreditation. As discussed previously, chain members may be able to achieve greater economies of scale (Amirkhanyan et al., 2008). It is possible that some of the cost savings achieved through chain membership may be applied to the pursuit of accreditation. In addition, it has been theorized that interconnectedness facilitates the voluntary sharing of values and practices between institutions and promotes conformity to industry norms (DiMaggio & Powell, 1983; Pfeffer & Salancik, 1978). Such industry norms could reasonably include resident safety as a moral necessity and the sharing between chain members of the value perceived in accreditation. Indeed, subsidiaries must often adopt performance evaluations that are compatible with the policies of the parent corporation (DiMaggio & Powell, 1983). It is therefore hypothesized that:

H3: Accreditation will be positively associated with chain membership

Please refer to the “Rationale for Selection of Structural Measures of Quality” for a more detailed explanation of factors mitigating cost-related effects in Ontario.
With respect to geographic location, one previous US study noted that rural LTC homes were less likely to be accredited than urban homes (Kang, Meng, & Miller, 2011). A similar phenomenon was noted in studies on accreditation in US hospitals (Lutfiyya et al, 2009; Brasure, Stensland, & Wellever, 2000). When some rural health services organizations were asked why they do not participate in voluntary accreditation, they described issues related to costs and difficulties in meeting standards or collecting data (Casey, & Klingner, 2000; Brasure, Stensland, & Wellever, 2000). It is therefore hypothesized that:

H4: Accreditation will be positively associated with urban location

With respect to facility size, two previous studies of US and Australian LTC homes found that accredited facilities tend to be larger (Wagner, McDonald, & Castle, 2012a; Grachek, 2002). It is possible that larger facilities may be more financially capable of pursuing accreditation as they can achieve some economies of scale in caring for residents and command greater internal resources with larger administrative staffs to focus on strategic planning. In contrast, small LTC homes are less able to benefit from economies of scale and some previous studies suggest that they may be more limited in their abilities to innovate and adapt to environmental pressures (Harrington, Swan, & Carrillo, 2007; Banaszak-Holl, Zinn, & Mor, 1996). It is therefore hypothesized that:

H5: Accreditation will be positively associated with greater facility size
Research Question II: Is Accreditation Associated with Better Resident Safety in Ontario LTC Homes?

In addition to selecting the resident safety measures of interest according to previous research in LTC, measures were selected based on amenability of risk reduction practices to incorporation into standardized prevention protocols. Standardization of care practices is one primary mechanism through which accreditation is thought to exert its effects (Paccioni, Sicotte, & Champagne, 2008; Touati & Pomey, 2009), thus measures that have successfully been incorporated into preventative protocols (Hirdes, Mitchell, Maxwell, & White, 2011) were selected as the measures of interest. It is therefore hypothesized that all resident safety measures of interest (which are unfavourable outcomes) will be negatively associated with accreditation:

H6: Accreditation will be negatively associated with fall prevalence
H7: Accreditation will be negatively associated with restraint prevalence
H8: Accreditation will be negatively associated with catheter prevalence
H9: Accreditation will be negatively associated with pressure ulcer prevalence
H10: Accreditation will be negatively associated with infection prevalence

Indwelling urinary catheters are known to be the greatest risk factor for urinary tract infections in LTC (Nicolle, 2009; Gardam, Amihod, Orenstein, et al, 1998; Nicolle, Strausbaughr, & Garibaldi 1996; Smith, 1985; Smith, Bennett, Bradley, et al, 2008) and urinary tract infections are known to be the most prevalent site of infection in LTC (Smith, Bennett, Bradley, et al, 2008; Richards, 2004; Nicolle, Bradley, Colgan, Rice, Schaeffer, Hooton, et al, 2005; Ouslander & Schnelle, 1995). It is therefore hypothesized that:

H11: If accreditation is negatively associated with the prevalence of catheters, it will also be negatively associated with the prevalence of infections

Accreditation Canada’s Required Organizational Practices (ROPs) are prioritized accreditation standards for which facility compliance is intended to directly determine

*note that pneumonia is considered the most common infection in LTC when restrictive clinical definitions for urinary tract infection are applied
whether an institution is granted accreditation status (Accreditation Canada, 2011a). Not all resident safety measures of interest in this study correspond to an Accreditation Canada ROP – the ROPs include standards directed at the prevention of pressure ulcers, falls, and infections but there are no ROPs for restraints and catheters (Accreditation Canada, 2011a). Accreditation standards that relate to restraints and catheters are more general in nature (i.e. follow evidence based guidelines for infection control, generate an official policy on restraint use). It is therefore hypothesized that:

*H12: Accreditation will be more strongly (negatively) associated with QIs that relate directly to a Required Organizational Practice (falls, pressure ulcers, and infections) than to QIs that do not relate to a Required Organizational Practice (restraints and catheters)*
Chapter 2: Methods

2.1 Overview of Methods

This study sought to answer the following research questions:

I) Which of the four organizational characteristics of interest (facility ownership, chain membership, location, and size) are predictive of Ontario LTC Home accreditation?

II) Is voluntary accreditation (through Accreditation Canada) associated with better resident safety in Ontario LTC homes?

The analysis for research question I consisted of a binary logistic regression model with accreditation status as the dependent variable and the four organizational variables of interest (facility ownership, chain membership, location, and size) as independent variables. For research question II, resident safety outcomes were operationalized as a set of five Resident Assessment Instrument – Minimum Data Set (RAI-MDS) based quality indicators (QIs): prevalence of falls, restraints, catheters, pressure ulcers, and infections. To compare resident safety QIs between accredited and non accredited facilities, resident-level RAI-MDS data were aggregated to the facility level. The analysis for research question II consisted of generating five separate multivariable models to examine the association between accreditation and the prevalence of each QI, adjusting for organizational variables determined to be confounders. Negative binomial regression was used to generate these models. SPSS version 20 was used for all analyses. For all tests, statistical significance was defined as a p-value of ≤ 0.05. Research ethics board approval was obtained from the University of Toronto Office of Research Ethics prior to the conduct of this study.
2.2 Overview of Data Sources

The data examined in this research originated from a mandated clinical assessment protocol as well as some primary data collected from government databases and other directories. Table 1 below presents a summary of these data sources along with a description of which variables were obtained from each source and definitions for the variables.
### Table 1: Summary of Data Sources

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Variables Obtained</th>
<th>Variable Type</th>
<th>Operational Definitions</th>
<th>Year Data Collected</th>
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<tr>
<td>Ontario Ministry of Health Reports on LTC Homes</td>
<td>Accreditation status</td>
<td>Dependent variable in research question I; Independent variable in research question II</td>
<td>Accreditation by Accreditation Canada. Two categories: accredited and non-accredited</td>
<td>2009/2010 fiscal year</td>
</tr>
<tr>
<td>Ownership type</td>
<td>Independent variable in research question I; Confounder in research question II</td>
<td>Three categories: for-profit ownership; municipal ownership; and non-profit ownership (this category includes homes operated by a charitable or religious organization or a hospital)</td>
<td>2009/2010 fiscal year</td>
<td></td>
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<tr>
<td>Facility size</td>
<td>Independent variable in research question I; Confounder in research question II</td>
<td>Three categories: Small: 25-79 beds; Medium: 80-139 beds; Large: ≥ 140 beds</td>
<td>2009/2010 fiscal year</td>
<td></td>
</tr>
<tr>
<td>Statistics Canada Postal Code Conversions Files</td>
<td>Facility location</td>
<td>Independent variable in research question I; Confounder in research question II</td>
<td>Two categories: Rural: population centre with &lt; 30,000 residents; Urban: population centre with ≥ 30,000 residents</td>
<td>2006</td>
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<tr>
<td>OLTCA† Directory</td>
<td>Chain membership</td>
<td>Independent variable in research question I; Confounder in research question II</td>
<td>“Chain” was defined as an organization of any ownership type that operates more than one LTC home or is part of a broader health system. Two categories: chain and non-chain</td>
<td>2011</td>
</tr>
<tr>
<td>CARF‡ Directory of Accredited Facilities</td>
<td>CARF accreditation</td>
<td>Potential confounder in research question II</td>
<td>Accreditation by the Commission on Accreditation of Rehabilitation Facilities. Two categories: CARF accredited and non-CARF accredited</td>
<td>2011</td>
</tr>
<tr>
<td>RAI – MDS 2.0*</td>
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<td>See Table 2 for detailed operational definitions of each QI</td>
<td>2010</td>
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<td>Prevalence of physical restraints</td>
<td>Dependent variable in research question II</td>
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<td>Prevalence of urinary catheters</td>
<td>Dependent variable in research question II</td>
<td>2010</td>
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<tr>
<td>Prevalence of pressure ulcers</td>
<td>Dependent variable in research question II</td>
<td>2010</td>
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<tr>
<td>Prevalence of infections</td>
<td>Dependent variable in research question II</td>
<td>2010</td>
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</tbody>
</table>

† Ontario Long Term Care Association
‡ Commission on Accreditation of Rehabilitation Facilities
* The Resident Assessment Instrument – Minimum Data Set 2.0
2.3 Data Sources

Ontario Ministry of Health Reports on LTC Homes

The Ontario Ministry of Health and Long-Term Care maintains a database of LTC homes in the province called “Reports on LTC Homes”. The database came into existence as a legislated requirement of the 2007 Long Term Care Homes Act for the purposes of public disclosure and government accountability. Most of the information in the database is reported directly from LTC homes themselves, however data on accreditation status are provided by Accreditation Canada and the Commission on Accreditation of Rehabilitation Facilities (CARF). The information in this database is updated regularly (Ontario Ministry of Health, 2012b). The directory is publicly available online at: http://publicreporting.ltchomes.net/en-ca/default.aspx.

Variables: The following facility level data from the “Reports on LTC Homes” database were collected for use in this research: facility size (number of beds), postal code, accreditation status (by Accreditation Canada), and ownership type. These data corresponded to the 2009-2010 fiscal year. Two categories were used to classify accreditation status (by Accreditation Canada): “accredited” and “non-accredited”.

Three categories of facility ownership were used: for-profit, municipal, and non-profit. All proprietary homes operated as for-profit institutions by either an individual, a private organization or a corporation were coded as “for-profit”. All facilities operated by municipalities or their equivalents (cities or counties) were coded as “municipal”. All facilities owned and operated on a non-profit basis by either a voluntary lay entity, charity, religious organization, or hospital were coded as “non-profit”. A similar classification system was used previously by Wodchis and colleagues (2010).

Finally, bed size was divided into three categories representing homes with 25-79 beds (small), homes with 80-139 beds (medium), and homes with ≥ 140 beds (large). This
classification system has been used previously by other authors studying determinants of quality in Ontario LTC homes (Wodchis et al., 2010).

**Statistics Canada Postal Code Conversions Files**

Statistics Canada maintains a series of electronic files called the Postal Code Conversions Files (PCCF) that can be used to link postal codes to national census data. Changes to postal codes are regularly reported to Statistics Canada by Canada Post and the files are subsequently updated on a semi-annual basis. Every five years, after the most recent national census, the PCCF is aligned with new census data (Statistics Canada, 2010). The PCCF data used in the present study thus corresponds to census data from 2006.

**Variables:** The following variable in the PCCF was used in the present study: “population centre and rural area classification”. This variable describes the population density corresponding to a particular postal code. Postal codes obtained through the Ontario Ministry of Health Reports on LTC Homes were linked to population density data from the 2006 census through this variable. The PCCF categorizes population density into the following four categories: 1) population centre < 1000 residents, 2) population centre with 1000 – 29,999 residents, 3) population centre with 30,000 – 99,999 residents, and 4) population centre with ≥ 100,000 residents. For the present study, Postal codes corresponding to a population centre with less than 30,000 residents (categories 1 and 2 in the PCCF) were coded as rural, while postal codes corresponding to centres with 30,000 or more residents (categories 3 and 4 in the PCCF) were coded as urban. The use of a community size of 30,000 residents as the cut point distinguishing “rural” from “urban” has been used previously by other authors examining data from Ontario (Glazier, Gozdyra, & Yeritsyan, 2011).
OLTCA Directory

The variable “chain membership” was obtained from the Ontario Long Term Care Association (OLTCA) directory. In this study, a chain was defined as an organization of any ownership type (for-profit, municipal, or non-profit) that operates more than one LTC home or is part of a broader health system. The OLTCA directory is a listing of all OLTCA member homes that is accessible to OLTCA members or researchers who pay a data access fee. The directory was accessed online at: http://www.oltca.com/en/accessing/index.html. For LTC homes that were not members of the OLTCA (173 homes), information on chain affiliation was obtained through internet searches. At the time that data were obtained, the directory had been last updated in 2011.

Variables: Two categories of chain membership were used: “chain” and “non-chain.”

CARF Directory of Accredited Facilities

In addition to Accreditation Canada, there is also one other accreditor of LTC homes in Canada: The Commission on Accreditation of Rehabilitation Facilities (CARF). Some LTC homes in Ontario are accredited by CARF as well as Accreditation Canada, while others are accredited by CARF alone (or Accreditation Canada alone). Accreditation Canada alone is the focus of this research because there is an explicit emphasis on patient safety in its accreditation standards, while CARF standards do not appear to have an emphasis on patient safety. Nonetheless, as previous research has demonstrated that CARF has the potential to influence health outcomes in LTC (Wagner, McDonald, & Castle, in press), CARF accreditation was examined as a potential confounder only in the analysis for research question II. The variable “CARF accreditation” was obtained through the Commission on Accreditation of Rehabilitation Facilities (CARF) Directory of Accredited Facilities. CARF accredits LTC homes as well as other organizations for rehabilitative care.
The CARF directory is a listing of all facilities that are currently CARF accredited. It can be accessed online at: http://www.carf.org/advancedProviderSearch.aspx.

Variables: Two categories of CARF accreditation were used: “CARF accredited” and “non-CARF accredited”. As accreditation by Accreditation Canada was the focus of this research, “accreditation status,” the primary variable of interest in both research questions I & II, was defined as accreditation by Accreditation Canada only.

The Resident Assessment Instrument – Minimum Data Set 2.0 (RAI-MDS)

The RAI-MDS 2.0 is an internationally validated assessment instrument that captures clinical, demographic and administrative data on residents in Ontario LTC homes. Under the RAI-MDS system, every LTC home resident undergoes a detailed assessment of their health status within 14 days of admission to the facility, every three months thereafter, and following a significant change in the resident’s condition by a staff member at the home specially trained to collect this information (CIHI, 2011b). Assessment information comes from multiple sources, including direct observation, review of clinical records, plans of care, as well as interviews with the resident, significant others and team members (Ontario Ministry of Health, 2007a). The primary purpose of the RAI is to standardize the assessment and care planning process, however the data produced is frequently used for research (Hutchinson, Draper, & Sales, 2009; US Department of Health & Human Services, 2012).

Variables: The five resident safety QIs examined in this research (prevalence of falls, restraints, catheters, pressure ulcers, and infections) were obtained from the RAI-MDS 2.0 through the Canadian Institute for Health Information (CIHI) (already case-mix adjusted by CIHI). Crude (non case-mix adjusted) QI rates were also provided by CIHI for descriptive purposes. As Ontario completed implementation of the RAI-MDS in all of its LTC homes by 2010 (CIHI, 2011b), records from the year 2010 were examined in this research.
Table 2 lists the resident safety QIs of interest along with their operational definitions.

Numerator represent the count of residents with the event of interest in a given facility, denominators represent the count of residents considered to be at risk for that condition in that facility. All five QIs examined in this study represent prevalence indicators. That is, they measure resident function or status at a given point in time and require a minimum of only one assessment per resident (CIHI, 2011c).

<table>
<thead>
<tr>
<th>QI Description</th>
<th>QI Numerator</th>
<th>QI Denominator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of residents who fell in the last 30 days</td>
<td>Residents who had a fall within the last 30 days recorded on their target assessment</td>
<td>Residents with valid assessments</td>
</tr>
<tr>
<td>Percent of residents in daily physical restraints</td>
<td>Residents who were physically restrained daily on their target assessment</td>
<td>Residents with valid assessments excluding comatose residents and those who are quadriplegic</td>
</tr>
<tr>
<td>Percent of residents with indwelling catheters</td>
<td>Residents with an indwelling catheter on their target assessment</td>
<td>Residents with valid assessments, excluding end-of-life residents</td>
</tr>
<tr>
<td>Percent of residents who had a stage 2 to 4 pressure ulcer</td>
<td>Residents who had a pressure ulcer at stages 2 to 4 on their target assessment</td>
<td>Residents with valid assessments</td>
</tr>
<tr>
<td>Percent of residents with one or more infections</td>
<td>Residents with at least one of the following infections or health conditions documented on their target assessment - pneumonia - respiratory infection - septicaemia - urinary tract infection - viral hepatitis - wound infection - fever - recurrent lung aspiration</td>
<td>Residents with valid assessments excluding end-of-life residents</td>
</tr>
</tbody>
</table>

2. All data used to calculate the QI rates were collected in 2010
3. QI = Quality Indicator
CIHI calculates RAI-MDS based QIs as a rolling four-quarter “average” to ensure that facilities meet the minimum number of assessments required to apply case-mix adjustment procedures. The number of residents meeting a QI’s criteria for the current quarter and each of the previous three fiscal quarters are thus summed together by CIHI to calculate a given QI in the form of an “average” over four quarters of data. As RAI-MDS assessments are performed every quarter, an individual resident can be counted in their facility’s QI up to four times. If a resident had multiple assessments performed within a quarter, only their latest assessment for the quarter was included in the QI calculation by CIHI (CIHI, 2011e).

A single four-quarter “average” calculated by CIHI that is the summation of all four individual quarters from 2010 was selected for analysis in this study, thus the QIs in this study represent RAI-MDS data for the entire year 2010. The data that were analyzed are henceforth referred to as the 2010 “Q4” rolling four quarter average, as the fourth quarter from 2010 was the last quarter included in the average.

**General Data Quality:** All data elements that were used to calculate the resident safety QIs examined are mandatory fields, therefore no missing values are permitted for these variables. Previous validation of the Canadian RAI-MDS has demonstrated that these data are generally of high quality and exhibit expected patterns of consistency, both within and across assessment records (CIHI, 2011b). Furthermore, the RAI-MDS 2.0 has undergone significant reliability and validity testing internationally (Poss, Jutan, Hirdes, Fries, Morris, Teare, & Reidel, 2008; Hawes, Morris, Phillips, Mor, Fries, & Nonemaker, 1995; Snowden, McCormick, Russo, Srebnik, Comtois, Bowen, Teri, *et al.*, 1999; Fries, Simon, Morris, Flodstrom, & Bookstein, 2001; Hartmaier, Sloane, Guess, Koch, Mitchell, & Phillips, 1995; Lawton, Casten, Parmelee, van Haitsma, Corn, & Kleban, 1998; Morris, Moore, Jones, Mor, Angelelli, Berg, Hale, *et al.*, 2003). Nevertheless, important data quality considerations remain for some variables in the RAI-MDS.
Reliability: Inter-rater reliability, represented by the kappa statistic, compares two sets of raters who have each observed and assessed the same resident independently (Mor, Angelelli, Jones, Roy, Moore, & Morris, 2003). Results of the largest inter-rater reliability study to examine the MDS are reported below in Table 3 (Mor, Angelelli, Jones, et al, 2003). Of the five resident safety QIs of interest in this study, all were shown to have moderate to substantial reliability, with the exception of the QI for infections, which was reported as having poor reliability. Some studies also suggest that there is over/under reporting of events that comprise the QIs (Hill-Westmoreland & Gruber-Baldini, 2005; Stevenson, Moore, & Sleeper, 2004). These studies are summarized in the last column of Table 3.

Validity: Validity for each RAI-MDS based QI is displayed in Table 3. Levels of validity were established by Morris and associates (2003) through examination of the correlation between a given QI and multiple dimensions thought to represent quality. These dimensions were developed by an expert clinical panel and validated empirically. A measure of the pooled association between a QI and these dimensions of quality, the multiple correlation coefficient “R”, was used to assign levels of validity to each QI through either the pooled association between the QI and dimensions reflecting superior quality (+ quality) or the QI’s pooled negative association with poor quality dimensions and positive association with superior quality dimensions (+ & – quality) (Morris, Moore, Jones, et al, 2003). As shown in Table 3, all resident safety QIs examined in the present study demonstrated moderate to high levels of validity.
### Table 3: Reliability, Validity, and Over/Under-Reporting for RAI-MDS Composite Quality Indicators

<table>
<thead>
<tr>
<th>RAI-MDS Composite Quality Indicator</th>
<th>Reliability (kappa)</th>
<th>Degree of Validity*</th>
<th>Issues with Over/Under-Reporting Noted in the Literature (for individual events that make up the QIs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of residents who have fallen</td>
<td>0.52²</td>
<td>moderate validity</td>
<td>Chart re-abstraction study of 56 LTC homes in Maryland noted that the MDS underreported the number of fall events⁵</td>
</tr>
<tr>
<td>Percent of residents in physical restraints</td>
<td>0.53¹</td>
<td>moderate validity</td>
<td></td>
</tr>
<tr>
<td>Percent of residents with indwelling catheters</td>
<td>0.67¹</td>
<td>high validity</td>
<td></td>
</tr>
<tr>
<td>Percent of residents with pressure ulcers (high &amp; low risk combined)</td>
<td>0.54¹</td>
<td>high validity</td>
<td>Study in 16 Idaho LTC homes found the MDS overestimated the number of cases of urinary tract infection. The MDS was able to adequately screen individuals who did not have urinary tract infections⁴</td>
</tr>
<tr>
<td>Percent of residents with one or more infections</td>
<td>0.39¹</td>
<td>high validity</td>
<td></td>
</tr>
</tbody>
</table>

3. Kappa < 0.40 = poor reliability; Kappa 0.41-0.60 = moderate reliability; Kappa > 0.61 = substantial reliability (Hirdes, Ljunggren, Morris, Frijters, Finne Soveri, Gray, Bjorkgren, et al, 2008)
4. Stevenson, Moore, & Sleeper, 2004
5. Hill-Westmoreland & Gruber-Baldini, 2005
6. Where "R" represents the multiple correlation coefficient:
   - High Validity = R (+ quality) > 0.45 or R (+ & - quality) > 0.55;
   - Moderate Validity = R (+ quality) 0.30-0.45 or R (+ & - quality) 0.40-0.55;
   - Not Valid = R (+ quality) < 0.30 or R (+ & - quality) < 0.4
   (Morris, Moore, Jones, et al, 2003)
2.4 Study Design

This research used a cross-sectional design, as the majority of LTC homes in Ontario have been accredited by Accreditation Canada (AC) for over a decade (Canadian Healthcare Association, 1999), long before the RAI-MDS was first implemented in Ontario in 2005 (CIHI, 2011b). This precluded the use of a longitudinal before-after type design. The LTC home served as the unit of analysis in the present study. To perform the analysis for research question II, resident-level RAI-MDS data were aggregated to the facility level in order to compare resident safety QIs between accredited and non-accredited institutions.

2.5 Construction of the Cohort

All LTC homes in the cohort were identified through the Ontario Ministry of Health Reports on LTC Homes. A total of 613 LTC homes out of the 626 LTC homes in Ontario were obtained from this Ministry dataset (the remaining 13 homes could not be included in the cohort, as they were not present in the Ministry Reports and no reliable source of information on AC accreditation status could be located). Of these 613 facilities, 25 very small homes (< 25 beds) were excluded from the cohort, as the small QI denominators for these facilities may have resulted in unstable regression estimates (Mardon, Khanna, Sorra, et al, 2010; Gruneir, Lapane, Miller, & Mor, 2008). One further home had to be excluded because it had not submitted RAI-MDS data to CIHI. This reduced the final sample size to 587 LTC homes. The final cohort examined was comprised of 131 non-AC accredited and 456 AC accredited homes representing 22% and 78% of the sample, respectively.

Case-mix adjusted QIs for each resident safety measure were linked to accreditation status and the other organizational variables of interest (for each facility) through Ministry of Health facility numbers and subsequently de-identified by CIHI to comply with confidentiality requirements. CIHI was requested to exclude initial facility admission assessments from
inclusion in QI calculations, as health conditions at initial admission do not reflect the quality of care provided in the LTC facility (Arling, Karon, Sainfort, et al, 1997). Details of CIHI’s case-mix adjustment procedure are provided in the section on analysis for research question II.

2.6 Analysis for Research Question I: Which Organizational Characteristics are Predictive of Ontario LTC Home Accreditation?

**Descriptive Statistics**

To examine facility level characteristics, descriptive statistics were tabulated. Pearson chi-squared tests were performed to compare proportions of descriptors between the accredited and non-accredited group. The pearson chi-square test is used for categorical data to determine whether proportions differ between groups (McClave & Sincich, 2009).

**Logistic Regression Model**

The analysis to answer research question I consisted of a binary logistic regression model to examine which organizational characteristics of interest were predictive of accreditation. As the intention of this analysis was to determine the independent effects of all four organizational variables of interest (facility ownership, chain membership, location and size) on the likelihood of accreditation while controlling for each other, all organizational variables were entered simultaneously into the model. Bivariate tests were not necessary because all four organizational variables were determined to be of interest a priori. Organizational variables with two categories were coded as “0” or “1” while dummy variables were generated for organizational variables with greater than two categories.
To produce the dependent variable for this model, non-accredited LTC homes were coded as “0” and accredited LTC homes were coded as “1”. The resulting regression coefficients obtained reflect the change in the value of the dependent variable when a predictor equals 1 compared to when that predictor equals 0 (Hilbe, 2011).

The equation for the resulting logistic regression model is depicted below:

\[
P(Y) = \frac{1}{1 + e^{-(b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \varepsilon_i)}}
\]

where:
P(Y) is the probability of accreditation
e is the base of the natural logarithm
b₀ is a constant
X₁ through X₄ represent the four predictors of interest (facility ownership, chain membership, location, and size)
b₁ through b₄ represent the coefficients (ie. weights) associated with these four predictors
ςᵢ represents an error term for the model

Odds ratios representing the adjusted association between accreditation and each organizational variable were calculated by taking the exponent of the coefficient estimates. The odds ratio represents the ratio of the odds of an event (ie. accreditation) occurring in one group (ex. chain homes) to the odds of that event occurring in the reference group (ex. non-chain homes). An odds ratio greater than 1 therefore indicates that a given category of a predictor is associated with increased odds of the outcome of interest occurring. Odds ratios less than 1 reflect decreased odds of the outcome (i.e. accreditation) occurring (Herbert, 2011).

To assess model fit, Negelkerke R-squared was tabulated. Values of R-squared that are close to 0 indicate that the independent variables in the model are poor predictors of the outcome of interest, while R-squared values close to 1 indicate perfect prediction of the outcome. The value of R-squared for this model was 0.27, indicating that the organizational variables were moderate predictors of accreditation.
2.7 Analysis for Research Question II: Is Accreditation Associated with Better Resident Safety in Ontario LTC Homes?

Descriptive Statistics

First, data were imputed for some of the unadjusted QI numerators. Small cell sizes were suppressed by CIHI (case-mix adjusted QI data were not imputed as none of these cells had been suppressed). As it was known that counts in suppressed cells were between one and four, all suppressed cells were imputed with a two (an estimation of the mean count for the suppressed cells). CIHI was unable to report the actual mean for the suppressed cells due to privacy concerns. A limitation of this type of imputation procedure is that it typically decreases the sample variance, as the imputed cells all have the same count (Blankers, Koeter, & Schippers, 2010). Although mean imputation is inappropriate for many types of data analyses because it distorts a distribution's shape, it was considered appropriate in this case, as it was used only to calculate mean unadjusted QI rates for descriptive purposes. Mean unadjusted QI rates for the accredited and non-accredited group of facilities were then calculated by dividing the number of residents in a facility who experienced the event of interest (numerator) by the number of residents in that facility considered at risk the event (denominator), multiplied by 100 to produce a percentage. These percentages for each facility were then averaged across all facilities in the group (ie. accredited vs. non-accredited) to produce the average unadjusted QI rate for the group.

To examine the resident level characteristics of the sample, descriptive statistics were tabulated. Pearson chi-squared tests were performed to compare proportions of descriptors between the accredited and non-accredited group. These descriptors were not aggregated to the facility level, in other words all residents within a group were summed together to calculate one proportion for the entire group. Histograms were generated for all QIs to examine the shapes of the distributions. To examine whether the results might have been different had a rolling four quarter average other than Q4 been selected for analysis,
mean QI rates for four rolling quarters representing data from 2009 - 2010 were graphed to visualize the extent of stability in QI rates.

**Adjustment for Case-Mix Performed by CIHI**

Two levels of risk adjustment were performed for research question II: (1) risk adjustment using resident data to estimate case-mix adjusted QI rates per facility (this adjustment was performed by CIHI - see Table 4 for a listing of the covariates used in this level of risk adjustment) and (2) adjustment for organizational characteristics through a series of regression models that were applied to the case-mix adjusted QI rates obtained from CIHI (this second level of risk adjustment was performed by the student and is described in detail in the next section).

CIHI’s procedure for case-mix adjustment is based on research carried out by interRAI and documentation from the Institute for Aging Research (CIHI, 2011d). Much of the case mix differences between facilities were adjusted for by CIHI through the assignment of residents to case mix categories according to their level of acuity. CIHI used the resource utilization group (RUG-III) system to perform such case mix adjustments for four of the five QIs of interest (the physical restraints QI was case-mix adjusted using the activities of daily living (ADL) long form scale instead of the RUG-III) (CIHI, 2011c). Although RUG-III is a case mix classification system originally designed for reimbursement purposes, it is frequently used for risk adjustment in research (Mor, Gruneir, Feng, Grabowski, Intrator, & Zinn, 2011; Werner, Konetzka, Stuart, & Polsky, 2011; Werner, Konetzka, Stuart, Norton, Polsky, & Park, 2009; Stevenson, Moore, Colwell, & Sleeper, 2005; Mor, Zinn, Angelelli, Teno, & Miller, 2004; Feng, Hirdes, Smith, et al, 2009; Mylotte & Neff, 2003).

The first step in CIHI’s case-mix adjustment procedure involved stratification of each LTC home’s resident population into three risk groups: high, medium and low, based on the case mix index (CMI) of the RUG-III (an exception was the QI for restraints, which was
stratified by the ADL long form scale rather than the CMI). Next, the unadjusted QI score for each risk group in a facility was calculated along with QI proportions in the risk groups of a reference population to enable indirect standardization. An expected QI score for each risk group was then calculated using logistic regression. The parameters for this logistic regression were calculated from the standard reference population and applied for each risk group. A “performance ratio” for each risk group was then calculated by dividing the observed QI score for a given strata by its respective expected QI score (based on the standard population). Indirectly standardized QI scores for each risk strata were then produced by multiplying the performance ratio by the expected QI score from the standard reference population (this indirect standardization process is depicted below – note that these calculations are performed three times: once for each of the high, medium, and low risk strata).

\[
\frac{\text{observed QI numerator}}{\text{observed QI denominator}} \times \frac{\text{reference population numerator}}{\text{reference population denominator}} = \text{indirectly standardized QI rate}
\]

As each facility has their own unique distribution of residents across the three risk groups, direct standardization was then applied so that all facilities could be treated as if they had the same distribution among the three risk groups as the standard reference population. The adjusted QI scores for each risk group were combined and weighted to reflect the distribution of the risk groups in the standard reference population (this direct standardization process is depicted below).
Finally, CIHI completed case-mix adjustment by modifying outliers. Any adjusted scores that were more than 10% above (or below) the maximum (or minimum) unadjusted QI score among all LTC homes submitting data were “trimmed” to within 10% of the standard deviation of the unadjusted QI (CIHI, 2011d).
Table 4: Resident Safety QIs Case-Mix Adjustment by CIHI$^1$

<table>
<thead>
<tr>
<th>QI Description</th>
<th>Resident Level Covariates</th>
<th>Facility Level Stratification$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of residents who fell in the last 30 days</td>
<td>- not totally dependent in transferring - locomotion problem - PSI subset 2 (non-diagnosis) - any wandering - unsteady gait/ cognitive impairment - age &lt; 65</td>
<td>CMI</td>
</tr>
<tr>
<td>Percent of residents in daily physical restraints</td>
<td>- none</td>
<td>ADL long form</td>
</tr>
<tr>
<td>Percent of residents with indwelling catheters</td>
<td>- stage 3 or 4 pressure ulcer - ALS/MS diagnosis - age &lt; 65</td>
<td>CMI</td>
</tr>
<tr>
<td>Percent of residents who had a stage 2 to 4 pressure ulcer</td>
<td>- RUG cognitive impairment - PSI subset 1 diagnoses - more dependence in toileting - age &lt; 65</td>
<td>CMI</td>
</tr>
<tr>
<td>Percent of residents with one or more infections</td>
<td>- age &lt; 65</td>
<td>CMI</td>
</tr>
</tbody>
</table>

2. CMI = Case Mix Index

Adjustment for Organizational Confounders via Regression Modeling

The second level of risk adjustment consisted of generating five separate multivariable models to examine the association between accreditation and the prevalence of each case-mix adjusted QI, adjusting for organizational variables determined to be confounders. Negative binomial regression was selected as the method to generate these models. The paragraphs that follow will first provide a rationale for why this method was selected, followed by additional information on the properties of negative binomial regression, and finally; a description of how this method was applied in the analysis.
Rationale for Selection of Risk Adjustment Method

Events of interest within the QIs (ex. falls, infections) are dichotomous when examined at the individual resident level but become discrete counts when aggregated to the facility level. Negative binomial regression, similar to poisson regression, is a method of modelling count data (i.e. data that consist entirely of non-negative whole numbers without decimals) (Hilbe, 2008). The dependent variable in negative binomial regression specifies the count of an event of interest - in this case, the numerator of the QI rate represents these counts. This type of regression can be used to model rates, such as the QIs, through the incorporation of an exposure variable (also sometimes called an “offset” variable), which represents the number of times an event could have happened (UCLA, 2012a). As larger LTC homes have more residents for whom QI related events could occur, this study used the denominator of the QI rate as the exposure level for that measure. With respect to the shape of the QI distributions, examination of histograms revealed that four of the five QIs had right skewed distributions. While ordinary least squares regression is dependent on the assumption that data are normally distributed, negative binomial regression is appropriate for the analysis of right skewed data (Gardner, Mulvey, & Shaw, 1995).

Background on Negative Binomial Regression

The negative binomial regression equation that predicts the outcome of interest (QI rate) based on the values of a series of independent variables is depicted below:
\[
\log(Y) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \ldots + b_iX_i
\]

Where:
log(Y) represents the logarithm of the QI rate (the numerator of this rate is the count of residents with the event of interest in a given facility, the denominator is the count of residents considered to be at risk for that condition in that facility)
b_0 is a constant
X_1 through X_i represent the independent variables (ie. accreditation and organizational confounder variables)
b_1 through b_i represent the coefficients (ie. weights) associated with the independent variables

As this type of regression models the logarithm of expected values of counts/rates, regression coefficients represent an estimate of the difference in the logs of expected counts between a category of interest (in this case, accreditation) and the reference category (in this case, non-accreditation). These regression coefficients can be conceptually difficult to interpret, thus the exponent of the regression coefficient – known as the “rate ratio” (RR) is more frequently interpreted (Hilbe, 2011). Since the difference between two logs is equal to the log of their quotient (i.e. \(\log[A] - \log[B] = \log[A/B]\)) and taking the exponent cancels out the effect of the log, the RR represents the ratio of the adjusted count or rate (UCLA, 2012b) (in this case, the adjusted QI rate for accredited institutions divided by the adjusted QI rate for non-accredited institutions). An RR greater than 1 therefore represents a positive association between the independent variable (accreditation) and the outcome of interest (QI prevalence) and an RR less than 1 represents a negative association between the independent variable and the outcome of interest (Hilbe, 2011). As higher values of the dependent variable QIs are indicators of poor resident safety, RRs greater than 1 are representative of poor care. The rate ratio is often also referred to as the incidence rate ratio or relative rate ratio (all of these terms refer to the same entity) (Hilbe, 2008).
**Application of Negative Binomial Regression in the Analysis**

As the objective of this analysis was to assess the independent effect of accreditation on QI prevalence, controlling for organizational confounders, the accreditation variable was forced into all five models, while only organizational variables that acted as confounders for a particular QI outcome were included in each model. To examine confounding, bivariable tests were performed prior to the analysis of the final multivariable models. These bivariable tests were carried out as follows: the crude (non-risk adjusted) association between accreditation and QI prevalence was compared to the adjusted association obtained after individually controlling for each potential confounder. All organizational variables that changed the crude association between accreditation and QI prevalence by more than 10% were included in the final models as confounders. Confounders were entered into the final regression models simultaneously with the accreditation variable.

As histograms for falls and infection prevalence somewhat resembled a normal distribution, ordinary least squares regression was employed to check the robustness of the estimates that were obtained from negative binomial regression for these two QIs. The results of the two models were highly similar.
Chapter 3: Results

3.1 Research Question I: Which Organizational Characteristics are Predictive of Ontario LTC Home Accreditation?

Descriptive Statistics

Descriptive statistics at the facility level are presented in Table 5. The final group of facilities examined was comprised of 456 AC-accredited and 131 non AC-accredited homes representing 78% and 22% of the sample, respectively. Overall, the majority of homes in the sample were large (36.3%), urban (60.0%), chain members (72.9%), owned by for-profit corporations (59.6%), and not CARF accredited (85.0%). 15.6% of facilities were accredited by both Accreditation Canada and CARF. Differences between accredited and non-accredited homes were evident with respect to facility ownership, chain membership, and location. Compared to non-accredited facilities, accredited facilities had a greater proportion of homes located in urban areas (62.7% vs. 50.4%; \( p = 0.011 \)). With respect to ownership, there were a greater proportion of accredited homes with for-profit ownership (69.3% vs. 26.0%; \( p < 0.001 \)) but the accredited group had a smaller proportion of both municipal (13.6% vs. 30.5%; \( p < 0.001 \)) and non-profit owned homes (17.1% vs. 43.5%; \( p < 0.001 \)). The accredited group had a higher proportion of facilities that were members of a chain compared to the non-accredited group (80.0% vs. 48.1%; \( p < 0.001 \)). There were no statistically significant differences between the accredited and non-accredited group with respect to facility size or CARF accreditation.
Table 5: Characteristics of Accredited and Non-Accredited Ontario LTC Homes, 2010†

<table>
<thead>
<tr>
<th>Variables</th>
<th>Accredited (N=456)</th>
<th>Non-accredited (N=131)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For-Profit</td>
<td>69.3%</td>
<td>26.0%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Municipal</td>
<td>13.6%</td>
<td>30.5%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Non-profit</td>
<td>17.1%</td>
<td>43.5%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Chain Membership</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain</td>
<td>80.0%</td>
<td>48.1%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Non-chain</td>
<td>20.0%</td>
<td>51.9%</td>
<td></td>
</tr>
<tr>
<td>Facility Location</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>37.3%</td>
<td>49.6%</td>
<td>0.011</td>
</tr>
<tr>
<td>Urban</td>
<td>62.7%</td>
<td>50.4%</td>
<td></td>
</tr>
<tr>
<td>Facility Size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large (≥140 beds)</td>
<td>37.5%</td>
<td>32.1%</td>
<td>0.299</td>
</tr>
<tr>
<td>Medium (80-139 beds)</td>
<td>35.5%</td>
<td>38.2%</td>
<td>0.652</td>
</tr>
<tr>
<td>Small (25-79 beds)</td>
<td>27.0%</td>
<td>29.8%</td>
<td>0.603</td>
</tr>
<tr>
<td>CARF^ Accreditation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CARF accredited</td>
<td>15.6%</td>
<td>13.0%</td>
<td>0.464</td>
</tr>
<tr>
<td>Non-CARF accredited</td>
<td>84.4%</td>
<td>87.0%</td>
<td></td>
</tr>
</tbody>
</table>

† Pearson chi-square tests were performed to compare proportions between groups
^CARF: Commission on Accreditation of Rehabilitation Facilities

**Multivariable Model**

Multivariable results examining organizational characteristics predictive of facility accreditation are displayed in Table 6. Odds ratios (OR)s in the table depict the odds of accreditation for a category of interest relative to a reference category. Overall, three of the four organizational characteristics examined (ownership, chain membership, and location) were significant predictors of accreditation:
Table 6: Multivariable Results Examining Organizational Characteristics Predictive of Facility Accreditation †

<table>
<thead>
<tr>
<th>Organizational Variable</th>
<th>Coefficient Beta (β)</th>
<th>Standard Error for β</th>
<th>Adjusted* Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal</td>
<td>-1.818</td>
<td>0.306</td>
<td>0.162</td>
<td>0.089 - 0.295</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Non-profit</td>
<td>-1.765</td>
<td>0.275</td>
<td>0.171</td>
<td>0.100 - 0.294</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>For-profit</td>
<td>0 (reference)</td>
<td>-</td>
<td>1.0 (reference)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Chain Membership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain member</td>
<td>1.019</td>
<td>0.231</td>
<td>2.770</td>
<td>1.760 - 4.360</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Non-chain</td>
<td>0 (reference)</td>
<td>-</td>
<td>1.0 (reference)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Facility Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban Location</td>
<td>0.541</td>
<td>0.259</td>
<td>1.718</td>
<td>1.034 - 2.856</td>
<td>0.037</td>
</tr>
<tr>
<td>Rural Location</td>
<td>0 (reference)</td>
<td>-</td>
<td>1.0 (reference)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Facility Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small (25-79 beds)</td>
<td>-0.422</td>
<td>0.339</td>
<td>0.656</td>
<td>0.337 - 1.274</td>
<td>0.213</td>
</tr>
<tr>
<td>Med (80 – 139 beds)</td>
<td>-0.339</td>
<td>0.281</td>
<td>0.713</td>
<td>0.411 - 1.237</td>
<td>0.229</td>
</tr>
<tr>
<td>Large (≥ 140 beds)</td>
<td>0 (reference)</td>
<td>-</td>
<td>1.0 (reference)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

† results correspond to a binary logistic regression model
* each variable was adjusted for the remaining three variables

Ownership

*H1: Accreditation will be positively associated with non-profit ownership*

*H2: Accreditation will be negatively associated with for-profit and municipal ownership*

Facility ownership emerged as the strongest predictor of accreditation. It was estimated that the odds of accreditation were approximately six times smaller for Municipal (CI = 0.089 - 0.295; p < 0.001) and non-profit facilities (CI = 0.100 - 0.294; p < 0.001) relative to for-profit facilities. Both of these associations were statistically significant.
Therefore, hypothesis 1 was not met. Hypothesis 2 was not met with respect to for-profit ownership but was met with respect to municipal ownership.

**Chain Membership**

*H3: Accreditation will be positively associated with chain membership*

Chain membership was the second greatest predictor of accreditation, with the odds of accreditation for chain facilities estimated to be nearly three times that of non-chain facilities. This association was statistically significant, therefore, hypothesis 3 was met. There was some imprecision in this estimate however, with the OR for chain membership being as low as 1.760 or as high as 4.360 (CI = 1.760 - 4.360; p < 0.001).

**Facility Location**

*H4: Accreditation will be positively associated with urban location*

The odds of accreditation for urban homes was estimated to be nearly two times that of rural homes (CI = 1.034 - 2.856; p = 0.037) with this OR estimate reaching statistical significance. Therefore, hypothesis 4 was met.

**Facility Size**

*H5: Accreditation will be positively associated with greater facility size*

The relationship between accreditation and facility size was in the hypothesized direction but the OR estimates for facility size categories did not reach statistical significance, thus hypothesis 5 was not met. In general, the differences in proportions of size categories between the accredited and non-accredited group were relatively small (27.0% vs. 29.8% for “small”, 35.5% vs. 38.2% for “medium”, and 37.5% vs. 32.1% for “large” for accredited vs. non-accredited facilities, respectively) compared to differences between these groups for the other three independent variables examined (see Table 5).
3.2 Research Question II: Is Accreditation Associated with Better Resident Safety in Ontario LTC Homes?

Descriptive Statistics

Descriptive statistics at the resident level are presented in Table 7. Overall, among all homes in the sample, 75.2% of the resident population was between the ages of 75 and 94, 70.5% of residents were female, and 73.9% were extensive to totally dependent in activities of daily living (ADLs). Compared to non-accredited facilities, accredited facilities had a slightly higher proportion of residents in the three lowest age groups (residents aged 0 – 84 yrs) than did non-accredited institutions (p ≤ 0.001 for all). In contrast, accredited facilities had a slightly lower proportion of residents in the two highest age groups (residents aged 85 – 95 or older) than did non-accredited institutions (p ≤ 0.001 for all). With respect to gender, accredited institutions had a slightly higher proportion of male residents (29.6% vs. 28.4%; p = 0.004). With respect to activities of daily living, accredited homes had a slightly lower proportion of residents that were extensive to totally dependant on the ADL hierarchy scale (73.5% vs. 75.6%; p = 0.028). The proportion of residents with dementia or end-stage disease did not differ between the accredited and non-accredited groups.
Table 7: Characteristics of Residents in Accredited and Non-Accredited Long Term Care Homes in Ontario, 2010‡ *

<table>
<thead>
<tr>
<th>Variables</th>
<th>Accredited (N=60,147)</th>
<th>Non-accredited (N=15,541)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0– 64 yrs</td>
<td>7%</td>
<td>5%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>65 – 74 yrs</td>
<td>10.1%</td>
<td>8.2%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>75 – 84 yrs</td>
<td>31.6%</td>
<td>30.3%</td>
<td>0.001</td>
</tr>
<tr>
<td>85 – 94 yrs</td>
<td>43.0%</td>
<td>47.1%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>&gt;95 yrs</td>
<td>8.2%</td>
<td>9.3%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>29.6%</td>
<td>28.4%</td>
<td>0.004</td>
</tr>
<tr>
<td>Female</td>
<td>70.3%</td>
<td>71.5%</td>
<td>-</td>
</tr>
<tr>
<td>Acuity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dementia</td>
<td>59.1%</td>
<td>58.9%</td>
<td>0.281</td>
</tr>
<tr>
<td>End-stage disease</td>
<td>1.5%</td>
<td>1.5%</td>
<td>0.679</td>
</tr>
<tr>
<td>Mean CMI</td>
<td>1.07</td>
<td>1.07</td>
<td>‡</td>
</tr>
<tr>
<td>Extensive to totally dependant on ADL hierarchy scale</td>
<td>73.5%</td>
<td>75.6%</td>
<td>0.028</td>
</tr>
</tbody>
</table>

‡ Pearson chi-square tests were performed to compare proportions between groups
‡ t-test could not be performed as group variances were not requested
* Descriptors correspond to the Q4 rolling quarter of 2010

Trends in the rolling four quarter average prevalence from 2009 – 2010 for the five QIs of interest are displayed in Figures 1-5. Overall, for all five QIs examined there was little change in rolling averages across quarters.
Falls

Trends in the rolling four quarter average for fall prevalence are displayed in Figure 1. From 2009 to 2010, the rolling average prevalence for falls ranged from 12.30% (Q1) - 12.64% (Q4) in accredited homes and 12.54% (Q1) - 13.22% (Q4) in non-accredited homes.

Figure 1: Trends in Rolling Four Quarter Average for Falls*

*Prevalence data represent a rolling four quarter average, where the number of residents meeting a QI's criteria for the current quarter and each of the previous three fiscal quarters are summed together to calculate a given QI. Therefore, this graph represents RAI-MDS data from the second quarter of 2009 to the fourth quarter of 2010.
Restraints

Trends in the rolling four quarter average for restraint prevalence are displayed in Figure 2. The rolling average prevalence for restraints ranged from 16.56% (Q4) – 17.84% (Q1) in accredited homes and 19.16% (Q4) – 20.20% (Q1) in non-accredited homes. In both accredited and non-accredited homes, the rolling average for restraints decreased slightly from 2009 to 2010.

Figure 2: Trends in Rolling Four Quarter Average for Restraints*

*Prevalence data represent a rolling four quarter average, where the number of residents meeting a QI's criteria for the current quarter and each of the previous three fiscal quarters are summed together to calculate a given QI. Therefore, this graph represents RAI-MDS data from the second quarter of 2009 to the fourth quarter of 2010.
Catheters

Trends in the rolling four quarter average for catheter prevalence are displayed in Figure 3. The rolling average prevalence for urinary catheters ranged from 2.87% (Q1) – 2.98% (Q4) in accredited homes and 2.83% (Q1) – 3.07% (Q4) in non-accredited homes.

Figure 3: Trends in Rolling Four Quarter Average for Urinary Catheters

*Prevalence data represent a rolling four quarter average, where the number of residents meeting a QI’s criteria for the current quarter and each of the previous three fiscal quarters are summed together to calculate a given QI. Therefore, this graph represents RAI-MDS data from the second quarter of 2009 to the fourth quarter of 2010.
**Pressure Ulcers**

Trends in the rolling four quarter average for pressure ulcer prevalence are displayed in Figure 4. The rolling average prevalence for pressure ulcers ranged from 5.31% (Q1) – 5.58% (Q4) in accredited homes and 5.28% (Q2) – 5.37% (Q4) in non-accredited homes.

**Figure 4: Trends in Rolling Four Quarter Average for Pressure Ulcers**

*Prevalence data represent a rolling four quarter average, where the number of residents meeting a QI’s criteria for the current quarter and each of the previous three fiscal quarters are summed together to calculate a given QI. Therefore, this graph represents RAI-MDS data from the second quarter of 2009 to the fourth quarter of 2010.*
Infections

Trends in the rolling four quarter average for infection prevalence are displayed in Figure 5. The rolling average prevalence for infections ranged from 10.90% (Q1) – 11.53% (Q4) in accredited institutions and 10.87% (Q1) – 11.41% (Q4) in non-accredited institutions, indicating that this prevalence increased slightly in both accredited and non-accredited institutions over the period of time observed.

Figure 5: Trends in Rolling Four Quarter Average for Infections*

*Prevalence data represent a rolling four quarter average, where the number of residents meeting a QI’s criteria for the current quarter and each of the previous three fiscal quarters are summed together to calculate a given QI. Therefore, this graph represents RAI-MDS data from the second quarter of 2009 to the fourth quarter of 2010.
Bivariable Tests for Confounding

A series of bivariable regressions were conducted for each of the five QI models to determine which organizational variables confound the association between accreditation and the prevalence of each QI of interest. To examine confounding, the crude association between accreditation and QI prevalence was compared to the adjusted association after individually controlling for each potential confounder. All variables that influenced the crude association between accreditation and QI prevalence by more than 10% were included in the final models as confounders. Overall, the models had different sets of organizational variables acting as confounders, however ownership was consistently the strongest confounder for all five QI models, while CARF accreditation was not a confounder for any of the models. The organizational variables included in each model are detailed in Table 9.

Final Multivariable Models

Mean unadjusted quality indicator rates for the accredited and non-accredited groups are displayed in Table 8. Multivariable results examining facility accreditation as a predictor of quality indicator prevalence are presented in Table 9. Data in both tables correspond to the Q4 rolling quarter of 2010. Negative binomial regression was employed to generate five separate models, each with a different QI as the dependent variable. Rate Ratios (RRs) represent estimates of the ratio of a QI rate in accredited homes (numerator) relative to that QI’s rate in non-accredited homes (denominator). Overall, of the five quality indicators examined in the final multivariable models, only one (falls) was significantly associated with accreditation after controlling for confounders.
Table 8: Mean Unadjusted Quality Indicator Rates

<table>
<thead>
<tr>
<th>Quality Indicator</th>
<th>Mean Unadjusted QI Rate for Accredited Facilities †</th>
<th>Mean Unadjusted QI Rate for Non-Accredited Facilities †</th>
<th>Sample Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls</td>
<td>12.64%</td>
<td>13.22%</td>
<td>3.81%</td>
</tr>
<tr>
<td>Restraints</td>
<td>16.56%</td>
<td>19.16%</td>
<td>10.93%</td>
</tr>
<tr>
<td>Catheters</td>
<td>2.98%</td>
<td>3.07%</td>
<td>2.25%</td>
</tr>
<tr>
<td>Pressure Ulcers</td>
<td>5.58%</td>
<td>5.37%</td>
<td>2.60%</td>
</tr>
<tr>
<td>Infections</td>
<td>11.53%</td>
<td>11.41%</td>
<td>5.19%</td>
</tr>
</tbody>
</table>

† Rates represent the number of residents in a facility who experienced the event of interest (numerator) divided by the number of residents in the facility considered at risk for the event (denominator) multiplied by 100 to produce a percentage, averaged across all facilities in a group.

Table 9: Final Multivariable Models Examining Accreditation as a Predictor of Quality Indicator Prevalence †

<table>
<thead>
<tr>
<th>Quality Indicator</th>
<th>Coefficient Beta (β)</th>
<th>Standard Error for β</th>
<th>Adjusted Rate Ratio for Accreditation</th>
<th>95% Confidence Interval</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls †</td>
<td>-0.074</td>
<td>0.030</td>
<td>0.929</td>
<td>0.875 - 0.985</td>
<td>0.014</td>
</tr>
<tr>
<td>Restraints</td>
<td>-0.097</td>
<td>0.063</td>
<td>0.908</td>
<td>0.802 - 1.027</td>
<td>0.123</td>
</tr>
<tr>
<td>Catheters</td>
<td>-0.071</td>
<td>0.0810</td>
<td>0.931</td>
<td>0.795 - 1.091</td>
<td>0.379</td>
</tr>
<tr>
<td>Pressure Ulcers</td>
<td>0.018</td>
<td>0.057</td>
<td>1.018</td>
<td>0.912 - 1.138</td>
<td>0.747</td>
</tr>
<tr>
<td>Infections</td>
<td>0.025</td>
<td>0.047</td>
<td>1.025</td>
<td>0.936 - 1.123</td>
<td>0.593</td>
</tr>
</tbody>
</table>

† results correspond to five separate negative binomial regression models
1. The multivariable model examining fall prevalence as the dependent variable included the following organizational confounders: ownership type and facility location
2. The multivariable model examining restraint prevalence as the dependent variable included the following organizational confounders: ownership type and chain membership
3. The multivariable model examining catheter prevalence as the dependent variable included the following organizational confounders: ownership type and facility size
4. The multivariable model examining pressure ulcer prevalence as the dependent variable included the following organizational confounders: ownership type and chain membership
5. The multivariable model examining infection prevalence as the dependent variable included the following organizational confounders: ownership type, facility size, chain membership, and facility location
**Falls**

*H6: Accreditation will be negatively associated with fall prevalence*

Mean unadjusted rates for fall prevalence were 12.64% and 13.22% in accredited and non-accredited institutions, respectively (Table 8); thus average fall prevalence was 5% lower in accredited homes than in non-accredited homes. After adjusting for confounders, accredited homes were estimated to have fall rates that were 8% lower than those of non-accredited homes (CI = 0.875 - 0.985; p = 0.014). The confidence interval for the rate ratio (RR) was relatively small (0.11 units wide) and did not include 1, resulting in a statistically significant RR estimate (Table 9). Therefore, hypothesis 8 was met.

**Restraints**

*H7: Accreditation will be negatively associated with restraint prevalence*

Mean unadjusted rates for restraint prevalence were 16.56% and 19.16% in accredited and non-accredited homes, respectively (Table 8); thus average restraint prevalence was 16% smaller in accredited homes compared to non-accredited homes. After controlling for confounders, it was estimated that rates of physical restraint use were 10% smaller in accredited facilities than in non-accredited facilities, however this association was not statistically significant (CI = 0.802 - 1.027; p = 0.123) (Table 9). Therefore, hypothesis 6 was not met. Although the disparity between average QI rates for accredited verses non-accredited institutions was greater for restraints than for falls, the large sample standard deviation for restraints (10.93%) compared to falls (3.81%) (Table 8) resulted in a confidence interval for restraints that was more than twice the length of the confidence interval for falls (0.23 vs. 0.11 units wide) (Table 9), producing a non-significant result for restraints.
Catheters

*H8: Accreditation will be negatively associated with catheter prevalence*

Mean unadjusted rates for catheter prevalence were 2.98% and 3.07% in accredited and non-accredited homes respectively (Table 8); thus average catheter prevalence was 3% smaller in accredited homes compared to non-accredited homes. After controlling for confounders, accredited homes had catheterization rates that were estimated to be 7% smaller than rates in non-accredited homes (CI = 0.795 - 1.091; p = 0.379) (Table 9), however this association was not statistically significant. Therefore, hypothesis 7 was not met.

Pressure Ulcers

*H9: Accreditation will be negatively associated with pressure ulcer prevalence*

Mean unadjusted rates for pressure ulcer prevalence were 5.58% and 5.37% in accredited and non-accredited homes, respectively (Table 8), thus average pressure ulcer rates were 4% larger in accredited homes compared to non-accredited homes. After controlling for confounders, accredited LTC homes were estimated to have a 2% greater rate of pressure ulcers relative to non-accredited homes (CI = 0.912, 1.138; p = 0.747) (Table 9), however this association was not statistically significant, thus hypothesis 9 was not met. The effect of accreditation on pressure ulcer prevalence was not in the expected direction.

Infections

*H10: Accreditation will be negatively associated with infection prevalence*

Mean unadjusted rates for infection prevalence were 11.53% and 11.41% in accredited and non-accredited homes, respectively (Table 8); thus average infection rates were 1% larger in accredited homes compared to non-accredited homes. After controlling for confounders, accredited facilities had infection rates that were estimated to be 3%
greater than in non-accredited facilities (CI = 0.936 - 1.123; p = 0.593) (Table 9), however this association was not statistically significant thus hypothesis 10 was not met. The effect of accreditation on infection prevalence was not in the hypothesized direction.

**Relationship between Accreditation, Catheters, and Infections**

*H11: If accreditation is negatively associated with the prevalence of catheters, it will also be negatively associated with the prevalence of infections*

This hypothesis could not be tested as there was no statistically significant association detected between accreditation and catheter prevalence.

**Effect of Required Organizational Practices (ROPs)**

*H12: Accreditation will be more strongly (negatively) associated with QIs that relate directly to a Required Organizational Practice (falls, pressure ulcers, and infections) than to QIs that do not relate to a Required Organizational Practice*

Of the three QIs that related directly to an ROP, only one had a statistically significant association with accreditation - accreditation was negatively associated with fall prevalence. As only one of the ROP-related QIs was associated with accreditation and none of the other four QIs demonstrated an association with accreditation, hypothesis 12 was not considered met.

### 3.3 Summary of Results

The results of analyses for research question I (which organizational characteristics are predictive of Ontario LTC home accreditation?) indicated that three of the four organizational characteristics examined (ownership, chain membership, and location) were significant predictors of accreditation. Of the five QIs examined in research question II (is accreditation associated with better resident safety in Ontario LTC homes?), only one (falls) was significantly associated with accreditation status. LTC facility accreditation was negatively associated with fall prevalence.
Chapter 4: Discussion & Conclusions

4.1 Summary of Findings

Overall, three of the four organizational characteristics of interest (facility ownership, chain membership, and location) were significantly associated with LTC home accreditation. For-profit facility ownership was predictive of accreditation, as was belonging to a chain and being located in an urban area. Of the five quality indicators examined, only one (falls) was associated with accreditation after controlling for confounders. The prevalence of falls was significantly lower in accredited facilities than in non-accredited ones.

4.2 Organizational Characteristics

With nearly 80% of facilities in the study sample having achieved accreditation status through Accreditation Canada, it is clear that accreditation was attainable for most homes. However, the observed differences in organizational characteristics between the accredited and non-accredited group of homes suggests that accreditation may be less attainable for some types of institutions. All four organizational variables combined demonstrated a moderate degree of predictive ability (Negelkerke R-squared = 0.27), suggesting that there are other characteristics predictive of accreditation status that were not accounted for in this research.

Facility ownership was identified as the strongest predictor of accreditation, with municipal and non-profit facilities nearly six times less likely to be accredited than for-profit facilities. These results were unexpected - the contention that for-profit facilities are less motivated to implement quality improvement innovations (Eggleston & Zeckhauser, 2002; Amirkhanyan, Kim & Lambright, 2008) was not supported by these data. For-profit institutions are generally believed to have strict return on investment criteria that do not permit allocation of resources to operational areas that are not profitable (Hillmer et al.,
2005; McGregor et al., 2006; Greenlick, 1988; Guggenheimer, 1988). However, this may not necessarily mean that for-profit institutions are less apt to invest in quality improvement interventions that are perceived to be cost neutral. Although the accreditation process requires devotion of substantial human and financial resources, it may nevertheless be perceived as cost neutral by for-profit LTC facilities in Ontario, as Ontario homes that acquire accreditation status are reimbursed at a higher rate (per bed day) by the provincial Ministry of Health (Ontario Ministry of Health, 2007b). The present study was not, however, able to empirically test the plausibility of this potential explanation, as accreditation related costs were not examined.

Although some US studies have attributed organizational priorities for quality improvement to competitive pressures between LTC facilities (Starkey, Weech-Moldonato, & Mor, 2005; McDonald, Wagner, & Castle, 2013; Zinn, 1994), competition for residents between facilities is unlikely to explain why for-profit homes in the Ontario sample were more likely to attain accreditation. There are long waiting lists for LTC home placement in Ontario (Health Quality Ontario, 2012a), thus all facilities would be operating close to 100% occupancy. An alternative explanation for the findings may relate to the fact that there has been a barrage of negative attention directed at for-profit LTC and for-profit health care in general - for-profit facilities may be seeking to deflect this negativity by pursuing legitimacy through accreditation. Institutional theorists posit that this need to demonstrate organizational legitimacy is one of the strongest forces shaping the behaviour of institutions (Meyer & Rowan, 1977; DiMaggio & Powell, 1983; DiMaggio & Powell, 1991). Indeed, one study of Ontario LTC organizations reported that for-profit providers have been increasingly concerned about their reputation, and have resorted to branding as a way to alleviate concerns about quality of care (Skinner & Rosenberg, 2006). Accreditation status may represent such attempts at branding and is a means of obtaining legitimacy in the eyes of policy makers (Lemieux-Charles et al., 2003; Ruef & Scott, 1998).
The second greatest predictor of accreditation was chain membership, with chain members being nearly three times more likely to attain accreditation. This was consistent with the original hypothesis regarding chain membership. However, the lack of a significant relationship between accreditation and facility size suggests that this effect was not necessarily mediated through increased economies of scale. Therefore, these results appear to more closely support the contention that interconnectedness facilitates the sharing of values and practices between institutions and promotes conformity to industry norms (DiMaggio & Powell, 1983; Pfeffer & Salancik, 1978). Accreditation could reasonably be considered an industry norm among LTC homes in Canada, where approximately 80% of these facilities are accredited. Furthermore, chain members may have access to specialized expertise from the parent organization that makes achieving accreditation easier/less resource intensive. Indeed, the largest for-profit LTC home chain in Canada provides member homes with specialized quality improvement and accreditation related support (Extendicare Canada, 2010). Similarly, municipal or non-profit homes that are members of a broader regional health system (defined as “chains” in the present study) may benefit from the accreditation-related expertise of regional hospitals or health units. Such partnerships, involving the sharing of staff and equipment were previously reported in a study of Ontario LTC organizations (Skinner & Rosenberg, 2006).

The third greatest predictor of accreditation was facility location - it was observed that urban homes were nearly two times more likely to be accredited than rural homes. These results are consistent with the original hypothesis and previous US studies on accreditation (Kang, Meng, & Miller, 2011; Lutfiyya et al., 2009; Brasure, Stensland, & Wellever, 2000). When asked about accreditation, rural institutions in the US have described barriers related to costs and difficulties in meeting standards or collecting data (Casey, & Klingner, 2000; Brasure, Stensland, & Wellever, 2000). As Ontario LTC homes are reimbursed the same amount (per case-mix adjusted bed day) regardless of their location in
the province, the effect of location on facility accreditation is not likely to be mediated by differences in provincial funding. However, it has been noted that residents in rural communities are less likely to make use of private (user-pay) LTC services and the fundraising base in rural communities is substantially smaller than in urban areas (Skinner & Rosenberg, 2006). Many Ontario LTC homes rely on such funds as supplemental revenue sources (Hillmer, 2008). Furthermore, as youth continue to migrate out of rural areas and immigrants remain attracted to large urban centers, rural Canada continues to experience difficulties retaining licensed health professionals (Tepper, Schultz, Rothwell, & Chan, 2006; CIHI, 2002; Caldwell & Temple, 2010; Skinner & Rosenberg, 2006). As preparation for accreditation surveys is an intensive process that likely requires the involvement of staff with a high level of training or experience in accreditation, rural facilities that are unable to recruit such personnel may be less able to pursue accreditation.

The only variable of the four examined that was not a statistically significant predictor of accreditation was facility size - the results revealed a non-significant positive association between size and accreditation. It is possible that size had some effect on a facility’s likelihood of achieving accreditation but this effect was too variable to reach statistical significance. Alternatively, others have suggested that facility size is actually a surrogate variable for other constructs, such as the availability of resources and the presence of obstacles to change (Mohr, 1969; Rogers, 1995). Such characteristics may occur most often in large facilities but are also present in smaller facilities, thus are best studied individually. It is possible that the use of these other constructs in place of facility size would have permitted a more refined analysis of organizational characteristics predictive of accreditation.

*LTC homes in Ontario are permitted to retain surplus revenue for services such as transportation, cable television, hairdressing, telephones and other luxuries*
4.3 Quality Indicator Prevalence

With respect to accreditation’s impact on the QIs of interest, results were mixed. There was a statistically significant association between accreditation and lower fall prevalence, while rate ratios for the remaining four QIs (pressure ulcers, infections, restraints, and catheters) were not statistically significant. These results are consistent with a review examining the association between various accreditation programs and health outcomes. The review concluded that accreditation was sometimes but not always associated with superior patient outcomes (Greenfield & Braithwaite, 2008). However, in contrast two more recent U.S. studies, examining accreditation in the LTC setting specifically, noted more favourable relationships between facility accreditation and health outcomes (Kang, Meng, & Miller, 2011; Wagner, McDonald, & Castle, 2012c). These inconsistencies in results between studies and the array of differences in accreditation programs between nations (Flodgren, Pomey, Taber, & Eccles, 2011) suggest that accreditation is best studied in jurisdiction-specific contexts.

As with other complex interventions in LTC (Gulpers, Bleijlevens, Ambergen, Capezuti, van Rossum, & Hamers, 2011), the success of accreditation programs within each institution is likely dependent on the program’s appropriate implementation and execution. An intervention that may be effective in itself may not produce results if it is not implemented in the way that was intended, is poorly complied with, or encounters obstacles in daily practice (Neyens, van Haastregt, Dijcks, Martens, van den Heuvel, de Witte, & Schols, 2011). The intent of accreditation programs is to help facility staff determine how best to tailor accreditation standards to their own institutions rather than to impose a rigid externally developed quality system. With that in mind, this study’s mixed findings for accreditation may, to some extent, have been due to inconsistencies between institutions in how standards were implemented. However, as associations between accreditation and superior
quality were noted for some QIs but not others, the discussion below focuses on each QI separately.

Fall prevalence was the only QI of the five examined that was significantly associated with accreditation. LTC home accreditation may have had an effect on falls without affecting the other QIs examined because falls represent the most common, and among the most serious adverse events in LTC, often having deleterious consequences on resident functioning (Gurwitz, Sanchez-Cross, Eckler, & Matulis, 1994; Kannus, Sievanen, Palvanen, Jarvinen, & Parkkari, 2005). The accreditation standards advise organizations to prioritize areas for improvement based on which types of events have the highest frequency of occurrence and represent the highest degree of risk (Accreditation Canada, 2012f) – thus fall prevention is likely to be considered a high priority in accredited LTC institutions. Furthermore, falls conceivably fit well within Accreditation Canada’s CQI process for adverse events, whereas other QIs may not have. This CQI process involves mandatory reporting of adverse events, followed by an in-depth investigation aimed at learning from each event and informing improvements within the facility.

Although the Long Term Care Homes Act already requires Ontario LTC homes to have fall prevention programs in place, there is no guidance in the regulations to specify processes of care that must be followed after a fall incident and which kinds of assessments comprise an appropriate falls prevention program (Long Term Care Homes Act, 2007). Accreditation Canada standards for falls may have been effective because they provide LTC homes with this additional support, recommending applicable staff training and fall risk assessments processes incorporating balance and strength training, vision care, medication review, and behavioural assessments (Accreditation Canada, 2011a; Accreditation Canada, 2010c), and enabling the application of resident-specific fall reduction interventions (Wagner, Scott, & Silver, 2011; Wagner, Dionne, Zive, & Rochon, 2011). Rather than adopting a validated fall risk assessment tool “as is”, the accreditation standards require organizations
to tailor these assessment tools to the unique characteristics of residents residing within their facility (Accreditation Canada, 2011a). There is evidence to suggest that fall prevention programs in LTC are more likely to be successful when they are designed with the particular setting and needs of residents in mind (Neyens, van Haastregt, Dijcks, Martens, van den Heuvel, de Witte, & Schols, 2011; Montero-Odasso, Levinson, Gore, Epid, Tremblay, Bergman, 2007). The comprehensive guidelines from the American Geriatrics Society and British Geriatrics Society support the use of such resident-specific approaches in fall prevention (American Geriatrics Society & British Geriatrics Society, 2010).

Finally, accreditation standards require organizations to monitor fall trends, causes, and degree of injury in a consistent way to assess the progress of interventions within the facility (Accreditation Canada, 2011a). Recent studies suggest that such monitoring is essential for the success of fall prevention programs in LTC, as programs not appropriately designed with frail residents in mind can actually increase the number of fall incidents (Cameron, Murray, Gillespie, et al., 2010; Neyens, van Haastregt, Dijcks, Martens, van den Heuvel, de Witte, & Schols, 2011).

Although accreditation had a statistically significant effect on fall prevalence, with a rate ratio of .929, this effect was fairly modest. Success in multi-factorial fall prevention programs is believed to be dependant on the availability of devoted resources such as a multidisciplinary falls team. The resource constrained environments that many LTC homes operate in may not always permit the formation of these teams. Furthermore, fall prevention programs are challenging to implement (Neyens, van Haastregt, Dijcks, Martens, van den Heuvel, de Witte LP, & Schols, 2011; Capezuti, Taylor, Brown, Ouslander, Strothers, 2007), thus LTC homes may not always be able to apply these interventions in a manner that would be considered optimal.

As the present study was cross-sectional in nature, we are unable to preclude the possibility that observed findings for falls could have resulted from other concurrent
programs – homes that participated in accreditation may have been more likely to participate in other quality improvement initiatives as well. The Canadian Patient Safety Institute’s “Safer Healthcare Now!” campaign has a similar emphasis on fall reduction and is the largest national patient safety campaign in Canadian history. Co-lead by the Registered Nurses Association of Ontario (RNAO), this program provided LTC facilities with support for fall reduction and expertise to assist with implementation of the RNAO best practice guidelines for fall prevention. This LTC campaign began as early as 2007 and involved strategies such as assessment of resident fall risk upon admission; teaching staff, residents and families how to prevent falls; and having residents do balance and strength training (Canadian Patient Safety Institute, 2012). There were also regional fall prevention projects endorsed by Local Health Integration Networks (LHINs) taking place in 2008 (OLTCA, 2008).

Contrary to the specific accreditation standards governing fall reduction, restraint reduction is not an explicit requirement in any of the accreditation standards. This lack of specificity may be a possible explanation for the absence of a relationship between accreditation and restraints. The Accreditation Canada standards for LTC do however require institutions to enact policies governing restraint use within the facility and adherence to these policies is assessed during accreditation surveys (Accreditation Canada, 2011c, Accreditation Canada, 2010b, Accreditation Canada, 2004).

Studies indicate that such institutional policy changes can impact staff perceptions of what is considered appropriate vs. inappropriate restraint use, thus institutional policy is an important component of successful restraint reduction strategies (Gulpers, Bleijlevens, Ambergen, et al., 2011, Baier, Butterfield, Harris, et al., 2008). However, our results suggest that policy change alone may not be sufficient to substantially reduce restraint use. In order for restraint reduction to be successful, viable alternative strategies should be in place and available to staff in a facility (Registered Nurses’ Association of Ontario, 2012; Dimant,

It should be noted that although the result for restraint prevalence was deemed not statistically significant (p-value was equal to 0.12), effect size was greater for the restraints QI than for the falls QI (which would have suggested a 10% lower prevalence of restraints in accredited facilities had the result been considered statistically significant). It is therefore possible that accreditation did have a positive impact, but this impact was variable due to wide variation in restraint rates between homes or inconsistency in accreditation’s influence between homes. However, although the prevalence of restraints was somewhat higher in non-accredited homes than in accredited homes*, both groups still fell short of what is widely considered best practice. Most experts agree that physical restraints can be avoided in many circumstances (Mor, Gruneir, Feng, Grabowski, Intrator, & Zinn, 2011) and it has been suggested that a prevalence rate of approximately 0% to 5% is realistically achievable in the LTC setting (Guttman, Altman, & Karlan, 1999). The average prevalence of restraints in this sample was 16% and 19% in accredited and non-accredited homes, respectively, thus the potential impact of accreditation on restraint prevalence was not considered clinically significant.

Similar to the accreditation standards for restraints, there is a lack of specificity in the accreditation standards for infection prevention and control that may help explain why there was no observed relationship between accreditation and infection prevalence. There is an absence of accreditation standards focusing specifically on urinary tract infections (UTI)s, however most surveys have found that UTIs are the most common type of infection in LTC (Warren, 2001; Nicolle, Strausbaugh, Garibaldi, 1996; Stevenson, Moore, Colwell, & Sleeper, 2005). The Accreditation Canada infection prevention and control ROPs are directed primarily at respiratory and food-borne infectious agents, which are associated with

* differences between these crude rates were not examined for statistical significance
different preventative measures than UTIs (Smith, Bennett, Bradley, et al., 2008; Warren, 2001; Gammack, 2002).

As there are no specific accreditation standards targeting UTI prevention, it is perhaps not surprising that accreditation was not negatively associated with urinary catheters – the greatest risk factor for UTIs in institutionalized older adults (Warren, 2001; Smith & Nicolle, 2001; Gammack, 2002). Although evidence based guidelines recommend that urinary catheters generally not be used (Nicolle, 2009; Gardam, Amihod, Orenstein, Consolacion, & Miller, 1998; Nicolle, Strausbaugh, & Garibaldi 1996; Smith, 1985) and the accreditation standards require institutions to follow these guidelines (Accreditation Canada, 2011a), such requirements may have been too general to have any impact on catheter use in accredited LTC facilities.

Although there are some legitimate medical indications warranting the application of a urinary catheter, long term catheterization in LTC is often used to manage urinary incontinence (Warren, 2001; Smith & Nicolle, 2001; Nicole, 2001; Woods & Bender, 1989; Resnick & Ouslander, 1990) as repetitive adult diaper changes and bed preparations are time consuming for staff (Brandberg, Seeberg, Bergström, & Nordqvist, 1980; Holroyd-Leduc, Sen, Bertenthal, Sands, Palmer, Kresevic, Covinsky, et al., 2007; Saint, Lipsky, & Goold, 2002). In this study there was substantial variation in catheterization rates between institutions that remained after controlling for case mix, suggesting that the use of catheters in this sample was the result of facility practices rather than legitimate medical indications. Overall, these results indicate that there might be a case for Accreditation Canada to consider standards directed specifically at the prevention of UTIs, including the reduced use of urinary catheters.

Widespread non-compliance with some of the most important accreditation standards for infection prevention and control may be another explanation for the absence of a relationship between accreditation and infection prevalence. A 2009 Accreditation
Canada report indicated that only 63% of institutions surveyed in 2008 were compliant with the ROP for tracking infection rates, analyzing infection data to identify trends, and distributing this information throughout the organization (Accreditation Canada, 2009). Tracking of infection rates over time is an important tool to inform a facility's infection prevention and control strategy (Gill, Keil, Jones, Aydon, & Biggs, 2011; Jarvis, 2003). Furthermore, distributing performance data throughout an organization can motivate improvement as staff gain a greater sense of individual responsibility and a perceived connection between their individual efforts and the performance of the overall organization (Locke, 2009; Bate, 2000). Performance measurement and reporting is a powerful tool that is often necessary to motivate action in health care institutions, where workers may see quality improvement as futile and a potential waste of resources (Dixon-Woods et al., 2011).

With respect to the results for pressure ulcers, it is unlikely that our findings related to any lack of specificity in the accreditation standards or a lack of compliance with these standards. The Accreditation Canada standards for pressure ulcer prevention are fairly comprehensive. Accredited homes are required to perform pressure ulcer risk assessments for all residents at regular intervals using a standardized risk assessment tool, implement protocols aimed at preventing pressure ulcers, educate staff on risk factors and prevention strategies, and monitor the success of their prevention program through performance measurement (Accreditation Canada, 2011a). Many studies have noted the apparent effectiveness of such practices in pressure ulcer prevention (Lyder, Shannon, Empleo-Frazier, McGeHee, & White, 2002; Regan, Byers, & Mayrovitz, 1995; Suntken, Starr, Ermer-Seltun, Hopkins, & Preftakes, 1996).

A possible explanation for these findings could be that some redundancies exist between the Accreditation Canada program and other potential influencers of pressure ulcer care in Ontario. In 2005 the Ministry of Health launched the “Long Term Care Best Practice Nursing Initiative” to help staff in LTC incorporate best practice guidelines (including those
for pressure ulcer prevention) into their routines (OLTCA, 2006). Similarly, with the implementation of the RAI-MDS in Ontario beginning in 2005 (Ontario Ministry of Health, 2011), a validated risk assessment tool for pressure ulcers would have become more readily accessible to many homes through the RAI-based Resident Assessment Protocol for pressure ulcers (inter-RAI, 2012). In 2007 the Ministry sponsored implementation of a Pressure Ulcer Awareness and Prevention Program by the Canadian Association for Wound Care in provincial LTC homes (Poss, Murphy, Woodbury, Orsted, Stevenson, Williams, Macalpine, Curtin-Telegdi, Hirdes, 2010). The program included education on repositioning, nutritional supplements, and the latest advances in preventative equipment (OLTCA, 2009). Furthermore, the Long Term Care Homes Act initiated in 2007 contains detailed requirements with respect to pressure ulcer prevention that all LTC homes must follow (LTC Homes Act, 2007). Finally, the pilot phase of Health Quality Ontario’s “Residents First” program, which included training in quality improvement strategies for pressure ulcer prevention, was rolled out in late 2009 (Health Quality Ontario, 2012b). These programs could have improved pressure ulcer care in non-accredited homes to the extent that there were no detectable differences between accredited and non-accredited facilities.

An alternative explanation for our results could be that the costliness of pressure ulcer prevention may preclude many homes (both accredited and non-accredited) from achieving an optimal level of care. Evidence-based recommendations for pressure ulcer prevention include the replacement of standard mattresses with specialized pressure redistribution mattresses (McInnes, Bell-Syer, Dumville, Legood, Cullum, 2008), the provision of daily oral nutritional supplements (Stratton, Ek, Engfer, et al., 2005), daily application of emollient to dry skin (Reddy, Gill, Rochon, 2006), and regular resident repositioning (Smith, Bennett, Bradley, et al, 2008; Rosenthal, Thomas C., Williams, et al., 2006). Some of these interventions are relatively costly. One study in Ontario LTC hospitals concluded that preventative measures for pressure ulcers are more costly in the long run.
than are the potential cost savings that could be achieved through prevention (Wodchis, Teare, & Anderson, 2007). This contention is supported by a recent accreditation report suggesting that LTC homes in one Canadian health region lacked a sufficient number of pressure redistribution mattresses to adequately care for residents (Accreditation Canada, 2010d).

In terms of Accreditation Canada’s prioritization of accreditation standards as “Required Organizational Practices” (ROP)s, accreditation did not appear to have a greater impact on the three QIs that were ROPs (falls, pressure ulcers, and infections) than on the other two QIs (restraints and catheters), with the exception of falls. It therefore does not appear that accredited LTC homes necessarily prioritize ROP standards over other accreditation standards. Indeed, two recent Accreditation Canada reports noted substantial non-compliance with some of the ROPs, while other non-ROP accreditation standards had very high levels of compliance (Accreditation Canada, 2009; Accreditation Canada, 2011f). Unlike the other accreditation standards, compliance with ROP standards is intended to always have a direct impact on whether a facility is granted accreditation status. When a facility does not meet a ROP standard, they must submit evidence to Accreditation Canada specifying how the unmet standard is being addressed (Accreditation Canada, 2009). As there has been little research directed at Accreditation Canada to date, it is unclear why this additional level of stringency does not appear to have translated into improved outcomes in the ROP areas.
4.4 Policy Implications

The results from this study have a number of policy implications. The finding that rural and non-chain homes are less likely to be accredited than their counterparts suggests that facilities may be less able to pursue accreditation when they have difficulties accessing staff with specialized training or experience in accreditation. Previous studies examining the LTC sector have established that the burden of paperwork associated with managerial innovations can shape institutional responses, where reactions are often based on an intervention’s perceived “costliness” in terms of human or financial resources (Foner 1994; Savishinsky 1991; Hennessy, McNeely, Whittington, Strasser, & Archea, 1997; Grenade, 2003). Homes that perceive their human resources as insufficient to comply with accreditation standards may thus choose to avoid accreditation. One Canadian study noted that under-resourced institutions felt the accreditation process took time and resources away from patient care and non-accreditation related quality improvement initiatives (Lemieux-Charles et al., 2003). Given these considerations, the current Ontario policy of financially reimbursing homes for accreditation-related costs (Ontario Ministry of Health, 2007b), in the absence of other supports, may not permit all homes to pursue accreditation.

Ontario could make accreditation a more viable option for under-resourced LTC homes by reducing some redundancies between the accreditation standards and existing legislation. There is some potential for duplication between the Accreditation Canada standards and the Long Term Care Homes Act, which includes some requirements similar to the Required Organizational Practices (Accreditation Canada, 2011a; Long Term Care Home Act, 2007). Indeed, Ontario LTC staff and industry associations have responded negatively to new legislation and innovations that are perceived as increasing administrative workload, as they feel that this workload is presently excessive (OANHSS, 2009; Poss et al.,
2010). In the US hospital sector, many states have responded to similar concerns by granting institutions “deemed status”, which waives the requirement for state-run inspections when a facility has been granted accreditation status by the Joint Commission (The Joint Commission, 2009).

Other jurisdictions, such as France, Australia, and the Canadian province of Quebec have taken a more heavy-handed approach and simply made accreditation mandatory for all institutions (Quebec National Assembly, 2002; Pomey et al., 2005; Grenade, 2003). However, the risk of regulatory sanctions or litigation in mandatory accreditation systems may preclude the ability of organizations to learn through disclosure and analysis of adverse events (Pomey et al., 2005). A more effective solution may be for accreditors to improve access to staff with specialized training or experience in accreditation through facilitating linkages with accredited homes or providing extra support during the pre-accreditation phase.

With respect to the quality indicators examined, availability of resources in the LTC facilities studied is also a relevant consideration that may have influenced some of our findings. Accreditation’s lack of impact on pressure ulcer prevalence may have been attributed to the costliness of some interventions recommended for prevention. This contention is supported by a recent survey which noted that 55% of beds in surveyed Ontario LTC homes still have standard mattresses (Pham, Stern, Chen, Sander, John-Baptiste, Thein, Gomes, et al., 2011). Preventing pressure ulcers also involves regular turning and repositioning of residents; some U.S. studies have found that lower rates of pressure ulcers appear to be dependant on the presence of greater numbers of staff within a facility (Smith, Bennett, Bradley, et al., 2008; Horn, Bender, Ferguson, Smout, Bergstrom, Taler, Cook, et al., 2004; Kayser-Jones, Kris, Lim, Walent, Halifax, & Paul, 2008; Capon, Pavoni, Mastromattei, & Di Lallo, 2007; Horn, Buerhaus, Bergstrom, & Smout, 2005).
Accreditation programs are designed to build capacity and enhance quality improvement related expertise – they make no claims of being able to increase the amount of financial resources available to institutions. The authors of one recent study in Ontario LTC hospitals concluded that policy makers may need to provide financial incentives to encourage reductions in pressure ulcer incidence (Wodchis, Teare, & Anderson, 2007). However, in Canada the LTC sector exists in a fiscal environment where government funders have called for cost containment (Berta, Laporte, & Kachan, 2010; Berta, Laporte, Zarnett, et al., 2006). It is possible that increased funding in some care areas may be a necessary precondition before any accreditation-related improvements in care outcomes can be observed.

4.5 Future Research

This research focused only on LTC homes in the province of Ontario, thus results may not be generalizable to other provinces in Canada. As environmental factors such as culture, incentives, and regulations can greatly affect the success or failure of accreditation programs (Al Tehewy, Salem, Habil & El Okda, 2009), future research should examine accreditation outcomes in other Canadian provinces. Previous studies have also noted that an organization’s motivations for pursuing accreditation can affect the level of impact that these programs have within institutions (Dick, Gallimore, & Brown, 2002). Further research could examine whether LTC institutions motivated by external legitimacy concerns direct or prioritize accreditation activities in different ways than institutions motivated by a desire to enhance quality or organizational learning.

Previous studies have noted the tendency of some organizations to limit the domain of accreditation-related activities to a select group of managers or departments (Pomey, Contandriopoulos, Francois, & Bertrand, 2004; Paccioni, Sicotte, & Champagne, 2008).
However, accreditation programs are considered to have better prospects for success when all levels of staff are involved in the accreditation process (Pomey, Contandriopoulos, Francois, & Bertrand, 2004). As LTC homes have been characterized as rigidly hierarchical in nature (Rosen, Mittal, Degenholtz, Castle, Mulsant, Rhee, et al., 2005), there is some potential for similar pitfalls in this setting. Future research should examine the extent of frontline staff involvement in accreditation within Canadian LTC institutions to determine whether processes could be better optimized. Similarly, as the extent of staff “buy-in” can potentially impact the level of effort devoted to accreditation, it is important that future studies examine staff perceptions of the value in accreditation and the potential impact of these perceptions on accreditation outcomes.

Due to the observational design of this study, we were unable to definitively determine why accreditation had a modest effect on some QIs while it had no apparent impact on others. Understanding of these results would be enhanced by future research examining whether organizational behaviour influences how accreditation standards are implemented within an institution and whether these factors explain some of the variability in outcomes between accredited facilities. Previous studies have noted that the organizational context in which accreditation takes place can influence the type of change dynamics that occur within a facility (Pomey et al., 2010; Paccioni, Sicotte, & Champagne, 2008; Lemieux-Charles et al., 2003), however no studies to date have examined whether the external regulatory environment that facilities operate in can moderate accreditation outcomes within institutions. If facilities spend much of their non direct care time complying with rigid regulatory requirements, they may have less time and energy to devote to organizational learning through accreditation. Similarly, it has not yet been studied whether certain organizational cultures or leadership styles may be more receptive to external evaluation and implementation of accreditation standards than others. An understanding of such
influences is important, as it may help accreditors better tailor programs to unique institutional and jurisdictional circumstances.

The fact that accreditation was associated with a lower prevalence of falls but not any of the other QIs examined may be attributed to fall reduction initiatives being given priority over other initiatives in accredited LTC homes. The present study was, however, unable to test this supposition. Similarly, it is unknown why accredited organizations’ compliance with some of the ROPs (e.g. performance of medication reconciliation at admission) was recently reported to be so low while compliance was very high for many non-ROP accreditation standards (e.g. regular monitoring of the organization’s performance by the governing body) (Accreditation Canada, 2009; Accreditation Canada, 2011f). Future research should examine whether such instances represent a deliberate strategy by organizations to focus resources on certain priority areas as opposed to being the result of barriers that institutions face in complying with some standards. Although the Accreditation Canada pre-accreditation phase presently involves a preliminary assessment of some basic elements of quality and assistance in gaining self-assessment expertise (Accreditation Canada, 2011b), it is unclear if additional ongoing supports are needed to enable some organizations to implement the entire accreditation program. An understanding of these factors could inform future enhancements to the accreditation process or revisions to existing standards. Indeed, Accreditation Canada has expressed interest in obtaining feedback on the ease with which their standards can be implemented (OLTCA, 2009b).

With respect to costs, to date there have not been any studies examining the indirect costs that Canadian LTC facilities incur in pursuing accreditation. The direct costs associated with a four year Accreditation Canada cycle include an initial registration fee of $1,175, an annual fee calculated at 0.0129% of the annual business operating budget, and a survey fee calculated at a rate of $2,065 per surveyor, per day (the number of surveyors and survey duration are based on a facility’s size and the scope of services provided)
(Accreditation Canada personal communication, 2012). The Ontario Ministry of Health increases its per diem funding rate of $80.13 to each LTC facility by $0.33 when a facility attains accreditation status (Ontario Ministry of Health, 2007b), however it is not known whether this funding is sufficient to cover both the direct and indirect costs associated with LTC home accreditation.

This research was limited to making a cross sectional comparison of resident safety outcomes between accredited and non-accredited facilities at a single point in time. There may have been small improvements in quality accredited facilities were able to achieve that this study was not designed to detect. Future research utilizing longitudinal designs may be more appropriate at capturing the changes in quality that take place following accreditation. With respect to the operationalization of resident safety outcomes of interest, it is possible that this study was unable to detect an effect that only existed in residents considered a high risk for the development of some conditions. Preventative measures for pressure ulcers and falls are typically targeted at residents considered to be at high risk (Lyman, 2009; Poss et al., 2010; Horn, Sharkey, Hudak, Gassaway, James, Spector, 2010; Lyder et al., 2002; Wagner et al., 2011; Neyens et al., 2009). Rather than focusing on the highest risk residents, the present study examined residents at all levels of risk together. One of the original hypotheses for this study was to examine high risk residents for falls and pressure ulcers specifically. This hypothesis could not be tested due to data availability limitations. Future research examining these high risk groups of residents may expose more beneficial effects of accreditation that the present study was unable to detect.

Finally, this research was relatively narrow in scope in that it only examined the impact of accreditation on safety-related processes and outcomes in LTC. There may be potential benefits of accreditation in other important areas of LTC, such as resident satisfaction, that this study did not measure. It would thus be beneficial for future studies to
examine the impact of accreditation on resident and family member perceptions of care quality.

4.6 Limitations

A major limitation of this study was its cross sectional and observational design, which made it impossible to control for facility participation in other quality improvement programs such as “Residents First” and “Safer Healthcare Now!” Such programs could have improved QI rates in non-accredited homes to the extent that there were no detectable differences between accredited and non-accredited facilities. Alternatively, the observed results for falls (attributed to accreditation) may have resulted from other fall prevention programs that accredited facilities were more apt to participate in. As our results suggest that homes with less access to specialized staff or supplemental revenue are less likely to participate in accreditation, it is also possible that the association between accreditation and falls may have been due to greater resources within accredited facilities.

Another limitation of this study was that costs were not examined, thus the influence of organizational characteristics on the odds of facility accreditation and the nature of quality indicator relationships observed could not definitively be attributed to costs. This study may also not be generalizable to very small LTC homes, as these facilities were excluded from the sample examined. However, as the vast majority of LTC homes in Ontario have greater than 25 beds; only about 3% of homes in the province were small enough to be excluded from the analysis.

There were also some factors in this study that may affect the comparability of QI rates between institutions. LTC facilities may have different resident turnover rates, with one recent Ontario study noting that homes can have anywhere from 5% to greater than 30% of their residents transitioning at any given time (Gruneir, Anderson, Rochon, & Bronskill,
High turnover facilities may differ from other facilities in ways that could affect QI measurement, such as differing thresholds for transfer of ill residents to hospital. With respect to the MDS-RAI, there is the possibility for some gaming (fraud), as information is self-reported by LTC homes themselves without any audit or oversight by an external body. This could occur if LTC home personnel feel it is in their best interest to make their site’s data appear more favourable (Hirdes, 2001). Similarly, although the MDS-RAI is a standardized data collection instrument, facilities may measure outcomes differently or with varying degrees of sensitivity (Schnelle, Wood, Schnelle, & Simmons, 2001; Mor, Angelleli, Jones, et al, 2003). Although this study was unable to account for such considerations, comparisons of QI rates between individual facilities are more sensitive to these biases than aggregate comparisons between large groups of facilities, where these factors would have to differ systematically between groups to affect a study’s findings.

With respect to the analysis of QI prevalence rates in the form of a four quarter average, a disadvantage of this approach is that residents with health events persisting beyond three months would have been counted more than once. For example, this could occur for residents with chronic urinary retention, which can be a legitimate medical indication for a catheter (Hwang, & Chen, 2009; Warren, 2001; Smith & Nicolle, 2001). However, such circumstances would only represent a small minority of MDS-RAI assessments and thus were not expected to have a major impact on our findings. Similarly, there can be advantages gained through using additive data across multiple quarters. Such data are reflective of a longer period of time, and thus are less likely to be subject to sporadic fluctuations in quality that may not be reflective of the “bigger picture”. In terms of the operationalization of resident safety as MDS-RAI based QIs, there are potential weaknesses in some of the QIs. For example, the infections QI includes a wide variety of infections with different etiology and prevention strategies that may have been better examined separately.
In terms of the methodology used to risk adjust QI rates, there may have been unmeasured confounders that were unequally distributed between the accredited and non-accredited groups which could not be accounted for. For example, the proportion of facilities located in areas with infectious disease outbreaks was not controlled for but might have differed between the accredited and non-accredited group and influenced infection prevalence rates. Furthermore, when making health outcome comparisons between facilities it has been demonstrated that the type of risk adjustment methodology employed can have a strong impact on results (Mukamel & Brower, 1998). A potential weakness of CIHI’s case-mix adjustment is their use of the RUG-III CMI to stratify and re-weight QIs - the RUG-III system was originally designed to measure resource utilization, not acuity. This study did not compare results using different risk adjustment methodologies to affirm the robustness of the findings. Finally, mean unadjusted QI rates and their associated standard deviations (used only for descriptive purposes) may have been somewhat inaccurate, as CIHI suppressed small cell sizes for these rates, thus mean imputation was employed.

With respect to accreditation status, the Ministry of Health Reports on LTC Homes only displays whether a facility is currently accredited, thus this study was unable to differentiate between homes that have never been accredited and those that were formerly but are not currently accredited. This could have affected the results because formerly accredited homes may continue to benefit from accreditation after they have discontinued their participation. However, any bias resulting from this limitation would have been towards the null hypothesis, making the findings presented here more conservative.
4.7 Conclusion

Although patient safety is a primary focus of the Accreditation Canada program, the program is associated with better patient safety in only some areas of care. There was a statistically significant association between accreditation and lower fall prevalence, while rate ratios for the remaining four QIs examined (prevalence of pressure ulcers, infections, restraints, and catheters) were not statistically significant. As falls represent one of the most severe and potentially debilitating adverse events in LTC homes (Kannus, Sievanen, Palvanen, Jarvinen, & Parkkari, 2005), arguably, these events represent the most important area of patient safety in LTC. Further research on the impacts of accreditation in health care institutions may help inform and improve accreditation programs.

The findings from this study also indicated that Ontario LTC homes located in rural areas or homes that are not members of a chain were less likely to become accredited. Difficulties with access to or recruitment of staff with specialized training or experience may act as barriers to accreditation for some facilities. Governments and accreditors may need to consider providing additional supports for under-resourced homes to ensure that accreditation is equally attainable for all LTC facilities.
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