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Potentially Avoidable Hospitalization in Institutionalized Older Persons

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Potentially Avoidable Hospitalization in Institutionalized Older Persons" submitted by Jennifer Dawn Walker in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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Abstract

Background: Prevention, early detection and treatment of acute illnesses and the comprehensive management of chronic conditions are important aspects of continuing care for older persons. Due to the costs and inherent risks of hospitalization, efforts to reduce avoidable hospitalizations from continuing care are important. One approach for measuring avoidable hospitalizations is to identify conditions for which hospitalization is considered preventable with appropriate primary care, such as ambulatory care-sensitive conditions (ACSC). This approach has been widely applied in community-based populations and has recently been extended to continuing care settings in the U.S. This investigation aimed to develop an indicator of potentially avoidable hospitalizations (PAH) to serve as a flag of the quality of preventive care for older continuing care residents in Canada.

Methods: A nine-member expert panel was convened to develop a consensus-based definition of PAH based on the ACSC approach. The refined PAH measure was applied to linked administrative hospital and continuing care data from Ontario, held at the Institute for Clinical Evaluative Sciences (ICES). Facility-specific rates and resident/facility-level predictors of hospitalization and PAH were explored in multivariate models including all older residents of complex continuing care facilities in Ontario admitted between April 1, 1997 and March 31, 2001.

Results: The expert panel added septicaemia and falls/fractures to the PAH definition and removed rare, less relevant conditions such as congenital syphilis. PAH rates showed an average increase over time and substantial variation across facilities. They were not related to previously validated facility-level quality indicators (QI). At the

resident level, the strongest predictor of increased PAH, other hospitalization, and death was health instability. Other predictors of PAH differed for long and short-stay continuing care residents as well as by degree of cognitive impairment. Key predictors of increased PAH included male sex among more cognitively impaired residents, functional impairment for short-stay residents, and younger age for long-stay residents.

Conclusions: The study contributes a revised measure of preventive care developed for the Canadian continuing care setting. The rate of PAH across continuing care facilities may be an independent indicator of the quality of preventive and health care services provided. As with other screening measures, variation on the PAH indicator could serve as a trigger for a more in-depth investigation of the factors that contribute to higher or lower rates of PAH.

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CHAPTER ONE: Introduction

Early detection and treatment of acute illness and long-term management of chronic conditions are important aspects of quality continuing care for older persons. Hospitalization of continuing care residents is common, with estimated rates averaging approximately 35% per year.[1-10] Hospitalization is often viewed as a negative outcome for long-term and chronic care residents, particularly when the condition responsible for the hospitalization is considered preventable. Despite the importance of this issue, there have been relatively few investigations in Canada focusing on transfers from continuing to acute care settings.

Continuing care is an increasingly important component of the Canadian health care system. In 2005, 13% of the population in Canada was over the age of 65. In 2005, there were 4,217,800 older Canadians. This represented a 1.8% increase over 2004, which was double Canada's overall growth rate.[11] In Ontario, facility-based continuing care is provided in both non-hospital and hospital settings. Hospital-based continuing care is called Complex Continuing Care (CCC). This sector provided 2.0 million days of care and cost $798.4 million in 2003/04.[12] CCC facilities provide a more acute and intense level of care than non-hospital continuing care settings. There is evidence that the complexity of caring for CCC residents has increased.[13] As such, there are more short-stay, post-acute patients in CCC than there are in traditional long-term care (LTC) settings. In 2004/05, 87% of CCC admissions came from an acute care bed and 22% of residents were discharged home.[14]

For residents of continuing care, acute hospital care may be the most appropriate setting for the effective management of an acute episode or exacerbation of a chronic

condition. However, some have argued that seniors in continuing care with complex care needs should be treated outside of acute care settings when possible.[15, 16] For certain events, such as diabetic coma, hospitalizations are considered necessary. However, the event and subsequent hospitalization are also considered potentially avoidable because, with adequate monitoring and management of diabetes, diabetic coma is not expected to occur.

The underlying driver to prevent hospitalizations of continuing care residents is two-fold. First, preventive care and management of chronic conditions in the continuing care facility may prevent use of more expensive hospital resources. At a health system level, acute hospitalizations use the highest proportion of health spending. In Canada, acute hospitals accounted for 30.2% of total health expenditures at $37.2 billion in 2003/04.[17] Second, hospitalization has the potential to lead to poor health and functional outcomes that could have been avoided. Hospital transfers and treatment during hospital stays are thought to pose risks for functional decline independently of the disease that prompted the hospital admission.[15, 18] Because older patients have reduced reserve capacity, events and conditions associated with hospitalization, such as immobilization and isolation, have the potential to lead to a "cascade to dependency" and functional decline.[15]

Studies in the U.S. estimate that the percentage of institutionalized older populations hospitalized each year is between 11.3% and 60.1%.[1-10] The individual estimates average approximately 35%. Hospitalization rates vary for many reasons. For example, rates are generally higher for new residents or short-stay residents compared to a cross-section of residents or long-stay residents.[3, 4, 6] Estimates for the percentage of hospitalizations of older people that are potentially avoidable range from 0-40%,[3, 19-28] averaging

approximately 17%. The proportion varies by definition of hospitalization, the definition of avoidable, and the population and context in which the study was done. There is a substantial body of literature examining the predictors of hospitalization in general for older people and sub-populations in this group. However, less is known about which groups of older people are at highest risk for potentially avoidable hospitalization (PAH). It has been hypothesized that variations in PAH rates may be attributable to differences in the quality of care provided in the continuing care facility.[19] However, much of the research examining PAH in continuing care has been descriptive.

Existing research on hospitalizations among institutionalized seniors has employed three broad approaches to identifying inappropriate and/or avoidable hospitalizations. The first is based on an expert review of the circumstances surrounding the transfer using patient charts or primary data.[3, 21, 24, 29] The second is the application of standard or study-specific appropriateness criteria to the acute setting.[22, 27, 30, 31] The third approach is to identify conditions for which hospitalizations are generally considered unnecessary with adequate preventive care, such as ambulatory care sensitive conditions (ACSC).[19, 20, 26, 32]

ACSCs were developed to identify hospitalizations in the general U.S. population aged less than 65 years that could be avoided with adequate access to ambulatory or primary care in the community.[33, 34] Variation in rates of ACSC hospitalizations can be used to examine health system performance, evaluate policy changes and audit the quality of preventive care.[35] There is an important delineation between "potentially avoidable" and "inappropriate" hospitalizations. Potentially avoidable refers to actions that may have prevented or minimized the acute event or exacerbation of chronic illness causing the hospitalization. Inappropriate refers to the circumstances surrounding the

decision to hospitalize a resident given the acute event or exacerbation that has occurred. The appropriateness of a decision to hospitalize depends on the preventive care resources available to the individual, the discretion of the physician, communication between service providers, and the availability of hospital resources. Judgement of the potential avoidability of the hospitalization is likely less dependent on the individual circumstances surrounding the event and more dependent on the quality and types of preventive care available. Hospitalizations for ACSCs are considered *potentially avoidable,* because they may be prevented with adequate primary care, but are often less likely to be considered *inappropriate* than hospitalizations for other diagnoses because once a serious preventable complication arises, such as diabetic coma, hospitalization is considered necessary.[35]

While the ACSC approach was developed for use in a younger non-institutionalized population, it has been extended in select studies to the older LTC population in the U.S. to denote the level of quality preventive care provided in the facility.[19, 32] The present study aims to improve the utility of the ACSC approach in the context of continuing care in Canada by refining a measure of PAH. While, ideally, continuing care data would be used directly to estimate access to effective preventive care, there are several practical advantages to using hospital data. Hospital data are readily available and captured in a national database called the Discharge Abstract Database (DAD). Thus, the data elements are consistent across Canadian jurisdictions and efforts are made to ensure that standard guidelines for diagnostic coding are applied. This improves the opportunity for comparisons across Canada. Conversely, comparable data on continuing care, particularly the extent to which preventive measures and clinical management of chronic illness is

taking place, are currently lacking. Different data collection systems are in place in different provinces, health regions, and individual facilities, resulting in fragmented data. The CCC dataset used in the present study, the Minimum Data Set Version 2.0 (MDS 2.0), is currently implemented or planned for implementation in several other jurisdictions (including LTC facilities in several provinces and health regions). While a PAH definition based on hospital data allows for immediate widespread application of the measure, the future availability of MDS 2.0 data will provide enhanced opportunity for widespread validation and exploration of the new PAH measure in the Canadian continuing care sector.

The purpose of this study was to develop and apply a measure of PAH that could serve as a marker or indicator of potential opportunities for quality improvement in preventive care services for older people in continuing care facilities. The study consisted of three Phases. Phase 1 used existing longitudinal MDS 2.0 and DAD data on residents of CCC in Ontario. In this Phase, the rates and predictors of overall hospitalizations and ACSC hospitalizations were evaluated. In Phase 2, an expert panel was convened to review the definition of PAH, to determine the utility of the ACSC approach and to develop a refined measure of PAH for continuing care in Canada based on available data. In Phase 3, the resulting revised definition of PAH was applied to the longitudinal CCC and hospitalization data from Phase 1. This Phase was undertaken to explore the effect of refinements made to the PAH indicator and to begin to assess the validity of the revised PAH indicator.

The specific objectives for each Phase were as follows.

Phase 1

Phase 1 of the study examined transfers between CCC and acute care facilities in Ontario for the 1997/98 to 2001/02 fiscal years. The specific objectives were:

- To describe the rate of hospitalization and ACSC hospitalization for CCC facility residents in Ontario.
- To examine the relationship between validated CCC facility-level quality indicators and rates of hospitalization and ACSC hospitalization.
- To investigate the clinical and functional predictors of ACSC hospitalization, other hospitalization, and death among CCC facility residents.

Phase 2

The second phase aimed to solicit feedback on defining potentially avoidable hospitalizations for CCC residents through advice and input from an expert panel. Specifically, the objectives were:

- To evaluate the ACSC approach to identifying potentially avoidable hospitalizations in CCC and LTC residents.
- To achieve expert consensus on a data-derived definition of potentially avoidable hospitalizations for CCC and LTC residents and its utility as a potential national quality indicator for LTC in the Canadian context.

Phase 3

Phase 3 revisited the administrative data to examine transfers between CCC and acute care facilities in Ontario for the 1997/98 to 2001/02 fiscal years. The purpose was

to evaluate the revised potentially avoidable hospitalizations definition emerging from Phase 2 against the ACSC definition used in Phase I. The specific objectives were:

- To describe the rate of hospitalization and potentially avoidable hospitalization for CCC facility residents in Ontario.
- To examine the relationship between validated CCC facility-level quality indicators and rates of hospitalization and potentially avoidable hospitalization.
- To investigate the clinical and functional predictors of potentially avoidable hospitalization, other hospitalization, and death among CCC facility residents.

The results of this study contribute to a better understanding of the impact of clinical and facility characteristics on PAH from institution-based care. CCC and LTC facilities deliver care for older people who have a multitude of chronic illnesses that must be effectively managed to prevent debilitating acute episodes. Improving our ability to measure and identify PAHs in this population will assist continuing care facilities in their essential role of providing primary and prevention care for their patients. If death and functional decline can be reduced by preventing unnecessary hospitalizations, then the quality of life for institutionalized seniors may be improved.

Variations in the newly developed PAH indicator could reflect the quality of preventive care, but also the resources available in the facility or the health care environment. As with other screening tests with limited sensitivity (true positive rate) and specificity (true negative rate), variation on the PAH indicator should serve as a trigger to more in-depth investigation. Use of the indicator is intended to help guide decision

makers to disentangle the various factors that may contribute to higher or lower rates of PAH.

The next section of the report reviews the existing literature on the risks associated with hospitalization. The approaches used to define PAH are described and assessed. Findings related to resident and facility predictors of PAH and overall hospitalization are summarized. An overview of the role of institution-based quality preventive care for older people is then provided. This review of the literature is followed by a presentation of the results from each of the three phases of the research project and a discussion of the research findings and implications.

CHAPTER TWO: Review of the Literature

This section lays the foundation for the present study by reviewing the existing literature on the risks related to hospitalization among vulnerable older adults. Existing approaches to the definition and measurement of potentially avoidable hospitalizations (PAH) are summarized, with a focus on ambulatory care sensitive conditions (ACSC). This is followed by discussions of the disease prevention and management in older populations and of predictors of overall hospitalization and PAH. Approaches to measuring quality indicators (QIs) within continuing care facilities are then outlined.

2.1 Hospitalization-Related Risks for Older Populations

Though hospitalization of continuing care facility residents may occur appropriately, efforts are made to avoid hospitalizations where possible. One of the main reasons for this is that hospitalization is associated with poor outcomes, including functional decline and mortality, among frail older persons.[15, 36-41] Functional decline has been reported to begin within the first two days of admission to hospital among older patients.[39] Exposure to increasing numbers of hospitalizations has been associated with further increased risk of functional decline.[41] Cognitive and physical impairments are widespread in continuing care settings and increase the risk for accelerated functional decline following hospitalization.[36-38, 42] Cognitive impairment has been estimated to more than double the risk of functional decline following hospitalization[36, 42] and is associated with the development of pressure sores and incontinence during the hospital stay.[43] Age has also been identified as an independent predictor of poor outcomes related to hospitalization with a two-fold increase in risk for those aged 90+ years compared with those 70-74 years of age.[40] While quantifying the extent to which these declines occur as a result of

the hospitalization is difficult, in many cases the observed decline cannot be attributed solely to the acute event.[15] There are several possible mechanisms by which hospitalization may lead to poorer outcomes for older populations including aspects of the hospital environment itself as well as exposure to medical errors/adverse events.

The hospital environment includes the knowledge, beliefs and attitudes of the hospital care providers and the medical model of care. There are concerns that medical staff receive little training specific to the care and treatment of older people[44] and that some care professionals have negative attitudes and beliefs about older patients.[45, 46] Thus, hospital staff may be poorly equipped to address the unique needs of older patients and may fail to maintain activity levels in their patients by assisting them out of bed when possible. Over half of Ontario acute care nurses reported increased patient to nurse ratios in their workplaces during extensive restructuring in the late 1990s.[47] This decreases the amount of time nurses can spend with individual patients to avoid declines in function and mobility.

The model of hospital care is typically one that promotes bed rest.[15] As described in detail by Creditor, the interaction of normal aging processes (including decreased muscle strength, vasomotor instability, decreased bone density, decreased ventilation, sensory impairment, skin changes, and tendency to urinary incontinence) with the characteristics of bed rest and immobility contribute to a cascade of dependency. Creditor outlined the complex relationships that eventually lead to nursing home admission following hospitalization. However, the concept can be generalized to describe the road to functional decline and poor outcomes, such as pressure sores, muscle atrophy, decreased

cognitive capacity, and incontinence. A modification of Creditor's framework is presented in Figure 2.1 on page 50.

The second mechanism by which hospitalization may increase risk for poor outcomes is through exposure to medical errors and, more specifically, adverse events. Broadly, a medical error is a preventable failure to achieve an intended outcome.[48] Medical errors can be prescription errors (estimated at 42% of all errors), communication errors or omissions (30%), and computer/equipment failures (16%).[48] When medical errors lead to adverse health outcomes, they are termed adverse events.

In 1964, Schimmel published The Hazards of Hospitalization.[49] This was an early look at the incidence of adverse events in the context of a university hospital. The estimated proportion of admissions that experienced an adverse event was 20% and length of hospital stay increased the risk. Adverse events are defined as "an injury that was caused by medical management (rather than the underlying disease) and that prolonged the hospitalization, produced a disability at the time of discharge, or both."[50] The Canadian Adverse Events Study reported a national estimate for the proportion of patients (excluding obstetrical and psychiatric patients) who experience an adverse event in both teaching and community hospitals based on chart reviews. The proportion was estimated to be 7.5%.[51] Approximately 37% of all adverse events were determined to be preventable events by physician reviewers. An estimated 38% of those experiencing an adverse event suffered temporary or permanent physical impairment and 16% died as a result of the adverse event.[51] Similar to findings from other studies, the risk of adverse event increased with age.[50-52]

There are at least two ways in which hospitalization may increase the risk for adverse events. First, there is an increased volume of services received, such as diagnostic tests, treatments and medications, which each carry a risk of adverse consequences.[51, 53, 54] In the Canadian Adverse Events Study, teaching hospitals had a higher overall rate of adverse events than community hospitals, but not a higher rate of preventable adverse events.[51] This may indicate that higher intensity of care exposes patients to increased risk of an adverse event that is not related to the quality of the care provided.[55] Second, with hospitalization, there is an increased number of different service providers involved in the care of an individual who each carry a risk of making a medical error. Additionally, increased numbers of service providers carries the potential for missed early warning signs of illness and prescription of conflicting medications due to communication errors.

Of particular importance for older chronically ill persons is the incidence of medication-related adverse events, termed adverse drug events. Older people in continuing care are likely to have multiple chronic conditions and to be taking several different medications.[54, 56] In addition, age-related physiological changes that affect pharmacokinetics and pharmacodynamics must be taken into account.[57, 58] These complicating factors increase the possibility of experiencing drug-drug interactions or drug-disease interactions and require vigilance on the part of the prescriber when discontinuing, changing, or beginning a medication regimen.[54] An estimated 86% of LTC facility residents who are transferred to hospital have at least one medication change[59] and the prevalence of prescribing error is estimated to be 62.4 per 1000 orders.[60] Of clinically significant errors, errors in dose and frequency of the prescribed medication have been cited as the most common errors.[60] Thus, frequent transfers between settings

present risks for chronically ill older persons, due to discontinuations and changes in medication orders in the new setting.

2.2 Defining Inappropriate and Preventable Hospitalizations

In the Canadian context, little work has been undertaken to empirically define preventable hospitalizations, or PAH, from continuing care settings. More effort has been expended to define the appropriateness of hospitalization.

2.2.1 Inappropriate hospitalizations

Canada has a universal health care system where, in principle, resources are distributed fairly. The Canada Health Act stipulates that health services must be publicly administered, comprehensive, universal, portable, and accessible.[61] Due to limited resources available for health care and the above criteria for health insurance, one might assume that all admissions to hospitals in Canada are appropriate. In fact, one Canadian research team defined an appropriate transfer as one 1) that resulted in an admission, 2) where diagnostic and therapeutic services obtained in the emergency department (ED) were not available in the LTC facility, or 3) that resulted in death in the ED.[28] In this study, 93% of transfers were considered medically appropriate.[28] However, when a hospital utilization review methodology was applied to evaluate appropriateness, 18% of acute care admissions in Ontario were categorized as non-acute,[62] suggesting that some admissions may have been inappropriate.

The above Canadian examples illustrate two commonly used approaches to defining inappropriate hospitalizations. The first is based on an expert review of the circumstances surrounding the transfer using patient charts or primary data.[24, 29, 63] Bellilli and colleagues conducted a prospective study of the appropriateness of the diagnosis and

management of events that occurred at night time and on holidays in Italian nursing homes.[29] Two experts reviewed data collection forms completed by physicians. They found lower hospitalization rates and more appropriate management among physicians on NH staff compared with temporary and community-based physicians. Eight percent of management by staff physicians was potentially inappropriate compared with 30% for community physicians.[29] Saliba and colleagues conducted a chart review in skilled nursing facilities to assess the appropriateness of ED and hospital transfers.[24] They recorded advance directives, baseline health status, characteristics of the acute illness, the resource needs and availability and the quality of acute care in the nursing facility. Trained physician reviewers determined that 36% of ED transfers and 40% of hospital admissions were inappropriate.[24] They concluded that inappropriate hospitalizations occurred most often when the hospital services could have been provided as an outpatient and when the evaluation and treatment of the acute condition was handled poorly in the continuing care facility.[24]

The second approach to defining inappropriate hospitalizations is the application of standardized appropriateness criteria to the acute setting to assess the appropriateness of hospital admissions and subsequent hospital days.[22, 27, 30, 31, 64] In general, the process is termed utilization review. Utilization reviews retrospectively apply explicit criteria to define when a patient should be admitted to and when they should be discharged from acute care to data abstracted from the patient chart.[65] Two widely used tools that have been applied in North America and Europe are the InterQual ISD (Intensity of Service/Severity of Illness/Discharge Screens)[66] and the Appropriateness Evaluation Protocol (AEP).[50, 67] The ISD was first developed in 1978 and the AEP in 1981 in the

U.S.[66, 68] These tools have become well-established in health care planning and research. They have been modified for use in several European jurisdictions [50, 64, 67, 69, 70] and applied in many Canadian provinces [31] including Saskatchewan,[71] British Columbia,[72] Ontario,[73] Manitoba,[74] and Prince Edward Island.[75] Both tools are designed for use in the general population of acute care patients. However, the AEP has also been used to investigate geriatric admissions specifically with an estimated 11% of emergency admissions deemed inappropriate.[22, 25] While both tools are typically used to assess hospital overuse, the ISD has been used in Canada by Trerise and colleagues to estimate underutilization of acute care in one Vancouver hospital, including inappropriate discharge from ED, inappropriate discharge from acute care, and use of non-critical care inpatient beds when criteria for admission to intensive care were met.[66]

One important consideration of using utilization review tools is whether a more appropriate alternative treatment location exists.[64] Though these tools were primarily designed and used to determine whether discharge was inappropriately delayed,[64, 67] the original version of the AEP also assesses the appropriateness of hospital admissions using 17 criteria that reflect clinical stability, the necessity of medical intervention, and planned surgical procedures within 24 hours.[50] The ISD also has a component for the appropriateness of admission.[31] When using the tools in this way, it is important to assess the suitability of the admission appropriateness criteria to the new health system and cultural context and to modify them as appropriate.[50] To account for this, the AEP allows users to alter the measure of inappropriateness based on the availability of alternate service locations (e.g., outpatient rehabilitation). In one U.K. study, use of a service-availability modification reduced the rate of inappropriate days by 50%.[76] However,

setting-specific modifications limit comparability with other jurisdictions.[77] The proportion of admissions considered inappropriate is often lower than the proportion of subsequent days due to delayed discharge.[78]

Though utilization reviews are useful and have been used extensively for the assessment of hospital utilization, there are several important limitations to their use. The tools rely on primary data collection through chart abstraction and expert review. Thus, they are resource and time-intensive to administer.[78] The validity and reliability of these tools has been questioned.[64, 79] One of the key concerns is the lack of consideration that the tools give to the context in which the utilization review takes place. Kalant and colleagues conducted a validation study of the AEP, the ISD, and a third utilization review tool, the Managed Care Appropriateness Protocol (MCAP). They compared the results obtained by the tools against the judgement of a Canadian clinical consensus panel.[31] They concluded that the tools were not sufficiently valid and presented low agreement levels between the panel and the tools (kappa values of 0 to 0.45 for the appropriateness of admission and 0.22 to 0.25 for subsequent days).[31] They suggested that the tools, if used at all, should be combined with a physician's judgement to override the appropriateness rating. Tu suggested that the validity of the tools could be improved by adapting the content to the Canadian context. He also underscored the importance of rigorous prospective validation studies that examine death rates and readmission rates as outcomes.[65]

While utilization review tools can be used to assess the appropriateness of an admission to hospital given a patient's current status and needs, they are not intended to reflect previous preventive and ongoing care. The tools are designed to reflect the quality

of acute care processes not the quality of care in the setting prior to the acute hospitalization, such as continuing care facilities, which is the focus of the current study.

2.2.2 Preventable hospitalizations

In contrast with inappropriate hospitalizations, preventable hospitalizations, or PAH, are intended to reflect deficiencies in the processes of preventive care leading up to the hospitalization.

Two small studies have used expert reviews of hospitalizations to identify those that were preventable. Coleman and colleagues suggest that a preventable hospitalization is one that could have been avoided with commonly available strategies in the nursing home such as adequate oral intake and regular medication review.[3] An expert panel determined that none of the 15 hospitalizations were preventable and four were potentially preventable.[3] Finucane and colleagues defined avoidable hospitalizations as those that could have been avoided if specialized care had been available in the nursing home.[21] Their experts reviewed 184 hospitalizations and concluded that 19 were avoidable.[21]

An alternate approach to defining PAH is to identify conditions for which hospitalizations are generally considered preventable, such as ambulatory care sensitive conditions (ACSCs).[19, 20, 26, 80, 81] Rather than examining potential overuse of hospitals as is done in utilization review (appropriateness of the hospitalization), this approach examines potential under use of preventive care in continuing care settings (avoidability of the hospitalization).[82] Because this method addresses the quality and availability of preventive care provided prior to the hospitalization, it more directly examines the extent to which hospitalizations can be avoided. For this reason, the ACSC approach was the

method selected for use in Phase 1 of the present study and formed the basis for consultation with the expert panel in Phase 2.

Ambulatory Care Sensitive Conditions (ACSCs)

The ACSC approach is typically used to monitor preventable hospitalizations at a population level by identifying hospitalizations that occur for conditions that can be prevented with adequate access to primary care.[33, 34, 83] This approach was developed for the general U.S. population and lists conditions that occur across the age spectrum, including both congestive heart failure and infant failure to thrive. It has been widely applied as a measure of access to care and varies by race,[84-86] with higher rates for First Nations people in Canada,[87] and by socioeconomic indicators, with higher rates among uninsured individuals in the U.S.[33, 86] ACSC rates also vary by geographical location and are higher for areas with lower aggregate income levels,[86] lower primary care density [83, 84, 88] and greater supply of hospital beds.[84]

ACSC diagnosis lists typically include the following conditions: angina pectoris, asthma, cellulitis, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), dehydration, dental conditions, diabetes, gastroenteritis, seizure disorders, hypertension, hypoglycaemia, immunization-preventable conditions, urinary tract infection (UTI), nutritional deficiency, pneumonia, severe ear/nose/throat infections, and tuberculosis.[33, 89] In the U.S., an estimated 7-10% of hospitalizations were for ACSCs among Medicare beneficiaries.[26, 90] Estimates place the rate between 40-51 per 1000 older persons in the U.S.[26, 91]

The ACSC approach to measuring access to primary care has been applied to older populations living in the community.[20, 90-93] In 2001, Kozak and colleagues identified a

significant upwards trend in the rate of ACSC hospitalizations for the U.S. population older than age 65, but not for younger populations.[92] They estimated that the rate had risen from 37 to 57 per 1000 between 1980 and 1998.[92] This finding was explored further by McCall and colleagues in 2004 using Medicare fee-for-service claims data.[91] They confirmed that the rate of hospitalization for most ACSC diagnoses increased between 1992 and 2000 (including cellulitis, chronic obstructive pulmonary disease, dehydration, pneumonia, septicaemia, and urinary tract infections) while others decreased (including asthma and stroke).[91] The number of hospitalizations for various individual ACSC diagnoses such as urinary tract infections, pneumonia, congestive heart failure (CHF), asthma, perforated or bleeding ulcer, gangrene, cellulitis, and diabetes have been described for older populations.[33, 34, 88, 94]

The ACSC approach has also recently been extended to older institutionalized residents in the U.S.[19, 32, 95, 96] Intrator and colleagues examined ACSC hospitalizations from freestanding nursing homes in four states.[32] They found that in six months, 15.5% of the residents were hospitalized and, of these, 37.1% had an ACSC as their principal diagnosis. They found that facility-specific six-month ACSC hospitalization rates varied from 0 to 21.2%. Kane and colleagues have used the ACSC definition to evaluate the effectiveness of specialized geriatric programs that are intended to enhance primary care delivery in both nursing homes and community care.[95, 96] They found that primary care provided by nurse practitioners in nursing homes as part of the Evercare program across five U.S. states was associated with a lower ACSC hospitalization rate.[96]

While ACSC lists typically consist of a core group of diagnoses, in some cases the conditions have been modified and selected to reflect the population of interest. For

example, McCall and colleagues included stroke and septicaemia in their investigations of older populations.[91] In addition, some researchers have excluded CHF and pneumonia in studies of older populations, which are the two most common causes of potentially preventable hospitalization in the elderly.[34, 88, 94] The justification for their exclusion is that these conditions may be an unpreventable part of the trajectory of decline for some older people. However, other research has indicated that, though progression of CHF is unavoidable in some residents, there are opportunities for improved management in LTC facilities.[97]

Expert panels have been used to revise and validate ACSC lists in certain contexts. For example, Brown and colleagues used three different consensus techniques to determine a core list of ACSC diagnoses for use in the general Canadian population.[35] They used a Delphi panel, a modified Delphi panel, and a questionnaire panel. Following an extensive literature review on ACSCs, each panel was provided with background materials and a list of potential ACSCs for consideration. While the different panels achieved consensus on different lists of ACSCs, there was overlap on eight core ACSCs among the three panels (asthma, angina pectoris, pelvic inflammatory disease, immunization preventable infections, otitis media, gastrointestinal ulcer, malignant hypertension, and congestive heart failure). The authors suggested that use of the core list would provide the greatest specificity (higher true negative rate)[98] and that use of the broader lists would provide the greatest sensitivity (higher true positive rate).[98] They found that the modified Delphi panel that had the opportunity to meet and discuss the possible ACSC inclusions developed a more comprehensive list of conditions for which there was consensus.[35] A similar example is Caminal and colleagues who developed a

recommended list of ACSCs for use in Europe.[99] To do this, they identified diagnoses from the literature, eliminated diagnoses with a hospitalization rate of less than 1/10,000 in the population and determined which of these had clarity of definition and coding. They then drew on expert advice through a survey with respect to the role of primary care in avoiding hospitalization for the conditions and whether or not hospitalization was necessary for those conditions.

The purpose of measuring ACSC hospitalization rates is that these conditions are thought to be sensitive to preventive care. The rates are typically measured on a population level to determine sources of variation. The approach has been applied in the context of continuing care to provide insight on the quality of preventive care offered in different facilities. Because continuing care facilities are the primary point of contact with the health care system for their residents, they have an important role to play in prevention and chronic disease management. Though the challenges and strategies differ for older persons, there is a substantial opportunity for preventive care in this population. The following section outlines some of the evidence for disease prevention and management in older persons, focusing on conditions that have been identified as ACSCs.

2.3 Disease Prevention and Management in Older Populations

Prevention is a key role for the continuing care sector and takes several forms. Primary prevention is the avoidance of initial disease, through strategies such as immunization and enhancing nutrition.[98] Secondary prevention involved early detection of disease and timely intervention to control the disease and minimize its impact.[98] Tertiary prevention is the effective long-term management of disease and disability.[98]

All three levels of prevention are important within continuing care, which provides ongoing management of chronic diseases and the prevention of infections or acute exacerbations of disease. The rate of emergency department visits from U.S. nursing homes has been estimated at 110 visits per 100 resident years.[100] An estimated 41.3% of the visits were multiple transfers, indicating that more targeted management and treatment may have been necessary in the nursing home.[100] Medication management is one important area related to prevention and management of illness in continuing care. An estimated 40-50% of residents in U.S. skilled nursing facilities are exposed to at least one inappropriate medication.[101, 102] Those exposed to inappropriate medications[103] and new medications[6] are at a significantly increased risk for hospitalization and death. Medication under-treatment is also a concern in this population.[104] Effective communication between care providers and residents is among the important factors contributing to early detection of illness and maintaining the health and function of residents. McGilton and colleagues identified substantial opportunity for improvement in the quality of communication and frequency of interactions between residents and nurses in Ontario CCCs.[105] They showed that a focused intervention to enhance communication though targeted training in one CCC improved nursing satisfaction and feelings of closeness with residents.[105]

The literature is extensive on the epidemiology, evidence for management and prevention strategies, and consequences of hospitalization for many individual conditions. The following section summarizes the key conditions for which preventive care is important in continuing care, with a focus on ACSCs. Rather than serving as a comprehensive review of all the relevant literature, this section provides a broad

overview of the opportunities for prevention and management of selected prevalent conditions, including pneumonia, CHF, and other chronic and acute conditions.

The incidence of nursing home-acquired ***pneumonia*** (NHAP) ranges from 99 to 912 annual cases per 1000 residents, with a median of 365.[106] An estimated 9 to 51% of pneumonia cases are transferred to hospital.[106] However, some have questioned the appropriateness of hospital transfers for NHAP.[107-110] A recent review article concluded that hospitalization for NHAP may not always be necessary and may contribute to increased morbidity and mortality, in addition to increased health care costs.[107] The most important predictor of outcomes following pneumonia is functional status prior to illness.[106] Because many residents of CCC have poor functional status, they are at increased risk for poor outcomes following NHAP.

In continuing care, pneumonia is often caused either by *Streptococcus pneumoniae* or gram-negative *Enterobacteriaceae* (related to aspiration with gastric tubes).[111, 112] However, other bacteria such as *Chlamidia pneumonia* have been increasingly responsible for pneumonia in this population and viruses place individuals at higher risk.[112] The risk of pneumonia increases with age due to decreased immune response[113] and the presence of comorbid conditions,[106] which are often associated with decreased lung capacity and cough reflex.[111]

Pneumonia can be prevented through several strategies. Adherence to infection control precautions and effective dental care practices are important in reducing exposure to bacteria and viruses.[112] Pneumococcal vaccination addresses the most common cause of bacterial pneumonia, *Streptococcus pneumoniae* and is recommended for all residents

of continuing care.[114] Also, influenza vaccination also plays an important preventive role[112] and has been shown to reduce influenza-related pneumonia by 40 to 50%.[106]

Early detection of pneumonia is challenging. While cough and fever are the most commonly reported presenting symptoms, they are only observed in less than 2/3 of patients with pneumonia.[106, 107] To be appropriately treated outside of hospital, the continuing care facility must have a physician or nurse practitioner available to assess the resident, access to radiography and laboratory testing, and the capacity to administer intravenous antibiotics and oxygen.[106] If adequate resources are in place, survival following a pneumonia episode has been shown to be similar when treated in continuing care compared with acute care settings.[109, 110] There appear to be better functional outcomes and mortality at two months following resolution of the pneumonia for those treated in continuing care.[108]

When incentives were pilot tested in one U.S. skilled nursing facility for physicians to treat acute illnesses without hospitalization, the most commonly prevented type of hospitalization was for lower respiratory tract infections,[115] including pneumonia. Thus, there appears to be some potential for preventing hospitalizations of this type.

CHF is another common condition for which continuing care facilities have an important role in prevention and management. The lifetime risk for CHF has been found to be 1 in 5.[116] The risk of developing CHF and experiencing adverse outcomes related to CHF increases with age.[117] Prevention of CHF is related to prevention of hypertension and myocardial infarction (MI), the two main risk factors for CHF.[116] Prevention efforts for older people, many of whom will already have hypertension and/or experienced MI, may be best directed at antihypertensive therapy and post-MI therapies.[116] Some studies

indicate that older adults are more likely to be seen in an advanced stage of CHF and less likely to receive evidence-based techniques for diagnosing and managing CHF.[117] For example, though there is solid evidence for the use of angiotensin-converting-enzyme (ACE) inhibitors in managing CHF,[118-120] Sloane and colleagues found that 62% of older persons with CHF living in assisted living care were not receiving ACE inhibitors.[104] Other effective interventions for CHF management include statin therapy (particularly with comorbid coronary artery disease, diabetes, or hypertension)[121] and exercise therapy.[122, 123]

Other chronic conditions that are amenable to preventive care include COPD, asthma, and hypertension. Many ***COPD*** exacerbations can be prevented in continuing care settings. Due to a strong relationship between smoking and COPD, smoking cessation is an important strategy for both prevention of COPD and for improvement of quality of life in those with COPD.[124] However, for most cases in continuing care, the COPD-related preventive care efforts necessarily focus on management and prevention of progression of COPD that has already occurred. For ongoing management of COPD, use of bronchodilators, oral antibiotics, and respiratory rehabilitation as needed may improve the condition and outcomes.[124] Immunization for influenza is also cited as a strategy for reducing COPD burden.[124] Influenza and other respiratory viruses have been implicated in hospitalizations for both COPD and ***asthma***.[125] Effective asthma management includes monitoring of and adherence to prophylactic medication. Nonadherence to asthma medication has been associated with asthma severity, increasing age, lower socioeconomic status, current smoking, earlier onset of asthma and number of comorbid conditions.[126]

As with COPD, most of the preventive strategies for ***hypertension*** in continuing care must focus on management and prevention of progression rather than primary prevention. Older people are at high risk for hypertension due to increasing arterial stiffness and sensitivity to sodium intake.[127] Hypertension in older persons can be managed through lifestyle modifications (such as weight loss, dietary sodium reduction, increased physical activity, low fat diet) and medication (such as thiazide diuretics with beta blockers, ACE inhibitors, calcium channel blockers, or angiotensin receptor blockers).[127-129] Management of hypertension is particularly important for preventing other conditions such as CHF and coronary heart disease.[129] A recent investigation in the UK found that the proportion of elderly patients with myocardial infarction or angina who are using antihypertensive medication has increased since 1998.[130] However, the study concluded that increased use of antihypertensive medications among the older population could contribute to further prevention of coronary heart disease.[130]

Preventive care in continuing care facilities also plays a role in avoiding acute events or conditions such as falls, periodontal disease, dehydration and urinary tract infections. ***Falls*** are often related to medication use and they account for an estimated 20% of preventable adverse drug events in continuing care.[54] The risk for an adverse drug event is particularly high for residents who are on seven or more medications.[54] However, the efficacy of fall risk modification by altering medication regimens has not been established.[131] Although targeting prevention efforts at high risk residents is one approach, one successful fall prevention program targeted all residents and reported a decrease of two thirds for serious falls over four years.[132] A recent review of fall prevention strategies recommended a multifaceted program including staff education and

assessment of risk factors, gait, assistive devices, and environment, with intervention on these factors as appropriate.[131]

Other strategies for preventing fall-related injuries focus on fracture prevention among older people with osteoporosis. These preventive efforts focus on improving bone mineral density with antiresorptive therapies, such as bisphosphonates, and calcium supplementation among others.[133] Sloane and colleagues found that 51% of assisted living residents with osteoporosis were not receiving any treatment; thus, there is some indication that older people with osteoporosis may be under-treated for their condition.[104]

Primary care for oral health is important for older people.[134] ***Periodontal disease*** is related to airway obstruction,[135] increased risk for pneumonia,[136] poor nutrient intake,[137] and cardiovascular disease,[136] among other conditions. Many older persons are at increased risk for periodontal disease due to comorbid conditions, medications, dry mouth, dexterity problems, and other aging-related factors.[138] One recent investigation of oral care in U.S. nursing homes indicated that current nursing practices with respect to oral care were not sufficient to prevent dental conditions.[139] Part of the difficulty is finding strategies to address disruptive behaviours during care.[139, 140] Despite this, successful programs can be implemented in LTC facilities that include strategies for daily oral hygiene.[140] For continuing care residents with reduced functional ability and dexterity, specific aids, such as electric toothbrushes, may also be used.

All older residents are at increased risk for ***dehydration*** due to physiologic age-related changes such as decreased fat free mass and loss of thirst sensation as well as functional decline in ability to intake fluids.[141] Simple educational programs and strategies for staff and residents have been suggested to increase awareness of the signs

of dehydration and ways to prevent it.[141, 142] Recommendations for preventing ***UTI*** include avoiding irritant fluids (such as caffeine), sufficient fluid intake, regular voiding, proper cleansing, and wearing white cotton underwear. When UTI occurs, early detection and treatment with oral antibiotics are usually necessary.[143] However, early detection is challenging because the symptomology for UTI is complex and not consistently recognized in older persons.[144] Education and communication between physicians and nurses within LTC facilities to agree on the symptoms that indicate UTI may help to improve early detection.[144]

The continuing care environment offers opportunities for preventive care in older persons who are institutionalized and potentially at higher risk for poor outcomes. Evidence-based management of prevalent conditions in older populations, including pneumonia and CHF, shows potential for preventing decline, hospitalization and death. Prevention of emerging health conditions and management of existing conditions are key roles for continuing care facilities.

2.4 Predictors of Hospitalization and Potentially Avoidable Hospitalization

2.4.1 Conceptual Framework

A widely used model to explain the relationship between the environment, individual characteristics, health behaviour, and health outcomes is the Model of Health Services Use that was developed in the 1960s by Andersen and colleagues and updated in subsequent years (see Figure 2.2 on page 51 for the most recent version).[145] While this model and its previous versions have been used extensively to predict and explain health services use in community-dwelling populations, including older populations,[20, 146, 147] its use has not been extended to older people living in continuing care facilities. This model

was developed using the individual as the unit of analysis. However, in a residential continuing care environment, the decision-making process is further complicated by facility characteristics (e.g., availability of resources, presence of care pathways, decision-making hierarchies) and caregiver characteristics (e.g., social structure and health beliefs of health professionals and family members). In addition, the model has been criticized for its lack of attention to environmental and provider factors,[148] which are of particular importance for residents of LTC in predicting hospital use. Thus, though Andersen's model guided the approach to the selection of predictors of hospitalization used in the present study, greater importance was placed on relationships that were previously observed in the literature or had clinical relevance.

2.4.2 Predictors of Hospitalization and PAH

Substantial research has been done in the U.S. to identify the patient, facility, and, to a lesser extent, regional factors that contribute to an increased risk of hospitalization for residents of LTC facilities. Hospitalization rates have been found to vary substantially between diagnostic groups from 28 per 100 resident years for coronary atherosclerosis to 130.5 for those with genitourinary system diseases.[9] A summary of the findings related to overall hospitalization is presented in Table 2.1 on page 39, while Table 2.2 on page 44 summarizes the literature investigating the predictors of PAH in older people.

All of the studies that examined predictors of PAH used ACSCs (as an aggregate measure and/or as individual conditions) as markers for preventive care. The two key studies that examined PAH among continuing care residents used administrative data in U.S. nursing homes and hospitals.[19, 32] Carter examined the predictors of ACSC hospitalization of Medicaid recipients in 500 nursing homes in Massachusetts over three

years.[19] Intrator and colleagues focused on a snapshot of long-stay urban nursing home residents in Maine, Kansas, New York and South Dakota who were assessed in the second quarter of 1997.[32] Because there have been few studies of PAH specifically examining continuing care facility residents, Table 2.2 also presents a summary of the findings for older people living in the community. Though predictors may differ for older people in LTC facilities due to a stronger role for care-related factors, they may also be similar. For example, McCall and colleagues found no differences in the predictors of ACSC for older community-based residents compared with all older persons (including facility-based).[91]

Predictors of hospitalization and PAH are often determined retrospectively. However, Hutt and colleagues used a prospective approach to examine hospitalizations among skilled nursing facility residents who acquired urinary tract infection, pneumonia, and congestive heart failure.[8] Alessi and colleagues took a similar approach and looked at infections, cardiac events, gastrointestinal bleeding, drug toxicity, and other acute events.[149] They found that the occurrence of an acute event was predicted by anaemia and mobility dependency but not by the number of medications. Excluding the short-stay residents did not affect the results. Both studies were small due to intensive data collection, limiting the power to detect differences between groups.

Sociodemographic Characteristics

From Table 2.1, it appears that male sex is associated with an increased risk of hospitalization.[6, 8-10, 19, 150-152] The PAH results for sex in Table 2.2 were not as consistent. The results did not vary strictly by community or facility-based population. However, the only facility-based sample showed a decrease in PAH associated with male sex.[19] The

results did vary by clinical population. For example, Hutt and colleagues found that males with pneumonia were at increased risk for hospitalization while those with CHF were at decreased risk.[8]

Older age was a more consistent predictor of PAH [20, 26, 90, 91, 153] than overall hospitalization. However, the only facility-based study to look at the effect of age on PAH found no relationship.[19] A small number of studies examined rural residence and marital status. Rural residence appeared to predict an increased risk of hospitalization[1] and PAH.[20] Being married predicted an increase in hospitalization[151] but had no effect on PAH risk.[20, 91] Unlike findings related to predictors of PAH in the general population, the literature on older populations showed no association with income.[20, 153] The relationship with race was not consistent for either hospitalization[59, 150] or PAH. [20, 153]

Health Care Provided

Selected elements of health care provided prior to hospitalization (e.g., the use of antibiotics[59] and feeding tubes[6]) have been shown to predict a higher risk of hospitalization for continuing care residents. In general, residents who have a short length of stay in continuing care have a higher risk of hospitalization.[9, 19, 59, 150] However, Carter found no relationship between length of continuing care stay and risk for ACSC hospitalization.[19]

Advanced care planning for end of life care is a complex and important element of continuing care.[154] As one might expect, some previous research has shown that the presence of "do not resuscitate" and "do not hospitalize" orders decreased the risk of hospitalization for continuing care residents.[8, 151, 152] However, many studies found that there was no relationship between advanced directives and the risk of hospitalization.[6, 8,

[108, 149] One possible explanation for this is that the discussion of advanced directives has been found to often occur after a resident has been faced with acute illness and hospitalization.[154] The effect of individual advanced directives on the risk of PAH has not been evaluated. However, Intrator and colleagues found that facilities with a higher proportion of residents with advanced directives had lower hospitalization and PAH.[32]

Functional Status

In general, ADL impairment predicted higher risk for hospitalization.[6, 9, 32, 108] For PAH, however, the findings were contradictory. In the community-based sample studied, Culler and colleagues found a positive relationship between ADL impairment and PAH.[20] In the facility-based sample, Carter found a negative relationship.[19]

Cognitively impaired residents were at lower risk for hospitalization.[1, 6, 19, 59, 100, 151, 152, 155] Burton and colleagues specifically compared medical services provided to nursing home residents by cognitive status. They found that residents with dementia experienced fewer physician and hospital visits overall and following an infection.[155] In contrast, Carter found no relationship between ACSC hospitalization and cognitive impairment.[19] Niefeld found a positive relationship for those who had dementia or Alzheimer's Disease.[90]

Clinical Indicators and Chronic Conditions

Higher numbers of chronic conditions predicted increased risk of PAH.[26, 90, 91] In addition, selected chronic conditions were associated with an increased risk of hospitalization and PAH. Hospitalization from continuing care was predicted by atrial fibrillation,[59] congestive heart failure,[1, 6, 9, 19, 152] respiratory disease,[6, 9, 19] and decubitus ulcers,[6, 19] among other conditions. Carter found that ACSC hospitalization from

continuing care was related to COPD, diabetes and cerebrovascular disease.[19]

The presence of comorbidities in older people complicates treatment and detection of acute events. In addition, chronic conditions typically cluster and poor coordination of care leaves patients vulnerable to potential errors, omissions, and drug interactions.[90] The odds of PAH among type 2 diabetics increases by an estimated 17% for each additional comorbid condition.[90] In particular, diabetes accompanied by cardiovascular disease, has been identified as a predictor of PAH in older populations.[90] This is of concern because an estimated 96% of community dwelling older people who receive treatment for type 2 diabetes have at least one other chronic condition, most of which are related to cardiovascular disease.[156] Comorbidity also increases the rate of health care utilization and the length of stay. For those with diabetes, the cost of a PAH was approximately double for those with CVD comorbidities than those without.[157] The rate of ACSC hospitalizations in Medicare beneficiaries in the U.S. rose with increasing number of chronic conditions. The rate rose exponentially from 1 per 1000 with only one chronic condition to 40 per 1000 for up to three conditions. For those with ten chronic conditions, the rate was 362 per 1000.[91]

Facility Characteristics

Non-profit status appeared to decrease the risk of hospitalization [9, 19, 32] and PAH.[32, 80] Overall, the number of beds in the facility did not appear to impact hospitalization or PAH rates.[19, 32] Hospitalization and PAH were decreased with the use of nurse practitioners or physician assistants.[32, 150, 152] Some investigators also found that the presence of an on-site physician decreased hospitalization and PAH.[10, 29] Higher levels and intensity of nursing staff was important for reducing PAH risk from continuing care

but not for overall hospitalization.[19, 32] Intrator and colleagues found that nurses aide training and evaluation decreased the risk of PAH and hospitalization.[32]

In contrast with staffing resources, the availability of onsite medical services, such as laboratory or intravenous services, did not significantly affect PAH risk or overall hospitalization.[80, 152] One additional study investigated the effect of the continuing care facility being adjoined to an acute care facility and found no relationship with the risk of hospitalization.[9] This finding is in contrast with studies of hospitalization appropriateness where the ability of the continuing care facility to treat acute illnesses has been found to be related to inappropriate hospitalizations.[24]

Regional Characteristics

There is a substantial body of literature to indicate that an underlying source of regional variation in hospitalization rates is the supply of regional resources, such as the availability of specialists and hospital beds.[158-165] Conditions for which this is likely to occur are termed supply-sensitive conditions. Some overlap exists between identified supply-sensitive conditions and common ACSCs, such as CHF.[166] While supply-sensitive conditions are a key source of variation for hospitalization in the community and are common among continuing care residents,[166] less is known about their role in predicting variation in rates of hospitalization from continuing care facilities.

The market/regional characteristics examined for continuing care populations, such as number of hospital beds, number of LTC beds, markers of poverty, urban population, and specialist density, showed no clear relationship with PAH or hospitalization from continuing care[19, 32] or the community.[90, 91] Intrator and colleagues investigated the role of supply and demand for hospital and nursing home beds, as measured by: the percent of

the population age 75 and over, the number of people age 75 and over per nursing home bed, per capita income, and the average number of nursing home beds in the region. In this investigation, no relationships were found between regional characteristics and overall hospitalization. The number of hospital beds per population age 75 and over reduced the odds of ACSC hospitalization; however, the magnitude of the effect was minimal.[32] Carter found that higher specialist concentration predicted increased hospitalization while higher numbers of LTC beds and poverty levels predicted decreased hospitalization.[19]

McCall and colleagues included community-residing subjects in addition to those in facilities. They demonstrated relationships between market-level factors, particularly poverty and availability of post-acute services, and rates for individual ACSCs.[91] Availability of home health care and skilled nursing facility beds (roughly analogous to CCCs) predicted increased rates of ACSC hospitalization while inpatient rehabilitation availability predicted decreased rates.[91] They found that a higher average age in the county predicted lower rates of PAH for older persons,[91] while Intrator and colleagues found no relationship.[32]

There are many inconsistencies in the findings from the literature review on predictors of hospitalization and PAH. However, some general patterns emerged in the findings. Resident characteristics (e.g., demographics, functional impairment), and selected facility factors (e.g., skill mix, non-profit status) were more consistent predictors than market factors (e.g., poverty, health care supply). Based on their findings, Intrator and colleagues concluded that residents' physical and functional status were more relevant than facility or market-level factors in predicting ACSC hospitalization.[32]

Though few studies have explored the role of market-level factors, the conclusion seems coherent with the findings of others.

2.5 Quality Indicators in Continuing Care

There is some evidence that poor quality in LTC facilities may lead to increased risk for PAH as shown in Table 2.2 (e.g., quality of care for acute illness, RN turnover, restraint use). One Canadian study showed that residents who received poor quality of care in LTC facilities had shorter survival times than those who received adequate care.[167] However, the relationships between differing aspects of quality of care and PAH are understudied.

One mechanism for monitoring and improving quality is through establishing quality indicators (QIs). QIs for continuing care are analogous to screening tests for potential opportunities to improve care practices and outcomes for residents. When aggregated at the facility level, they meaningfully reflect potential areas for quality improvement and patient outcomes that can be modified by the health services provided. To assist in understanding the quality of care provided in continuing care, a number of QIs have been developed and tested in the United States based on the Minimum Data Set (MDS) 2.0.[157] The first steps to define QIs based on clinical characteristics of nursing home residents were conducted at the Center for Health Systems Research & Analysis (CHSRA) at the University of Wisconsin-Madison by Dr. David Zimmerman and colleagues. Building on this initial work, a Centers for Medicare and Medicaid Services (CMS) U.S. national validation study further refined and validated the MDS-derived QIs.[157] A recent U.S. national validation study of 45 QIs for continuing care identified 10 QIs that displayed a high level of validity.[157] These were: the prevalence of indwelling catheter,

bladder/bowel incontinence, urinary tract infections, infections, pain, and pressure ulcers, worsening in late-loss ADL, locomotion, and bladder continence, and improvement in walking. Another 17 QIs for chronic care, based on Minimum Data Set Version 2.0 (MDS 2.0) assessment data were also validated, but resulted in lower levels of strength of evidence than the 10 mentioned above.

These QIs are used in the U.S. and many have been incorporated into the Ontario Hospital Report for Complex Continuing Care's balanced scorecard approach to reporting on quality of care.[168] For the Ontario Hospital Report 2003, an Expert Advisory Panel determined that five of the QIs with lower levels of validity were important to the care of patients in CCC and reflected the use of best practices. Additionally, the panel chose to include an indicator of new skin ulcers (stage 2 or higher) that was not tested in the U.S. study. A summary of the 17 QIs that either displayed a high level of validity or were included in the Hospital Report 2003 is provided in Table 2.3 on page 48.

A global indicator of the quality of preventive care provided in the continuing care facility may add to the existing array of QIs. Variations on this indicator could uncover differences in the quality and availability of preventive care across facilities. Use of the ACSC approach, as a measure of PAH, to measure the quality of preventive care could fill this role. Poorer than average performance on specific QIs, particularly those related to risk of infections or injuries, might be expected to predict a high rate of PAH. However, if PAH rates are strongly predicted by existing QIs, there would be little additional value to the PAH rate as an indicator of quality. To date, the relationship between QI performance of continuing care facilities and PAH rates has not been investigated.

2.6 Summary

Though not always clearly stated, the literature unveils a distinction between preventable and inappropriate hospitalizations. Efforts to measure each have been diverse, with somewhat less focus on measurement of preventable hospitalization. There is a clear role for continuing care facilities in prevention and chronic disease management for prevalent conditions. One way of measuring the quality of this care is to capture hospitalizations that could be avoided with high quality preventive care. Because the ACSC approach is applied to readily available data and has been subject to testing in community-based samples, it shows potential for measuring preventive care among older persons in continuing care. However, the existing ACSC measure was developed to measure avoidable hospitalizations in the U.S. general population under the age of 65. The literature has shown inconsistent findings with respect to predictors of ACSC in older populations and few studies have examined predictors among institutionalized older persons. This measure must be reviewed and refined as appropriate in order to function as a measure of preventive care in Canadian continuing care facilities.

Table 2.1: Summary of research findings: predictors of hospitalization in older long-term care facility residents.

Predictor	Predicts increase in hospitalization	No relationship with hospitalization	Predicts decrease in hospitalization
Sociodemographic Characteristics			
Male Sex	Hutt [8a,g,b] Carter [19d] Ackermann [150d] Fried [6h,d] Murtaugh [9d] Mor [151d] Barker [10 b] Intrator [152d]	Hutt [8c,g,b] Fried [108f,d] Barker [10d] Boockvar [59d]	Hutt [8e,g,b]
Older age	Murtaugh [9d]	Fried [108f,d] Hutt [8a,c,g,b] Mor [151d] Barker [10] Boockvar [59d]	Ackermann [150d] Fried [6h,d] Coburn [1d] Hutt [8e,g,b]
Minority race	Ackermann [150d]	Boockvar [59d]	
Rural	Coburn [1d]		
Married	Mor [151d]		
Source of admission to LTC		Barker [10]	
Care Provided in LTC Facility			
Antibiotics	Boockvar [59d]		
Do not hospitalize order present		Fried [6h,d]	
Do not resuscitate order present		Alessi [149d,j] Fried [6h,d] Fried [108f,d] Hutt [8c,e,g,b]	Mor [151d] Intrator [152d] Hutt [8a,g,b]
Feeding tube present	Fried [6h,d]		
MDS assessment done			Mor [151d]
Polypharmacy		Intrator [152d]	
Restrained		Carter [19d]	
Shorter length of stay	Carter [19d] Ackermann [150d] Murtaugh [9d] Boockvar [59d]	Mor [151d]	Coburn [1d]
Urinary catheter		Boockvar [59d]	
Weekend/evening shift	Fried [108f,d] Hutt [8c,g,b]	Hutt [8a,e,g,b]	

Table 2.1 continued

Predictor	Predicts increase in hospitalization	No relationship with hospitalization	Predicts decrease in hospitalization
Functional and Behavioural Status			
ADL impairment / decline	Fried [6h,d] Fried [108f,d] Murtaugh [9d] Intrator [152d]	Carter [19d] Mor [151d] Boockvar [59d]	
Functional impairment / Poor activity status	Fried [6h]	Carter [19d] Boockvar [59d]	Barker [10b]
Dementia/Cognitive Impairment	Murtaugh [9d]	Fried [108f,d]	Carter [19d] Coburn [1d] Fried [6h] Mor [151d] Intrator [152d] Burton [155d] Boockvar [59d]
Abusive behaviour		Barker [10b]	
Wandering behaviour		Barker [10b]	
Clinical Indicators and Chronic Conditions			
Arthritis		Murtaugh [9d] Barker [10]	
Atrial fibrillation	Boockvar [59d]		
Cancer		Fried [6h,d] Murtaugh [9d] Intrator [152d] Boockvar [59d]	
Cardiac disease	Carter [19d]	Murtaugh [9d] Barker [10] Boockvar [59d]	
Change in weight	Carter [19d]		

Table 2.1 continued

Predictor	Predicts increase in hospitalization	No relationship with hospitalization	Predicts decrease in hospitalization
Congestive heart failure	Carter [19d] Coburn [1d] Fried [6h,d] Murtaugh [9d] Intrator [152d]	Boockvar [59d]	
Continence		Barker [10b]	
Depression	Boockvar [59d]	Barker [10]	
Diabetes	Carter [19d]	Barker [10] Boockvar [59d]	
Gastrointestinal disease		Barker [10]	
Genitourinary disease	Murtaugh [9d]		
Hip fracture		Carter [19d] Barker [10] Boockvar [59d]	
High complexity	Coburn [1d]	Mor [151d]	Barker [10]
Hypertension		Carter [19d] Boockvar [59d]	
Mental Illness		Carter [19d]	
Osteoarthritis			Carter [19d]
Parkinson's Disease	Carter [19d]	Murtaugh [9d]	
Decubitus ulcer	Carter [19d] Fried [6h,d]	Boockvar [59d]	
Recent pneumonia		Boockvar [59d]	
Respiratory disease	Carter [19d] Fried [6h,d] Murtaugh [9d]	Barker [10]	
Stroke	Boockvar [59d]	Carter [19d] Murtaugh [9d] Barker [10]	

Table 2.1 continued

Predictor	Predicts increase in hospitalization	No relationship with hospitalization	Predicts decrease in hospitalization
Facility Characteristics			
Adjoined to hospital		Murtaugh [9d]	
Advanced directives level high			Intrator [32d,h,i]
Aide training & evaluation			Intrator [32d,h,i]
Case mix high			Carter [19d]
Cash flow		Carter [19d]	
Ownership turnover		Carter [19d]	
Deficiency citations			Carter [19d]
Intravenous Therapy		Intrator [32d,h,i]	
Laboratory or x-ray on site		Intrator [32d,h,i]	
Level of care lower		Intrator [152d]	Carter [19d]
LPN level high	Carter [19d]	Intrator [152d]	
Management by chain		Intrator [32d,h,i]	Carter [19d]
Non-profit status		Intrator [152d]	Carter [19d] Murtaugh [9d] Intrator [32d,h,i]
Number of beds		Intrator [32d,h,i]	Carter[19d]
Nurse aides level high		Intrator [32d,h,i]	
Physician on-site		Barker [10b] Intrator [152d] Intrator [32d,h,i]	Bellilli [29d] Barker [10d]
Physician assistant		Intrator [32d,h,i]	Intrator [152d] Ackermann [150d]
Public ownership			Murtaugh [9d]
Respirators higher than average		Intrator [152d]	
RN level high		Carter [19d] Intrator [152d] Intrator [32d,h,i]	
Specialists level high		Intrator [152d]	

Table 2.1 continued

Predictor	Predicts increase in hospitalization	No relationship with hospitalization	Predicts decrease in hospitalization
Regional Characteristics			
Average age in county higher		Intrator [32d,h,i]	
Number of hospital beds		Carter [19d] Intrator [32d,h,i]	
Number of LTC beds		Intrator [32d,h,i]	Carter [19d]
Specialist concentration	Carter [19d]		
Urban concentration		Carter [19d]	
Poverty		Intrator [32d,h,i]	Carter [19d]

[a] Residents with pneumonia,
[b] Skilled nursing facility residents,
[c] Residents with urinary tract infection,
[d] Nursing Home residents,
[e] Residents with CHF
[f] Residents with pneumonia
[g] Short-stay residents
[h] Long-stay residents
[i] Non-ACSC hospitalization
[j] Residents with acute events

Table 2.2: Summary of research findings: predictors of Potentially Avoidable Hospitalization (PAH) in older persons residing in continuing care and in the community.

Predictor	Predicts increase in PAH	No relationship with PAH	Predicts decrease in PAH
Sociodemographic Characteristics			
Male sex	Wolff [26 a,b] McCall [153 b]	Culler [20 a,b] McCall [91 b]	Carter [19 b,c] Niefeld [90 a,b,d]
Older age	Culler [20 a,b] Wolff [26 a,b] Niefeld [90 a,b,d] McCall [153 b] McCall [91 e]	Carter [19 b,c] McCall [91 f,g]	
Minority race	Culler [20 a,b]	McCall [91 b]	
Rural residence	Culler [20 a,b]	McCall [91 b]	
Married		McCall [91 b] Culler [20 a,b]	
Education high		McCall [91 b]	Culler [20 a,b]
Income		McCall [91 b] Culler [20 a,b]	
Care Provided			
Cardiology visit - prior year			Niefeld [90 a,b,d]
Number of physicians seen		Niefeld [90 a,b,d]	
Preventable hospitalization - prior year	McCall [91 b]		
Quality of care for acute illness poor	Saliba [24 h,i]		
Restrained	Carter [19 b,c]		
Short-stay		Carter [19 b,c]	
Specialist visit within year		Niefeld [90 a,b,d]	

Table 2.2 continued

Predictor	Predicts increase in PAH	No relationship with PAH	Predicts decrease in PAH
Functional and Behavioural Status			
ADL impairment	Culler [20 a,b]		Carter[19 b,c]
Dementia / Cognitive Impairment	Niefeld [90 a,b,d]	Carter[19 b,c]	
Dependence / Poor ambulatory status	Carter [19 b,c]		
Clinical Indicators and Chronic Conditions			
Cancer history		Culler [20 a,b]	
Cardiac Disease	Culler [20 a,b] Niefeld [90 a,b,d]	Carter [19 b,c]	
Change in weight		Carter [19 b,c]	
Congestive heart failure		Carter [19 b,c]	
COPD	Carter [19 b,c]		
Depression	Niefeld [90 a,b,d]		
Diabetes	Culler [20 a,b] Carter [19 b,c]		
Hip fracture		Carter [19 b,c]	
Hypertension		Culler [20 a,b] Carter [19 b,c]	
Mental Illness		Carter [19 b,c]	
Number of chronic conditions	Wolff [26 a,q] Niefeld [90 a,b,d] McCall [91 a,b]		
Osteoarthritis		Carter [19 b,c]	
Other Cerebrovascular	Carter [19 b,c]		
Parkinson's Disease		Carter [19 b,c]	
Decubitus ulcer		Carter [19 b,c]	
Severity of acute illness			Saliba [24 h,i]
Self rated health poor	Culler [20 a,b] McCall [91e,f,g]	McCall [91 g] Saliba [24 h,i]	
Stroke		Culler [20 a,b] Carter [19 b,c]	
Mortality within one year	Niefeld [90 a,b,d]		

Table 2.2 continued

Predictor	Predicts increase in PAH	No relationship with PAH	Predicts decrease in PAH
Facility Characteristics			
Aide training and evaluation			Intrator [32 b,c,e]
Cash Flow		Carter [19 b,c]	
Change of owner		Carter [19 b,c]	
Deficiency citations		Carter [19 b,c]	
Dementia training		Zimmerman [80 c,l]	
Advanced directives level high			Intrator [32 b,c,e]
Level of care low		Carter [19 b,c]	
LPN level high	Carter [19 b,c]	Zimmerman [80 c,l]	
Management by chain	Carter [19 b,c] Zimmerman [80 c,l]	Intrator [32 b,c,e]	
Non-profit status		Carter [19 b,c]	Zimmerman [80 c,l] Intrator [32 b,c,e]
Number of Beds		Carter [19 b,c] Intrator [32 b,c,e]	
Nurse aides level high	Intrator [32 b,c,e]	Zimmerman [80 c,l]	
Nurse practitioner or physician assistant			Intrator [32 b,c,e]
On-site medical services (e.g., intravenous therapy)		Zimmerman [80 c,l] Intrator [32 b,c,e]	
Physician on-site		Intrator [32 b,c,e]	Bellilli [29 c]
Operating tenure		Carter [19 b,c]	
Poor physical environment	Zimmerman [80 c,l]		
Privacy for resident intimacy			Zimmerman [80 c,l]
Rehabilitation service intensity		Zimmerman [80 c,l]	
RN level high	Intrator [32c, e,q]	Carter [19 b,c]	
RN turnover	Zimmerman [80 c,l]		
Staff privacy		Zimmerman [80 c,l]	
Staff satisfaction as a priority			Zimmerman [80 c,l]
Therapist level high		Zimmerman [80 c,l]	
Visitor level high			Zimmerman [80 c,l]

Table 2.2 continued

Predictor	Predicts increase in PAH	No relationship with PAH	Predicts decrease in PAH
Regional Characteristics			
Availability specialized nursing facilities	McCall [91 e,f]		
Availability of inpatient rehabilitation			McCall [91 e,f]
Average age in county higher		Intrator [32 b,c,e]	McCall [91 e,f]
Number of hospital beds	McCall [91 e]	Carter[19 b,c] Niefeld [90 a,b,d]	Intrator [32 b,c,e]
Number of LTC beds		Carter[19 b,c] Intrator [32 b,c,e]	
Nurse availability		McCall [91 b]	
Physician availability		McCall [91 b]	
Poverty	McCall [91 e,f]	Carter [19 b,c] Intrator [32 b,c,e] Niefeld [90a,b,d]	
Specialist concentration		Carter [19 b,c]	
Urban concentration		Carter [19 b,c]	

[a] Community-based
[b] ACSC-defined
[c] Nursing Home residents
[d] those with diabetes
[e] those with congestive heart failure
[f] those with chronic lung disease
[g] those with dehydration
[h] Skilled Nursing Facility residents
[i] expert review for appropriateness
[j] for laboratory or x-ray facilities
[k] Long-stay residents
[l] hospitalizations for infections

Table 2.3: Summary of selected Minimum Data Set derived Quality Indicators

Quality Indicator	Validity Level*	In Hospital Report 2003	MDS 2.0 Items Used in Calculation
Percent of chronic patients who are bladder or bowel incontinent	I	No	H1a, H1b, B1, J5c, P1ao, H3d, H3i
Percent of chronic patients who walk as well or better than the previous assessment	I	No	G1dA, G3a, B1, J5c, P1ao
Percent of chronic patients with infections	I	No	I2e, I2f, I2g, I2j, I2k, I2l, J1h, J1k, J5c, P1ao
Percent of chronic patients with a urinary tract infection	I	No	I2j, J5c, P1ao
Percent of chronic patients who had an unexpected loss of function in some basic daily activities	I	No	G1a(A), G1b(B), G1h(A), or G1i(A), B1, J5c, P1ao
Percent of chronic patients in physical restraints daily	II	Yes	P4c, P4d, P4e
Percent of chronic patients on antipsychotic medication without a diagnosis of psychosis	II	Yes	O4a, I1gg, J1i, J5c, P1ao
Percent of chronic patients who became more depressed or anxious	II	Yes	Mood Scale (E1a, E1c, E1e, E1f, E1g, E1h, E2), B1
Percent of chronic patients who declined in their ability to communicate	II	Yes	Communication Scale (C6, C4), B1, J5c, P1ao
Percent of chronic patients who declined in their ability to locomote	II	Yes	G1eA, B1, J5c, P1ao
Percent of chronic patients who fell within 30 days prior to assessment (among those without prior recent history of falling)	II	Yes	J4a
Percent of chronic patients whose bladder continence worsened	II	Yes	H1b, B1, J5c, P1ao
Percent of chronic patients with indwelling catheters	I	Yes	H3d, J5c, P1ao
Percent of chronic patients with new stage 2 or greater skin ulcers	N/A	Yes	M1
Percent of chronic patients with pain	I	Yes	J2a, J2b

Table 2.3 continued

Quality Indicator	Validity Level*	In Hospital Report 2003	MDS 2.0 Items Used in Calculation
Percent of chronic patients with pressure sores	I	Yes	M2a
Percent of chronic patients with rehabilitation potential who improved in the performance of activities of daily living	II	Yes	ADL Long Form Scale (G1j, G1i, G1e, G1f, G1h)

* QIs were selected if they displayed a level I validity as presented in the U.S. national validation study [157] or if they were included in the Complex Continuing Care Hospital Report 2003[168]

Figure 2.1: Creditor's Framework for the Hazards of Hospitalization[15]

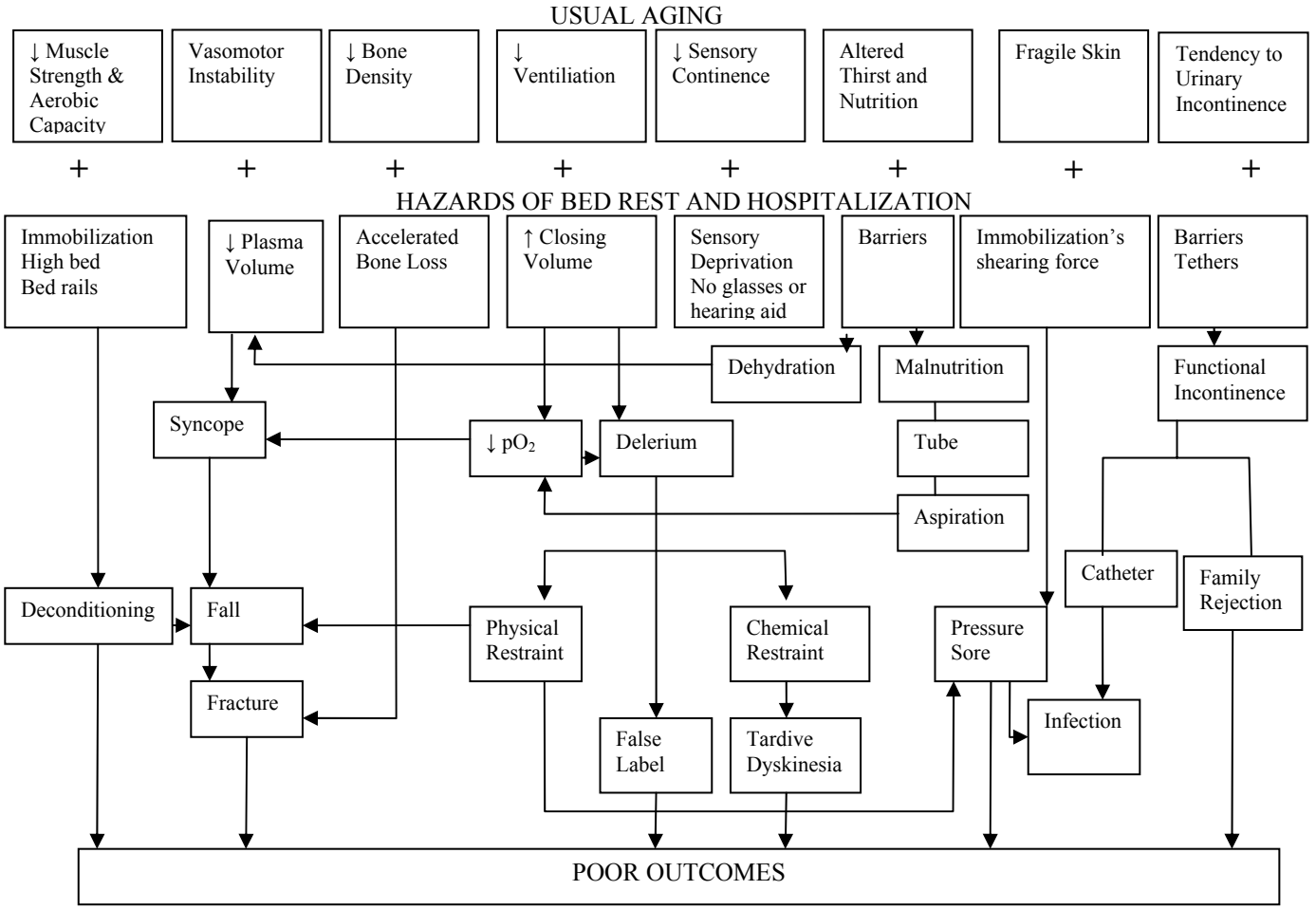
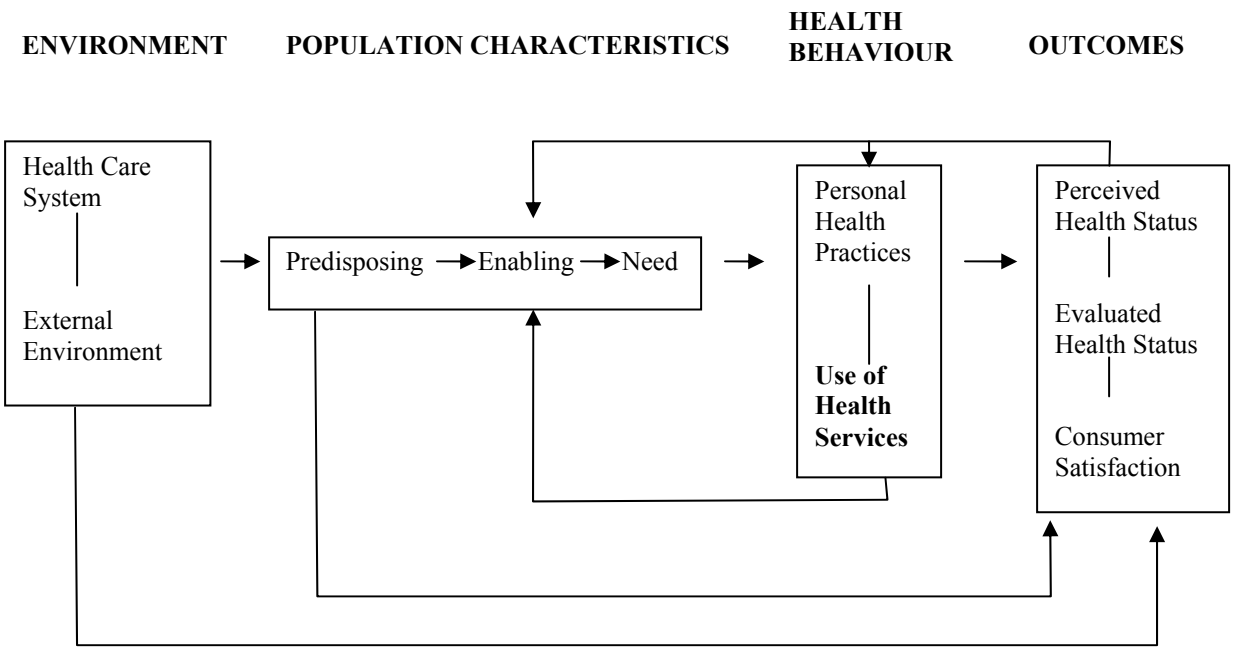


Figure 2.2: Andersen's Emerging Model of Health Services Use, 1995[145]



CHAPTER THREE: Methods

This chapter provides an overview of the methods used for the three phases of the research project. Phase 1 was an analysis of administrative data to examine rates and predictors of hospitalization overall and for ambulatory care sensitive conditions (ACSCs). These analyses employed administrative hospitalization and complex continuing care (CCC) data from the Institute for Clinical Evaluative Sciences (ICES). In Phase 2, an expert panel was convened to discuss the results obtained during Phase 1 and to develop a definition of potentially avoidable hospitalization (PAH) that was appropriate for use in the context of continuing care in Canada. In Phase 3, we revisited the questions and methods of Phase 1 using the definition of PAH that was derived from the expert panel's deliberations. The project received ethics approval from the Conjoint Health Research Ethics Board in Calgary, Alberta (see Appendix A on page 213). Throughout the Methods and subsequent Chapters, the term "ACSC" is used to denote the original definition of potentially avoidable hospitalization and "PAH" to refer to the revised definition developed during Phase 2. All relevant Tables and Figures are presented at the end of this Chapter (or in the Appendix section).

3.1 Phase 1 Methods: ACSC Hospitalization in CCC Residents

In the first stage of analysis, linked administrative hospital and CCC data were used to examine facility-specific rates of overall and ACSC hospitalization as well as the relationship between facility rates and performance on existing quality indicators (QIs). In addition, resident-level predictors of ACSC hospitalization, other hospitalization and death were examined. This first Phase was undertaken to provide a basis for the discussion of the Expert Panel in Phase 2 and to provide a baseline for comparison with

the results of Phase 3 using the revised PAH measure. The design and methods employed in Phase 1 are detailed in the following sections.

3.1.1 Defining ACSC Hospitalizations

ACSC hospitalizations were identified using the diagnoses coded on the discharge abstract for each acute care hospitalization. Data from these abstracts are stored in the Discharge Abstract Database (DAD) (described in Section 3.1.3). Diagnostic codes (using the International Classification of Diseases version 9 – Clinical Modification (ICD-9-CM)) for the original list of ACSCs examined are given in Appendix B on page 214.[89] Some previous work in the United States has limited the ACSC diagnoses to those that appear as the principal diagnosis (i.e., the reason for hospitalization).[32] This was done in an effort to limit ACSCs to those that occurred before the hospital admission. However, in the DAD, diagnoses are recorded with accompanying diagnosis types that can be used to identify pre-hospitalization conditions.[169] The relevant types are: "M" for the diagnosis that was the most responsible for the length of stay in hospital, "1" for a pre-admission diagnosis that also contributed to the length of stay, "2" for a post-admission diagnosis that contributed to the length of stay, and "3" for a pre-admission diagnosis that did not contribute to the length of stay. When the condition that was the most-responsible diagnosis occurred after admission to hospital, it was listed twice: once as type "M" and once as type "2". Thus, DAD diagnosis types allowed for more comprehensive identification of ACSCs than past approaches based on principal diagnosis alone.

Preliminary analyses confirmed that many of the hospitalization records recorded more than one ACSC diagnosis (see Figure 3.1 on page 89). Of the identified ACSC

hospitalizations, most had one or two ACSCs listed per hospitalization with a range up to five distinct ACSCs listed. Most residents had zero, one, or two ACSC diagnoses recorded. Congestive heart failure (CHF) and pneumonia accounted for the largest proportion of ACSC hospitalizations (Figure 3.2 on page 90), especially when only the most-responsible diagnosis field was considered.

Consequently, for the purposes of this study, ACSC hospitalizations in the DAD were defined as follows: had an ACSC ICD-9-CM code as listed in Appendix B that appeared in any of the 16 diagnosis fields; and, was accompanied by a diagnosis type of either "1" or "M" without an accompanying "2". Sensitivity analyses were done including and excluding CHF and pneumonia as ACSC hospitalizations to examine the potential impact of including these conditions to reflect preventable hospitalizations in older people.

3.1.2 Design

A schematic overview of the study design for Phase 1 of the investigation is presented in Figure 3.3 on page 91. A descriptive observational study design at the facility level was used to analyse trends and patterns in overall and ACSC hospitalization rates. To determine the extent to which ACSC hospitalization rates reflected previously validated QIs, a cross-sectional study design at the facility level was used to examine relationships between selected QIs (see Table 2.3 on page 48) and rates of overall and ACSC hospitalization. Resident-level predictors of ACSC and other hospitalizations were identified using a retrospective cohort study design where individual residents were identified on the basis of their exposure to the relevant correlates from Table 3.1 (page 86).

3.1.3 Data Sources

The data used for Phase 1 of the study were administrative health data collected for monitoring and financial purposes as mandated by the Government of Ontario. The use of administrative data for research brings strengths and limitations to the research project. These are more fully explored in Chapter 5: Discussion. For this specific project, the benefits of using administrative data outweighed the limitations. By using readily available data from all the CCC sites, the PAH measure developed is likely to be more practical and to be further refined over time.

The data used for the project were held at ICES. ICES is designated as a "Prescribed Entity" under Ontario's Personal Health Information Protection Act (PHIPA).[170] Under this authority, ICES is permitted to disclose personal health information without consent for the purposes of evaluating or monitoring the health system. ICES also accepts the responsibility of maintaining the confidentiality of the heath information it receives. The protocol for this project was reviewed by the ICES Privacy Officer to ensure that it met criteria for privacy and confidentiality of data outlined in ICES' Privacy Code.[171]

Ontario Chronic Care Patient System

Resident-level records were obtained from the Ontario Chronic Care Patient System (OCCPS) database, which captures longitudinal clinical and demographic data on all residents of CCC facilities in Ontario using the Minimum Data Set Version 2.0 (MDS 2.0), as mandated by the Ontario Ministry of Health and Long-Term Care since July 1996.[172] The MDS assessment instrument for long-term care (LTC) was originally

developed by inter*RAI*[a] fellows between 1988 and 1990. It was designed for use in U.S. nursing homes in response to a contract offered by the U.S. Health Care Financing Administration (HCFA, now the Centres for Medicare and Medicaid Services). The tool was first used by U.S. nursing homes in 1990 and was subsequently updated in 1994-1995.[173, 174] It has been used across all U.S. nursing homes since 1996 and has been implemented in many other jurisdictions. The MDS 2.0 offers a comprehensive and standardized assessment to be used as a screening and care planning tool in the clinical management of residents. It provides information on residents' sociodemographic characteristics, physical and cognitive status, psychological and health conditions, behavioural problems, service use, and medication use. Copies of the MDS 2.0 full and quarterly assessment instruments are included in Appendix C on page 227.

Trained staff members in CCC facilities completed full MDS 2.0 assessments 7-13 days after admission and then annually thereafter, with partial quarterly assessments completed every 90 days. The time period of interest for each assessment was the previous seven days. Resident-level assessments and facility information were collected and entered in CCC facilities. MDS 2.0 data entry software was provided by licensed vendors (for a list of current vendors, please see www.cihi.ca/ccrs). Data were submitted to the Ontario Ministry of Health and Long-term Care by the CCC facilities on a quarterly basis. At the end of each fiscal year, the database was released to ICES.

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[a] inter*RAI* is a 26-country network of clinicians and researchers committed to improving the health and quality of care of vulnerable seniors and is responsible for the development and validation of all MDS tools and data applications (see www.interrai.org for a comprehensive bibliography of relevant literature).

Resident-specific MDS 2.0 data were available for the 1996/97 to 2002/03 fiscal years and were linked longitudinally by an analyst at ICES.

The OCCPS database is held by the Canadian Institute for Health Information (CIHI) from which ICES obtains an annually updated cut of the database through the Ontario Ministry of Health and Long Term Care. In fiscal year 2003/04, the OCCPS at CIHI was rolled into the pan-Canadian Continuing Care Reporting System (CCRS). CIHI currently conducts data quality audits to improve the data quality of the CCRS database. CIHI has also recently published frequently asked coding questions to assist in standardizing coding decisions across Canada.[175] However, these data quality measures were not in effect for the 1997/98 to 2001/02 fiscal years included in this study. A small proportion of residents may not have been assessed if they were in the CCC facility for fewer than 14 days. CIHI's data quality audits for the 1996/97 to 2002/03 fiscal years have suggested that the group of CCC residents who never receive an MDS assessment may contain more respite and palliative care residents.[13]

Discharge Abstract Database

The DAD was used to identify hospitalizations of CCC residents. Though the DAD is maintained by CIHI, ICES is designated as a "Prescribed Entity" in the Ontario Personal Health Information Protection Act (PHIPA) and receives the Ontario portion of the DAD from the Ontario Ministry of Health and Long Term Care.[170] The DAD contains acute discharge abstracts for participating Canadian hospitals, thus covering approximately 75% of all acute care hospitalizations in Canada, including all hospitalizations in Ontario.[176] Trained abstracters have collected patient-specific data related to acute care hospitalizations in Ontario using standard guidelines since April

1994. The standard guidelines, produced and maintained through CIHI, are used to abstract information from the patient's chart. For the fiscal years of interest, 1996/97 to 2001/2002, the DAD data in Ontario were collected using ICD-9-CM diagnosis codes and Canadian Classification of Procedure (CCP) intervention codes.

OCCPS / DAD Data Linkage

The OCCPS was linked to the DAD by an analyst at ICES using a unique ICES Key Number (IKN), which replaced the patients' Ontario Health Insurance Plan (OHIP) number to protect privacy. The records were linked using an episodes-of-care approach. Using this approach, consecutive CCC or acute care records were considered part of one episode if the discharge from one institution was within three days of the admission to another. This was done to account for an observed delay in processing admissions and discharges over weekend days. All episodes contained a CCC facility admission and originated either in an acute hospital or a CCC. For the purposes of this study, hospitalizations were considered if they occurred after a CCC stay and within the episode. For example, if a resident was discharged from CCC and admitted to an acute facility seven days later, this would not be counted as a hospitalization from the CCC facility for that resident. Conversely, if the resident was discharged from CCC and admitted to an acute facility 24 hours later, a hospitalization would have been counted.

Supplementary Databases

The above resident-level data were then linked with the Ontario's Registered Persons Database (RPDB) to determine the date of death, if any, for all causes. The RPDB is used to determine eligibility for health services and includes all individuals with present or

past Ontario health coverage.[177] The date of death was used to determine whether or not the resident died within one year of admission to CCC.

Descriptive information about the CCC facilities and their processes was used to adjust the estimates of relationships between facility-level QIs and hospitalization rates. At a CCC corporation level, the data were linked to responses from the Hospital Report Complex Continuing Care System Integration and Change (SIC) survey. The survey was designed to collect information on processes by which CCCs improve care, integrate their services with other areas of the health care system, support decision-making using information and technology, and support staff skills.[172] The survey was developed in consultation with CCCs and under the direction of an advisory panel using a Nominal Group Technique. For a complete description of the development of the survey, please refer to the Hospital Report 2001: Complex Continuing Care at www.hospitalreport.ca. CCC facilities were asked to respond based on their activities between March 31, 1999 and April 1, 2000. There was a 91.9% response rate.[172] The survey was refined for the Hospital Report 2003 process, in which CCC facilities were asked about their practices between March 31, 2001 and April 1, 2002.[178] The Evidence-Based Practice Section of the 2003 survey, which includes questions about the use of clinical practice guidelines, is included in Appendix D on page 239. Some individual CCC sites are managed under the same corporation. CCC corporation values were assigned to individual CCC sites within each corporation.

3.1.4 Sampling Frame

The sampling frame contained full and quarterly MDS 2.0 assessment records for all CCC patients in Ontario completed between July 1, 1996 and March 31, 2003. Because

data were available on the entire target population of residents receiving chronic care in a CCC facility in Ontario, no specific sampling technique was applied. The implicit sampling in this type of study is on the dimension of time.[179]

The selected records consisted of all patients admitted to a CCC facility in Ontario between April 1, 1997 and March 31, 2002. Records from residents admitted in the 1996/97 fiscal year were excluded to mitigate the data collection and data entry problems associated with introducing the new MDS 2.0 instrument. For all analyses, subjects were included if they had an admission assessment completed and if they were between the ages of 65 and 120 on admission to the CCC. Due to questionable data quality, assessments were excluded if the assessment date occurred outside of the period between the admission and discharge dates and subjects were excluded if the date of death preceded the admission date (<0.5% of records).

3.1.5 Facility-level Analysis of Rates

Sample selection

For the calculation of hospitalization and ACSC hospitalization rates over time, no specific criteria were applied to individual residents. QI scores, hospitalization and ACSC hospitalization rates were calculated for the 1997/98 to 2001/02 fiscal years. The System Integration and Change (SIC) survey of CCCs applied to the 1999/2000 and 2001/02 fiscal years. Because the number of clinical practice guidelines in place in the CCC (from the SIC survey) was used as a control variable in the analysis of the relationship between facility-level QIs and hospitalization rates, mean QI scores, hospitalization rates, and number of clinical practice guidelines were examined over these two fiscal years.

CCC facilities with unstable hospitalization rates were excluded based on the Cochran test for outliers. To test for outlier status, large jumps in hospitalization rates were detected by calculating the change in hospitalization rate between years and then obtaining the variance in change values for each CCC. The Cochran statistic was calculated by dividing the CCC variance in change values over the five years by the total variance (sum of the variance across all CCCs). For four degrees of freedom and 120 units, the Cochran critical value was 0.0495.[180] One CCC had a ratio that exceeded this critical value and was thus excluded from the analysis of rates and the investigation of the relationship between QIs and hospitalization rates.

Variables and Measurement

Hospitalization and ACSC Hospitalization Rates

CCC facility-specific hospitalization and ACSC hospitalization rates were calculated as the number of hospitalizations per 100 resident-years. For descriptive purposes, they were calculated by fiscal quarter and fiscal year from April 1, 1997 to March 31, 2002.

Quality Indicators(QIs)

As discussed in Section 2.5 on page 36, QIs for continuing care represent a screening tool to identify potential areas for quality improvement in the continuing care facility. There have been substantial initiatives to develop QIs for continuing care derived from data collected using the MDS 2.0. In the initial development work to define QIs, MDS items were used to define QIs and also to risk-adjust selected QIs. In recent large-scale validation studies,[157, 181] each QI has been assigned a validity level of I (highest level of validity – strongest evidence that they represent care processes in continuing care), II

(mid-level validity – appropriate for use but not as strongly recommended), or III (not valid – failed to be supported).[157]

For the present analysis, QIs were selected if they were assigned the highest level of validity (level I) in the U.S. national validation study or if they were selected for use in the Ontario Hospital Report for Complex Continuing Care 2003. [168] QIs were calculated and risk-adjusted following the methodology used for the Hospital Report for Complex Continuing Care 2003 and the U.S. national validation study. Detailed information on the calculation and risk-adjustment are published by the CMS at http://www.cms.hhs.gov/quality/nhqi/AppendixE.pdf . Table 2.3 lists the QIs included, the validity levels, and the MDS 2.0 items used in their calculation.

The MDS 2.0 assessments for each resident were evaluated to determine whether or not the QIs were triggered. To be included in the calculation of QIs, the resident must not have been a short-stay resident. Short-stay residents were excluded from the calculation of QIs because quality-related outcomes observed in this group may not have been attributable to the CCC facility. Rather, they may reflect the quality of the care provided at the previous setting. The proportion of residents within each facility who triggered on a given QI was calculated to produce a QI score for each facility.

QI scores on the 17 selected QIs were available for the 1998/99 to 2001/02 fiscal years. Average QI performance over the 1999/2000 and 2001/02 fiscal years was used in models containing facility practice characteristics from the System Integration and Change survey, which were only available for the 1999/2000 and 2001/02 fiscal years. Following this, facility-specific relative QI performance was summarized as above average (superior 25%) performance, average (middle 50%), or below average (poorest

25%) performance. For example, facilities with the lowest proportion of residents who had indwelling catheters were in the superior performance category while facilities with the lowest proportion of residents with ADL improvement were in the below average performance category.

CCC Facility Characteristics

CCC size, freestanding status, and rural/urban status were used in the facility-level analysis. Additionally, as part of the Hospital Report 2001 and 2003 processes, the System Integration and Change survey of CCC corporations was conducted to collect information on the use of specific clinical practice guidelines (see Section 3.1.3 on page 59). For the Hospital Report 2001, facilities were asked to report on practices for the 1999/2000 fiscal year. For the Hospital Report 2003, facilities were asked about the 2001/02 fiscal year. The clinical practice guidelines of interest included incontinence, urinary tract infections, behaviour, falls, pressure ulcers, use of physical restraints, pain, and psychotropic medication use. A variable representing the average number of clinical practice guidelines in place during the 1999/2000 and 2001/02 fiscal years within the facility was included in the analysis.

An additional facility-level variable included was the average nursing hourly wage for the 2001/02 fiscal year. This variable was obtained from the Ontario Hospital Reporting System (OHRS) with wages attributed according to the Ontario Cost Distribution Methodology.[182] In Ontario, nursing wages are negotiated and set according to seniority and education. Thus, the average nursing wage was used as a proxy for level of nursing skill mix.

Data Analysis

Hospitalization and ACSC Hospitalization Rates

Overall and facility-specific hospitalization rates were calculated as the number of hospitalizations per 100 resident-years over the five years and in each fiscal year and quarter between April 1, 1997 and March 31, 2002 to examine trends over time. In addition, overall and facility-specific first hospitalization rates were calculated to minimize the impact of rehospitalizations on the rates. The incidence rates described above were also calculated for ACSC hospitalizations specifically.

Relationship between Rates and Quality Indicators

Facility-specific proportions of residents that flagged on each QI were examined over the 1997/98 to 2001/02 fiscal years to investigate trends over time. Because CCC facility responses to the SIC survey were only available for the 1999/2000 and 2001/02 fiscal years, the corresponding facility-specific hospitalization rates, ACSC hospitalization rates, nursing hourly wage, number of clinical practice guidelines in place, and QI performance for 1999/2000 and 2001/02 were used.

CCC facilities were described in terms of freestanding status, size, rural/urban status, geographic region, average nursing hourly wage, and average application of seven clinical practice guidelines. Bivariate relationships between each average QI performance and hospitalization rates and ACSC hospitalization rates were investigated using Poisson regression models, constructed using SAS PROC GENMOD.

Poisson models operate on the assumption that the mean is equal to the variance, based on characteristics of the Poisson distribution. When the variance is affected by unexplained random variation, the dispersion parameter (the Pearson statistic divided by

its degrees of freedom) is greater than one.[183, 184] Thus, to assess the fit of the models, the dispersion parameters were examined. In all of the Poisson models, the dispersion parameters were approximately 15. To correct for this overdispersion, negative binomial models were constructed to describe the bivariate relationships between QIs and hospitalization and ACSC hospitalization.[185]

For each QI that displayed a significant ($p<0.10$) bivariate relationship with hospitalization rates, a multivariate negative binomial regression model was developed using SAS PROC GENMOD. These models determined the relationship between performance on each QI (relative to other facilities) and hospitalization rates, controlling for average nursing hourly wage, number of practice guidelines, and rural/urban status. The rationale for this analysis was to identify overlap between the constructs measured by the QIs and by ACSC hospitalization rates. If the ACSC hospitalization rates represent a distinct element of quality not already captured by the existing QIs, then we would expect to see no consistent relationships with the QIs at a facility level.

Preliminary cross-tabulations revealed substantial overlap in the rural/urban status, freestanding status, and size of facility variables, with clustering among rural, non-freestanding, and small CCC facilities. For example, there were zero CCCs that were rural and freestanding. There was only one facility that was freestanding and small and only one that was rural and large.

Thus, to mitigate the problems in multivariate modelling caused by zero cell sizes and multicolinearity, only one of the above variables was selected for inclusion in the models. Small cell sizes prevented the use of freestanding status and facility size. Thus,

rural/urban status was used in multivariate modeling to represent the characteristics of the facilities.

Although the general model (see Model 1) specifies one variable representing QI performance, two dummy variables were included to capture the three levels of relative performance (above average, average, and below average).

Model 1: $\log(\lambda) = \beta_0 + \Sigma\beta_{QI}X_{QI} + \Sigma\beta_i X_i$

Where:
λ = the rate of hospitalization or ACSC (no. per 100 resident-years)
β_0 = baseline rate of hospitalization or ACSC
β_{QI} = difference in log rates of hospitalization associated with QI performance (note $e^{\beta QI}$ = rate ratio)
X_{QI} = QI performance
β_i = difference in log rates of hospitalization associated with the *i*th facility characteristic (note $e^{\beta i}$ = rate ratio)
X_i = facility characteristics (i = 1,…, k)

3.1.6 Resident-Level Analysis of Predictors

Sample selection

For the resident-level analysis, the total sample was limited to non-palliative residents who were admitted between April 1, 1997 and March 31, 2001. "Palliative" or end-of-life residents (n=5363) were identified retrospectively if they died within 30 days of admission and had an admission health instability score of three or more, as measured by the Changes in End-stage disease and Signs and Symptoms scale (CHESS). [186] The CHESS scale is derived from items on the MDS 2.0 assessment instrument as discussed under *Variables and Measurement* on page 71. This method of identifying palliative residents was based on the work of Dr. Teare and the Joint Policy and Planning Committee of Ontario where residents who were most likely to have been admitted to a CCC bed for short-term end of life care were identified.[187] The 30 day cut-off was

determined based on programmatic information that suggested that palliative patients usually died within 30 days of admission. The CHESS score of three or more was the point at which residents were at significantly increased risk of poor outcomes. In his original work, Dr. Teare found that eighty percent of patients who died within 30 days of admission had a CHESS score of three or more. When these two criteria are used together, residents who are unstable and who die within 30 days of admission are retrospectively identified as short-stay end-of-life residents.[187] This approach identifies residents who likely received end-of-life care focused on pain control and psychological, social, and spiritual concerns instead of active treatment. However, it does not necessarily identify those under a palliative care plan. End-of-life residents were excluded to ensure that the sample included residents for whom prevention and functional maintenance were relevant goals of care.

Admissions were restricted to those occurring on or before March 31, 2001 to address the data issues arising from the shift from the ICD-9-CM to the ICD-10-CA coding systems. Because the switch occurred beginning April 1, 2002, this limitation allows for one full year of follow-up for hospitalization outcomes before the switch to ICD-10-CA.

Variables and Measurement

Outcome Measures

A four-level outcome variable was constructed that included ACSC hospitalization, other hospitalization, death, and none of the preceding outcomes (no outcome) within one year of admission to the CCC facility. Residents with no outcome may have stayed in the facility or may have been discharged home or transferred to another facility.

Resident characteristics

OCCPS data from the first MDS 2.0 assessment following admission to CCC were used to ascertain the baseline demographic, clinical, and functional variables for CCC residents. A complete listing of the client characteristics derived from the MDS 2.0 that were examined in the present study is provided in Table 3.1 on page 86, along with their embedded MDS 2.0 items. Throughout the text, the item number refers to the MDS 2.0 item number in Table 3.1.

a. Sociodemographic Variables

The sex and birth date of the resident were provided on the admission MDS 2.0 assessment (items AA2 and AA3a respectively). Sex was coded as 1 for male and 2 for female. Age (in years) was calculated as the difference in years between the birth date and the admission assessment date. Two age categories were created with the split at 80 years (less than 80 coded as 0, 80 and over coded as 1), approximately the mean age of the sample. Data on personal contact with family and friends were also collected on the admission MDS 2.0 assessment (item F2e), with the possible responses of yes (coded as 1) and no (coded as 0).

b. Resource Use Variables

Length of stay in CCC was categorized as either short (coded as 1) or long-stay (coded as 0) according to methodology developed for the Hospital Report 2003.[168] Short-stay residents were those who had only one assessment completed (i.e. stayed for less than approximately one quarter) and who did not experienced a prior or subsequent stay in the same CCC facility within 90 days of admission or discharge.

Resource Utilization Groups (RUGs) are categories of LTC residents based on case-mix groups and per diem resource use.[188] The RUG-III methodology was developed based on 108 variables from the MDS 2.0 to create seven categories of utilization: rehabilitation, extensive, special, clinically complex, cognitive, behavioural, and reduced physical functioning.[189] The algorithm has been shown to explain 55% of resource use patterns and has been used since 1998 in the United States to determine funding for LTC facilities. In Ontario's CCCs, the RUG-III based payment system came into effect in April 2000. The RUG-III methodology has been validated in Canada,[190] the Czech Republic,[191] the United States, Japan, Spain, Sweden, and England & Whales.[192]

c. Health and Functional Status Variables

Seven ACSCs are captured on the MDS 2.0: angina (J3c), asthma (I1hh), Chronic Obstructive Pulmonary Disease or COPD (I1ii), CHF (I1f), diabetes (I1a), grand mal seizure disorders (I1aa), and hypertension (I1h). These were summarized as the total **number of pre-existing ACSC conditions**. Data on "do not resuscitate" (item A10b) and "do not hospitalize" (item A10c) **advanced directives** were also collected with the options being either present or absent. Residents with missing values were classified as having neither advanced directive. Because the "do not hospitalize" advanced directive was often missing, these variables were combined to represent the presence of either a "do not hospitalize" or a "do not resuscitate" order (coded as 1) compared with no such advanced directive or missing data on advanced directives (coded as 0).

The Cognitive Performance Scale (CPS) was derived from the admission MDS 2.0 assessment to measure the level of **cognitive impairment** of residents.[63,64] This scale was developed in 1994 and has been validated against the Mini-Mental State

Examination or MMSE.[193, 194] The algorithm for the scale is included in Appendix E on page 246. To derive the scale, five items from the MDS 2.0 are used: comatose state (B1), cognitive skills for daily decision making (B4), short-term memory (B2a), making self understood (C4), and dependence in eating (G1h). The scoring algorithm produces seven levels of classification for cognitive status where 0 = intact and 6 = very severe cognitive impairment. The mean MMSE scores (range from 0 to 30) for the seven CPS categories in the validation sample were CPS0 = 24.9, CPS1 = 21.9, CPS2 = 19.2, CPS3 = 15.4, CPS4 = 6.9, CPS5 = 5.1, and CPS6= 0.4. For the purposes of this study, the CPS categories were further aggregated to intact (CPS = 0, coded as 1), borderline cognitively impaired (CPS = 1 to 2, coded as 2), and cognitively impaired (CPS = 3 to 6, coded as 3). A CPS score of three or more was used by Intrator to identify cognitive impairment.[32] The borderline group was created to explore distinctions between residents with no impairment compared with residents with lower levels of impairment.

The MDS 2.0-derived Activities of Daily Living-hierarchy (ADLh) was used to measure the level of **ADL dependency** based on four MDS 2.0 items. The hierarchy is included as Appendix F (page 247) and has been validated against other measures of ADL impairment.[195] The items used to derive the score include physical functioning in personal hygiene (G1j), toileting (G1i), locomotion (G1e), and eating (G1h).[65] The final score ranges from 0 (no impairment) to 6 (total dependence). The algorithm assigns lower scores to early loss ADLs, like personal hygiene, and higher scores to late loss ADLs, such as eating. *A priori*, three categories were considered for the ADLh: low ADL impaired (ADLh = 0 to 2, coded as 1), moderately ADL impaired (ADLh = 3 to 4, coded as 2), and severely ADL impaired (ADLh = 5 to 6, coded as 3).

Health instability was measured using the CHESS.[186] The CHESS is a strong and independent predictor of mortality that has been used as a measure of health instability.[186] It is also associated with pain, complex medical procedures, and an increase in physician activity.[186] CHESS scores are derived from eight MDS 2.0 items, including deterioration in cognitive status (B6), deterioration in ADL function (G9), shortness of breath (J1l), dehydration (J1c), edema (J1g), vomiting (J1o), weight loss (K3a), and leaving food uneaten (K4c). The final CHESS score ranges from zero (not at all unstable) to five (highly unstable). CHESS scores were further grouped as stable (CHESS = 0 to 1, coded as 1), moderately unstable (CHESS = 2 to 3, coded as 2), and highly unstable (CHESS = 4 to 5, coded as 3). Scores above three have been found to predict adverse outcomes in CCC residents.[187] The other two categories were defined based on the distribution of the sample (approximately 50% had a score of 0 or 1).

Depression was measured by another validated MDS 2.0-based outcomes scale, the Depression Rating Score (DRS).[66] The scale is based on a sum of scores from seven MDS 2.0 items: made negative statements (E1a), persistent anger with self or others (E1d), expressions of unrealistic fears (E1f), repetitive health complaints (E1h), repetitive anxious complaints (E1i), sad/pained/worried facial expressions (E1l), and crying/tearfulness (E1m). The DRS ranges from 0 to 14 where a score of 3 or more has been shown to be associated with a clinical depression. Specifically, at this cut-off, the DRS shows 91% sensitivity and 69% specificity in predicting Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) Major or Minor Depression diagnoses.[196] Based on this, the DRS was categorized as no depressive symptoms (DRS = 0 to 2, coded as 0) and depressive symptoms (DRS = 3 to 14, coded as 1).

Psychotropic medication use was captured on the MDS 2.0 by four items: antipsychotic use (O4a), antianxiety drug use (O4b), antidepressant use (O4c), and hypnotic use (O4d). If any were present, then residents were classified as using psychotropic medications (coded as 1) and if none were present, residents were classified as not using psychotropic medications (coded as 0).

Communication difficulty and behavioural symptoms were identified as present based on triggering the related Resident Assessment Protocols (RAP).[197] RAPs represent potential care-planning issues triggered by responses to the MDS 2.0 items. The RAPS were developed by expert groups and validated by clinical focus groups. They are accompanied by care-planning guidelines to assist in clinical decision-making.[197] The communication difficulty RAP was triggered by three MDS 2.0 items including impaired ability to hear (C1), make self understood (C4), or understand others (C6). The behavioural symptoms RAP was based on frequently wandering (E4aa), verbally abusive (E4ab), physically abusive (E4ac), socially inappropriate or disruptive (E4ad), resisting care (E4ae), or deteriorated behavioural symptoms (E5). If any of the items were present, the RAP was triggered. If triggered, the RAP variable was coded as 1 and if not it was 0.

The MDS 2.0 items I1a to I1qq collect information on the presence of 43 chronic conditions. These were summed to provide an overall estimate of the **number of chronic conditions**. This variable was categorized, based on the approximate mean for the sample, as one to three (coded as 0) and four or more (coded as 1).

Case Mix Groups

In preliminary analyses, we found that the single most common most-responsible diagnosis (ICD-9-CM code) accounted for less than five percent of all hospitalizations.

Therefore, in order to summarize the most common reasons for hospitalization of CCC residents, Case Mix Groups (CMG) were used. CMGs are derived from a case mix methodology that is adapted from the Diagnosis Related Groups (DRG) methodology used in the United States. The CMG methodology uses clinical input from the acute discharge abstract and statistical analyses to classify patients into groups that are clinically similar and have relatively homogeneous levels of resource use. In Ontario hospitals, the CMG approach provides the basis for funding decisions for acute hospitals.[198] Based on the most-responsible diagnosis, each discharge is assigned to one of 27 Major Clinical Categories (MCC) (e.g., digestive system, burns, cardiac, etc…).[198, 199] Individuals are then classified as medical or surgical patients and a complexity overlay, derived from the other diagnoses listed on the abstract and their associated diagnosis types, is applied. Patients are finally assigned to one of 478 CMG categories. These categories were used to describe the hospitalizations of CCC residents between April 1, 1997 and March 31, 2002.

CCC Facility Characteristics

Relevant characteristics of the CCC facilities included the facility size, freestanding (i.e., not adjoined to an acute care hospital) status, and rural or urban location. Details on these characteristics are presented in Table 3.1 on page 86. Facility size was determined based on the average number of resident-days per facility over the 1997/98 to 2001/02 fiscal years. Facilities with greater than 10,000 resident-days per year were categorized as large facilities (coded as 0). This cut-off was chosen based on the distribution of facilities and because 10,000 resident-days per year and under corresponds to a facility of approximately 30 beds or less, which was thought to accurately represent a small facility.

CCC facilities were classified as either adjoined (coded as 1) if they were on the same site as an acute-care facility or freestanding (coded as 0) if they were geographically separate from acute care. Rural CCCs (coded as 1) were identified based on postal code according to methodology used by Statistics Canada. According to Statistics Canada, "an urban area has a minimum population concentration of 1,000 persons and a population density of at least 400 persons per square kilometre, based on the current census population count."[200] This includes both "urban core" (census metropolitan areas with at least 100,000 persons and census agglomerations with between 10,000 and 99,999 persons). Any area not designated as urban core, was classified as rural by default. CCCs with postal codes in rural areas were considered rural CCCs.

Over the time period of the study, some CCC facilities were closed, newly formed, or merged. For CCC facilities that merged, the merged facility number was applied to all years. This strategy was chosen because with one facility number, separate sites could not be identified.

Cross-tabulations between the facility characteristic variables showed substantial overlap at the resident level, as shown in Table 3.2 on page 88, resulting in small cell and colinearity concerns in the model development. There were zero residents from rural facilities that were adjoined to an acute care hospital. There were a small number of residents (n=383) from large rural facilities. Only 158 residents were from small facilities that were adjoined to acute care hospitals. Thus, most residents were in urban, large, freestanding facilities. Of the three facility characteristics, freestanding status was thought to have the most practical relevance to hospitalization rates. Previous investigations had looked exclusively at freestanding continuing care facilities.[32] For

these reasons and in order to avoid multi-colinearity and small cell size issues in the models, only freestanding status was chosen to be included in the resident-level modelling process.

Data Analysis

Sample Size

The sample size calculation for the association between predictor variables and hospitalization was done using sex as an explanatory variable. The minimum sample size was calculated based on the formula:[201]

$$N = \frac{[(pbar*qbar(1+1/k))^{1/2} Z_{1-\alpha/2} + (p_1*q_1 + (p_2*q_2)/k)^{1/2} Z_{1-\beta}]^2}{(d)^2}$$

Where:

α = 0.05 $Z_{1-\alpha/2}$ = 1.96
β = 0.2 power = 0.80 $Z_{1-\beta}$ = 0.84
p_1, p_2 = projected probabilities of hospitalization in the two groups = 0.3 (males), 0.24 (females) [6, 8-10, 19, 150-152, 202]
$q_1, q_2 = 1 - p_1, 1 - p_2$;

$d = |p_1 - p_2|$
$pbar = \frac{p_1+kp_2}{1+k}$
$qbar = 1 - pbar$
k = 1 for equal sized groups.

The sample size required to detect a relative risk of hospitalization of 1.25 was 857 in each exposure group, based on estimations using male sex as the explanatory variable. Loss to follow-up and refusal rates did not impact the estimate because secondary data were used and a separate consent process was not used for this investigation.

Hospitalization Description

A list of the ten most common CMGs for each year was compiled and trends for each were examined by year and by ACSC hospitalization status. The proportion of hospitalizations defined as an ACSC hospitalization was calculated and specific conditions were broken down by diagnosis type. The number of ACSCs per individual hospitalized resident was calculated. The distribution of ACSCs was examined and

compared to the distribution of ACSCs limited to the most-responsible diagnosis only to determine the effect of limiting ACSC to only most-responsible diagnosis and excluding type 1 diagnoses from the definition.

Sample Description

Residents who were admitted to CCC facilities between April 1, 1997 and March 31, 2001 were described by sociodemographic (including age, sex, and contact with family), resource use (including length of stay, and RUGs), and health and functional characteristics (including pre-existing ACSC, advanced directives, cognitive status, ADL status, health instability, depression, psychotropic medication use, communication difficulty, behaviour problems, and number of chronic conditions). They were also classified by the characteristics of the CCC facility (including size, freestanding status, and rural/urban location) in which they were being cared for.

Bivariate and Multivariate Predictors of Hospitalization and ACSC hospitalization

Residents with different outcomes were compared on clinical and functional characteristics (see results Table 4.3 on page 118) using Chi-Square tests for categorical variables and ANOVA for continuous variables.

A priori, there was a hypothesized difference in the predictors of hospitalization for short-stay versus long-stay residents. Long-stay residents were expected to more closely reflect the characteristics of typical long-term care residents. Short-stay residents were expected to have been admitted for post-acute care and rehabilitation. It was felt they would experience a higher hospitalization rate after admission to CCC. Thus, separate models were constructed for long-stay and short-stay residents to reflect the presumed differences between these two resident groups.

The outcome of interest had four categories: ACSC hospitalization, other hospitalization, death, and no outcome within the first year following admission to the CCC facility. With this type of unordered multinomial outcome variable, a multinomial logistic regression modelling strategy would be appropriate, using a tool such as PROC CATMOD in SAS. However, because the individual residents are residing in CCC facilities, this strategy would ignore the potential clustering of unmeasured confounding variables that occur as a result of living in the same facility. In other words, the facility-level differences that arise due to policy, practice, or clinical differences may affect the relationships between individual resident characteristics and the risk of the outcomes. There were two options for modelling these outcomes. One was a hierarchical linear model that provided estimates of the individual facility and population parameters using the GLIMMIX macro in SAS.[203] The other was a generalized estimating equation (GEE) that estimated the population parameters while taking the clustering of risk at the facility level into account[203] using PROC GENMOD with the repeated option in SAS.[204] Because the goals of the research project were to obtain population estimates, the GEE approach was taken.

GEE methodology is based on a quasi-likelihood estimation method that requires specification of the correlation structure. The possible correlations include independence (analogous to logistic regression), dependent (applicable to longitudinal designs), exchangeable (assumes all correlations are equal across clusters), autoregressive (applicable to longitudinal designs), and unstructured (unspecified). The exchangeable correlation structure is most suitable for non-longitudinal correlations and where cluster sampling is used.[204] Thus, the exchangeable structure was used for the GEE models.

Because PROC GENMOD is not applicable to non-ordinal multinomial responses, three separate GEE models were constructed to investigate the effect of the predictor variables on the risk of ACSC, other hospitalization, and death compared with no outcome for each length of stay group. For each of the three models, a logit link was used and variables were included in the modelling process unless they were not significantly related to any of the three outcomes at the p=0.05 significance level. Interactions were tested between CPS and CHESS, DRS, and ADL as well as between ADL and the number of comorbid conditions and age/sex and all other variables. If significant interactions were found, then stratified models were presented.

Model 2: $\log(p) = \beta_0 + \Sigma\beta_i X_i$

Where:

p = the probability of ACSC hospitalization, other hospitalization, or death within one year following admission to CCC

β_0 = baseline log odds of ACSC hospitalization, other hospitalization, or death

β_i = difference in log odds of ACSC hospitalization, other hospitalization, or death (note $e^{\beta i}$ = risk ratio)

X_i = covariates ($i = 1,\ldots, k$)

3.1.7 Modelling Strategy

For each of the multivariate models used, variables were included if they were significant in bivariate tests at $p < 0.10$. A backwards elimination strategy was used to reduce all models to their most parsimonious form. Interactions were tested where specified. For all other significance tests, alpha was set at 0.05. All analyses were done using the SAS Version 8 for UNIX statistical software package.

In summary, the Phase 1 analyses used administrative data to examine the predictors of hospitalization and ACSC hospitalization at the resident level. At the facility level, the rates of hospitalization and ACSC hospitalization were described and the relationships between the rates and QIs were examined.

3.2 Phase 2 Methods: Expert Panel to Develop Revised PAH Definition

3.2.1 Design

An expert panel was established to elicit informed advice and opinions on PAH. The goal of this process was to develop a revised definition of PAH that was appropriate for use in the context of continuing care in Canada.

The planned format for the expert panel meeting was a modified Nominal Group Technique (NGT). NGT is a consensus method commonly used in health services research to gather feedback and information from relevant experts.[205] Using this method, panellists brainstorm ideas of relevance to the topic and then rank their importance to narrow the list to the most important items. We modified the NGT process by asking participants to rate the final list of important items according to the RAND Appropriateness Method methodology,[206] as discussed in Sections 3.2.4 and 3.2.5 on page 83.

3.2.2 Panel Composition and Invitation Process

The aim was to have an expert panel consisting of nine to 12 individuals.[205] Efforts were made to ensure that at least five of the members were from Canada and that at least five of the members had clinical experience in continuing care or geriatric care. Potential participants were nominated by members of the study team to represent service providers in continuing care (i.e., physicians, nurses), continuing care system administrators (regional and facility directors), and methodologists (biostatisticians, health services researchers) with research expertise in continuing care. All invitees also had particular experience in the area of PAHs and were selected to represent different provincial health systems across Canada.

Initially, 17 selected invitees were sent an introductory letter by mail, fax and by personal email from a member of the study team (see Appendix G on page 248). The letter invited the individuals to participate and presented a selection of available dates for the meeting. If invited participants were not available or felt that another person could provide more relevant expertise on this subject, they were asked to nominate an alternate expert for the panel. From this process, five additional invitees were selected. Based on the responses, the study team identified a lack of representation for specific groups. Thus, four additional physicians, one nurse, and one administrator were invited. Of the 25 invitees, 22 agreed to participate, two did not respond, and one declined due to a lack of recent expertise. Based on the preferences and availability of the responders, June 18 & 19, 2005 was selected for the meeting to maximize participation. Of the 22, nine were available for the selected meeting date.

A consent form (attached as Appendix H on page 251) was provided to participants twice: first by email in advance of the meeting and then as part of their participant binders at the meeting. In the consent form, participants were informed of the study goals and objectives as well as the risks and benefits of their participation. One person participant returned the signed consent before the expert panel meeting and the remaining participants signed and returned their consent forms at the meeting.

3.2.3 Meeting and Consensus Process

The expert panel meeting took place over 1.5 days on June 18 & 19, 2005 in Calgary, Alberta, Canada. Costs for the participants' travel expenses were reimbursed and no other incentives were offered for participation. Of the five research team members, four were present at the meeting as facilitators and/or observers. The meeting

was facilitated by two members of the research team who were thought to represent a balance in perspectives for the participants. Dr. David Hogan is a geriatrician and clinical expert in continuing care and Dr. Gary Teare is a methodological and content expert in health care quality measurement and continuing care. In advance of the meeting, participants were sent a one-page backgrounder on the ACSC approach along with relevant references.

The session was tape-recorded and written notes were made during the meeting. The meeting agenda and background material is included as Appendix I on page 253. The facilitators opened the meeting by welcoming the participants, presenting background information on the study, and introducing the other members of the research team present.

This was followed by a discussion of the concept of PAH and the use of ACSC methodology to identify PAH from long-term care. Preliminary results of predictors and hospitalization rates based on the ACSC definition of potentially avoidable hospitalization were presented to frame the subsequent discussion. Next, a discussion was held on the use and limitations of ACSC to measure preventable hospitalizations.

Following the first break, the research team members reassessed the proposed agenda and decided instead to focus the discussion on each diagnosis currently included as part of the ACSC list. Participants were asked to discuss the relevance of the item, the appropriateness and comprehensiveness of the specific ICD-9-CM diagnosis codes included, and whether other types of diagnoses should be considered in addition to the most-responsible diagnoses. After discussing each ACSC, the facilitator asked the group for their consensus on whether or not the condition should be retained, what

modifications should be made to the specific codes included, and whether or not the most-responsible diagnosis field was sufficient.

Other conditions or ideas that arose during the discussion were recorded and presented to the group in the afternoon. Participants were asked to identify other factors, such as the availability of physician resources, and conditions, such as pressure ulcers, that were important in defining PAH. Additional conditions were discussed in a similar way to the ACSCs, according to relevance to PAH and the inclusion of type 1 diagnoses.

The decision to modify the agenda was crucial to ensure that the discussion remained focused and produced meaningful results. However, it affected the practicality of proceeding with the modified NGT methodology planned for Day 2 to identify components of a definition of PAH.

On the second day of the meeting, a summary of the consensus decisions achieved through the facilitated discussion was presented. Participants were invited to ask questions or clarify ideas. They were then asked to rate the necessity of each of the original ACSC diagnoses and the additional items that arose in the discussion on a 9-point scale where nine meant that the item is essential to a definition of PAH and one meant that including the item would not contribute to our understanding of PAH. Disagreement was determined and the items were classified based on the median necessity score (7-9 = “necessary”, 4-6 = “supplementary”, 1-3 = “unnecessary”) (see data analysis section for more details). A discussion of the relative merits of the new approach to defining PAH compared to the ACSC approach followed.

3.2.4 Data Analysis

Following the meeting, a summary of the findings and the discussion was distributed to panel members as well as to those experts who agreed to participate but could not attend the scheduled meeting (included as Appendix J on page 257). This was done in an effort to share findings and to validate that the notes captured the key elements of the discussion. The summary plus an additional review of the written notes and tape recordings were used to highlight the themes presented in the Section 4.2 on page 95.

Disagreement on the 9-point ratings for each item was defined as having at least three panellists rating in 1-3 range and at least three rating in the 7-9 range. This approach was developed for 9-member expert panels for use in the RAND Appropriateness Method.[206] The agreement results are presented and discussed in Table 4.9 and Section 4.2. Where there was no disagreement, the median rating was used to classify each item as necessary (median rating between 7 and 9), supplementary (4-6), or unnecessary (1-3), as stated above. Preliminary classification of the ratings was done during the expert panel meeting using a pre-developed Microsoft Excel spreadsheet and summarized for the participants.

3.2.5 Revising the PAH Definition

On the advice of the expert panel, hospital discharge abstract coding experts were consulted on several issues and questions that arose during the meeting. For example, while panel members thought that septicaemia was an important condition to include in the revised PAH definition, they wondered how urinary tract infection cases that resulted in septicaemia would be coded. Would potentially avoidable hospitalizations with a most-responsible diagnosis of UTI already capture those that progressed to septicaemia? Two

coding experts in Calgary were contacted and two in Toronto. The coders in Calgary had extensive experience as health records coders in Calgary's hospitals. They were also previously involved with research projects and were familiar with how the codes were used for research. Because the Calgary coders warned that practices in the 1997-2002 time period may have varied substantially across the country, two additional Toronto-based health records experts were consulted. One of the coders in Toronto taught coding at a local college, actively worked in health records part-time and had experience in several different acute facilities. The other had extensive health records and health care database experience and provided valuable guidance on analytic programming for the ICD-9-CM codes. Based on the advice of the coders and the recommendations of the expert panel, a revised definition of PAH was developed. The revised definition was translated to SAS programming code to identify PAHs in the dataset. The ICD-9-CM codes included in the revised PAH definition is included as Appendix K on page 263.

3.3 Phase 3 Methods: Potentially Avoidable Hospitalization in CCC Residents

The methodology and analyses described in Section 3.1 using the ACSC definition of potentially avoidable were repeated using the PAH revised definition as outlined in Figure 3.3 on page 91.

Facility-level analyses of the relationship between PAH and QIs were conducted in the same way as Phase 1, using the new definition of PAH. The negative binomial modelling approach to correcting for overdispersion in Poisson regression models was similarly employed.

The resident-level analyses were conducted using the same group of non-palliative residents admitted between April 1, 1997 and March 31, 2001. PAH, other

hospitalization, and death were followed for one-year after admission and predictors were examined. The models were developed the same way as described in Section 3.1 with identical stratification.

Table 3.1 List of Resident and Facility Characteristics used in Analysis.

Variable	Levels	Data Source(s)
Resident Characteristics		
Sex	1=Male 2=Female	Admission MDS 2.0 (item AA2)
Age	Continuous (date of entry-birth date)	Admission MDS 2.0 (items AB1 and AA3)
Absence of personal contact with family/friends	1=yes 0=no	Admission MDS 2.0 (item F2e)
Do not resuscitate directive	1=present 0=absent	Admission MDS 2.0 (item A10b)
Do not hospitalize directive	1=present 2=absent	Admission MDS 2.0 (item A10c)
Length of stay in CCC	Continuous (admission date to hospital – admission date to CCC)	DAD (item 04/01) and Admission MDS 2.0 (item AB1)
Resource Utilization Groups	1 = rehabilitation 2 = extensive 3 = special 4 = clinically complex 5 = cognitive 6 = behavioural 7 = reduced physical functioning	Admission MDS 2.0 (108 items)
Pre-existing ACSC Conditions	Continuous (0-7)	Admission MDS 2.0 (items J3c, I1hh, I1ii, I1f, I1a, I1aa, I1h)
Cognitive Performance Scale (CPS) score	0 = intact 1 = borderline intact 2 = mild impairment 3 = moderate impairment 4 = mod.-severe impairment 5 = severe impairment 6 = very severe impairment	-Admission MDS 2.0 (items B1, B4, C4, B2a, G1Ah)
Activities of Daily Living (ADL) hierarchy score	0 = independent 1 = supervision 2 = limited 3 = extensive 1 4 = extensive 2 5 = dependent 6 = total dependence	-Admission MDS 2.0 (items G1j, G1i, G1e, G1f, G1h)
Depression Rating Scale (DRS) score	0-14 categorized at 0-2 and 3+	-Admission MDS 2.0 (items E1a, E1d, E1f, E1h, E1i, E1l, E1m)

Table 3.1 continued

Variable	Levels	Data Source(s)
Communication Resident Assessment Protocol (RAP)	1 = triggered on need for communication improvement 0 = no trigger	-Admission MDS 2.0 (items C1, C4, C6)
Changes in Health, End-stage disease and Signs and Symptoms scale (CHESS)	0 = not at all unstable to 5=highly unstable	- Admission MDS 2.0 (items b6, g9, j1l, j1c, j1g, j1o, k3a, k4c)
Chronic Conditions	Number of disease conditions (out of a possible 43 listed on the MDS) Note: For descriptive purposes, specific conditions will be presented separately for Objective 1	-Admission MDS 2.0 (items I1a-qq)
Modified Behavioural Symptoms RAP	1 = triggered on potential for behaviour issues 0 = no trigger	-Admission MDS 2.0 (items E4aA, E4bA, E4cA, E4dA, E4eA) Note: E5 not included
Use of psychotropic medications	1 = use of one or more psychotropic medications 0 = no psychotropic medications	-Admission MDS 2.0 (items O4a, O4b, O4c, O4d)
CCC Facility Characteristics		
Facility size (number of resident days)	0 = Large (greater than 10,000 patient days per year over 1997/98 to 2001/02) 1 = Small	ICES
Facility Urban/Rural Indicator	0 = urban 1 = rural	ICES (based on facility postal code and data provided by Statistics Canada)
Acute care provided on site	0 = no 1 = yes	ICES
Number of practice guidelines in place	Continuous	System Integration and Change Survey
Hourly Nursing Wage -an average over all levels of nursing staff	Calculated by dividing the total worked and purchased (not incl. benefits) nursing care expenditures by the total worked and purchased nursing service hours.	Ontario Hospital Reporting System (OHRS) database housed at ICES. This indicator reflects both the experience and the professional skill level of nurse staffing in the CCC facility.

Table 3.2 Cross-tabulations of facility characteristics at the resident level among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001. (number of residents)

3.2a Rural Location by Freestanding Status

	Freestanding	Adjoined to Acute	Total
Urban Location	11248	16957	28205
Rural Location	0	6061	6061
	11248	23018	34266

3.2b Rural Location by Size

	Small Size	Large Size	Total
Urban Location	7699	20506	28205
Rural Location	5678	383	6061
	13377	20889	34266

3.2c Freestanding Status by Size

	Small Size	Large Size	Total
Adjoined to Acute	158	11090	11248
Freestanding	13219	9799	23018
	13377	20889	34266

Figure 3.1: Frequency of Ambulatory Care Sensitive Conditions (ACSC) and Potentially Avoidable Hospitalization (PAH) conditions listed per hospitalization of Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001 and hospitalized before April 1, 2002.

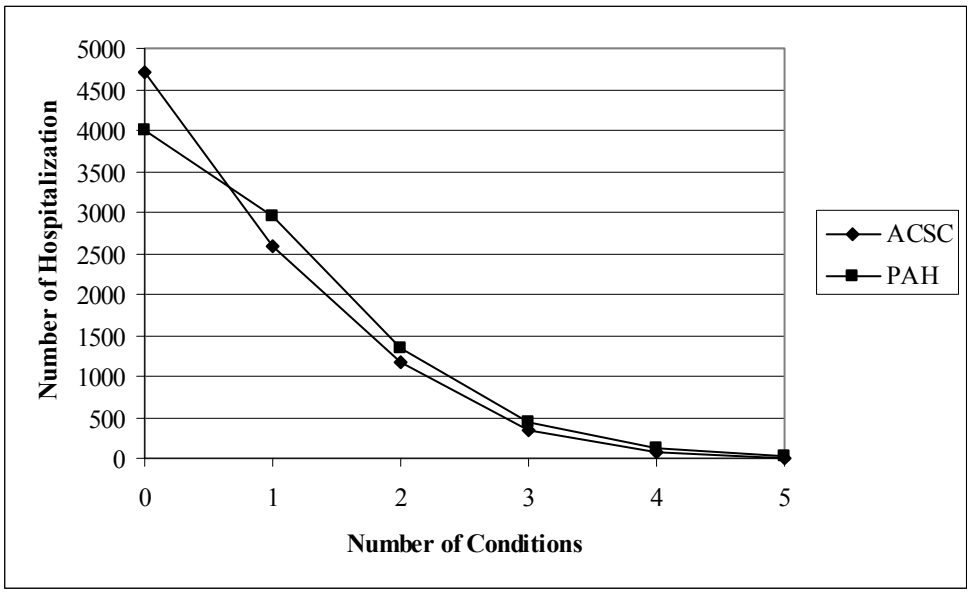


Figure 3.2: Distribution of specific Ambulatory Care Sensitive Conditions (ACSC) listed per Hospitalization of Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001 and hospitalized before April 1, 2002.

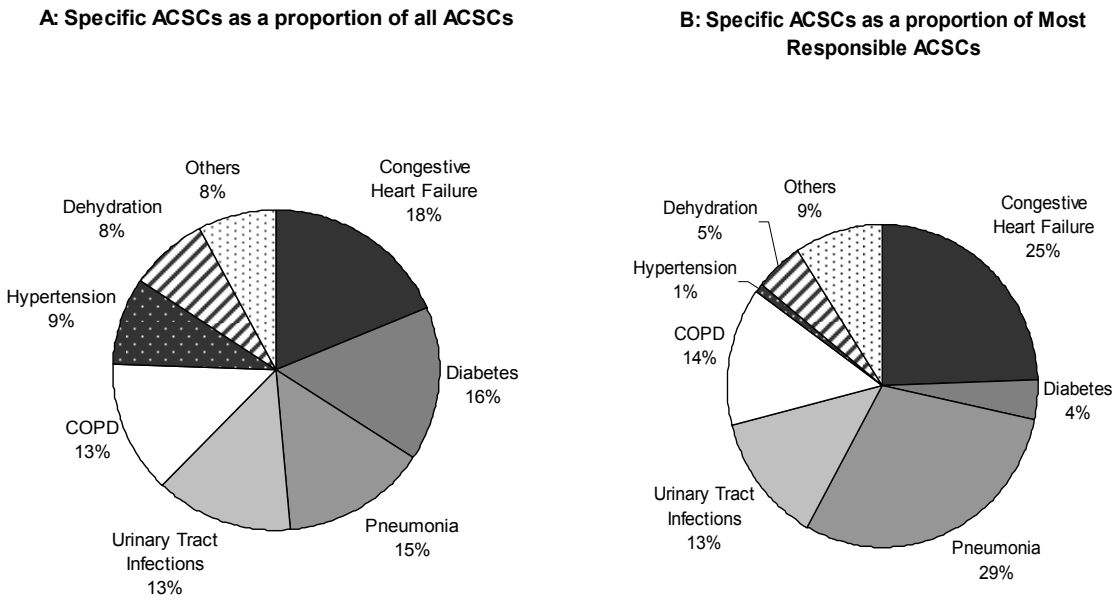
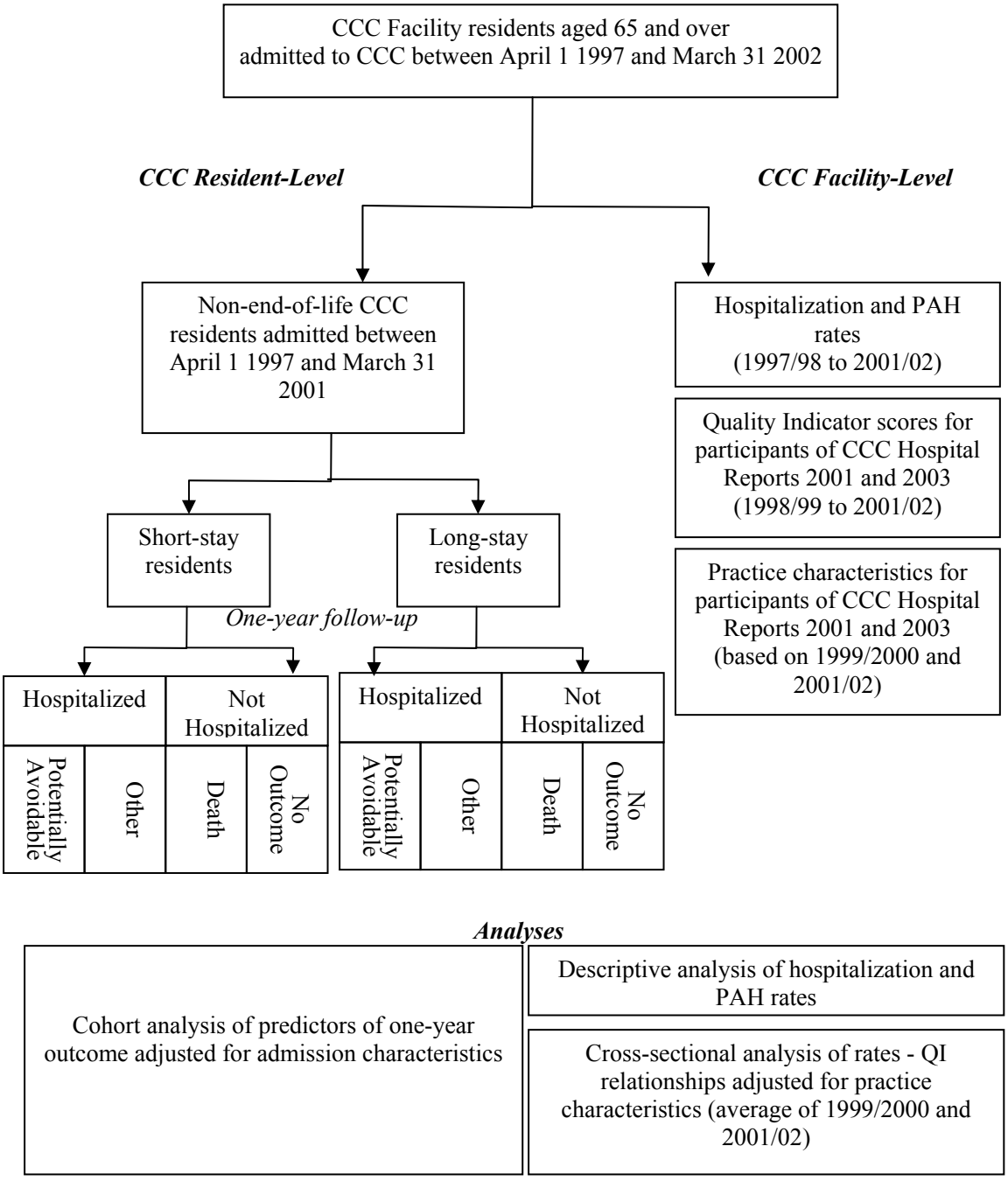


Figure 3.3: Schematic representation of study design, sample and analysis for CCC residents and facilities in Ontario.



CHAPTER FOUR: Results

This chapter outlines the results from the three phases of the project. Because the focus of the study was on developing and validating a revised definition for PAH, the results will focus primarily on findings from Phases 2 and 3. First, a brief summary of the key findings from our Phase 1 analysis using the ACSC definition are presented. Second, the deliberations of the expert panel from Phase 2 that led to a revised definition of PAH are described in some detail. This is followed by our detailed Phase 3 results. Phases 1 and 3 included analyses at the level of the facility and the resident. The facility-level description and results, including hospitalization rates and relationships with QIs, are presented first followed by the resident-level analyses, including predictors of hospitalization rates. Last, similarities and differences between the Phase 1 results obtained using the ACSC definition and Phase 3 using the revised PAH definition are highlighted. Tables and Figures are presented at the end of the chapter.

4.1 Phase 1 Results: ACSC Hospitalization in CCC Residents

Our initial analyses relied on the original list of ACSC conditions that were developed for community populations. Forty-seven percent (n = 4177) of all hospitalizations were classified as ACSC (see Figure 4.1 on page 146). Forty percent of these were for a most-responsible ACSC diagnosis. A brief summary of our key findings follows.

4.1.1 Facility-level Analysis of ACSC Hospitalization Rates

The mean facility-specific ACSC and overall hospitalization rates rose slightly over the study period (Figure 4.2, page 147). In bivariate negative binomial models, facilities with superior performance (best 25% of CCCs) on the “depressed & anxious” and “pain”

QIs (i.e., had lower proportion of residents with depression/anxiety and pain) had significantly higher rates of ACSC hospitalization than facilities with average (middle 50%) performance in 1999/2000 and 2001/02 (Table 4.1 on page 115). High rates of ACSC hospitalization were related to poor performance (worst 25% of CCCs) on the "ADL loss" and "walking improvement" QIs (i.e., facilities with a higher proportion of residents with ADL loss and lower proportion who maintained or improved in walking ability). There were no statistically significant bivariate relationships observed between ACSC hospitalization or overall hospitalization rates and facility characteristics or specific care practice guidelines in place.

Table 4.2 on page 117 shows that, when adjusted for the average number of clinical practice guidelines in place in the CCC facility, nursing hourly wage and rural/urban status, high rates of ACSC hospitalization were significantly associated with superior performance on the "depressed & anxious" and "pain" QIs and poor performance on the "ADL loss" and "walking improvement" QIs.

4.1.2 Resident-level Analysis of Predictors of ACSC Hospitalization

Bivariate Results from ACSC Analysis

When the four-level multinomial outcome was constructed using ACSC (ACSC hospitalization, other hospitalization, death, or no outcome), we found that the outcome was related to a number of resident and facility characteristics: age, sex, length of stay, Resource Utilization Group (RUG-III), having an ACSC listed on the admission MDS, presence of an advanced directive, cognition, ADL status, health instability, depressive symptoms, psychotropic medication use, communication difficulty, behaviour difficulty, the number of chronic conditions, CCC facility size, freestanding status, and rural/urban

location (see Table 4.3 on page 118). When ACSC hospitalization was compared with no outcome within one year specifically, the risk of an ACSC hospitalization was significantly reduced with older age, female sex, short length of CCC stay, residing in a CCC adjoined to acute care and residing in a rural CCC (see Table 4.4, page 120). The risk of an ACSC hospitalization was significantly increased with the presence of an advanced directive, borderline impaired cognitive status (compared with intact or more impaired status), ADL dependency, health instability, depressive symptoms, the presence of four or more chronic conditions, and residing in a large facility. Note, however, that the absolute risk differences were small. ADL dependency and clinical instability were the health factors most strongly associated with an ACSC hospitalization. *A priori*, there were thought to be possible differences between the predictors in long versus short-stay residents due to differences in the profile of residents in these groups. For example, short-stay residents are often post-acute and are more than twice as likely to be discharged home than long-stay residents.[14] The long-stay CCC resident population was thought by the expert panel to more accurately reflect the typical long-term care resident population. Because subsequent models were constructed by length of stay, Table 4.5 on page 121 shows the proportion of the sample with admission characteristics by length of stay.

Multivariate Results from ACSC Analysis

In multivariate adjusted models, long-stay residents with no cognitive impairment were more likely to experience an ACSC hospitalization if they were younger or had higher levels of health instability (see Table 4.6, page 123). For those with borderline cognitive impairment, younger age and health instability remained significant predictors of ACSC hospitalization. Additionally, residing in a freestanding CCC increased the odds

of experiencing an ACSC hospitalization in this group. For long-stay residents with cognitive impairment, younger age was no longer associated with an ACSC hospitalization. Male sex, the absence of an advanced directive, ADL impairment, health instability, having greater than four chronic conditions, and residing in a freestanding CCC all increased the odds of ACSC hospitalization.

Among short-stay residents with no cognitive impairment, ACSC hospitalization was associated with ADL impairment and health instability (see Table 4.7, page 125). These relationships were even stronger in the group with borderline cognitive impairment. In this cognitive category, male sex, having greater than 4 chronic conditions, and residing in a freestanding CCC also increased the likelihood of an ACSC hospitalization. For short-stay residents with cognitive impairment, male sex, ADL impairment, health instability, and residing in a freestanding CCC all increased the likelihood of an ACSC hospitalization.

4.2 Phase 2 Results: Expert Panel Refinement of the PAH Measure

In their discussions, the expert panel members concluded that the ACSC methodology with qualifications was a potentially helpful system-level approach to identify PAH of residents residing in long-term care settings. Identified themes of the discussion, agreed upon by the participants as a group both at the meeting and in the post-meeting summary, were as follows.

1. PAH is a system-level concept: PAH is a concept that is most useful in investigating variation at a system-level rather than in care planning at the level of an individual long-term care resident. Assessing PAH for individual residents can be

complex and highly influenced by factors unique to that patient, in that setting and at that time.

2. PAH rates are affected by both facility and resident factors: PAH rates are a function of facility capacity, quality of care, and policies as well as resident characteristics.

3. PAH reflects effective prevention, management, and/ or intervention strategies: Hospitalizations can be avoided in three ways: prevention of the condition, effective management of chronic conditions and their complications, and early intervention for emerging acute conditions. Defining PAH for conditions that are amenable to the above was identified as an important indicator of the quality of care provided in long-term care settings.

4. Determining the "right" rate for PAH is difficult: While PAH is an important issue, participants were also concerned about the equally important issue of hospitalizations for LTC residents that were being inappropriately avoided. The PAH rate may be used to identify differences between jurisdictions and/or facilities. Comparing those with a high to those with a low rate can help in delineating what factors underlie differences and what rate should be considered as a benchmark.

5. Risk-adjustment is controversial: Excessive risk-adjustment may hide quality issues but, on the other hand, not risk-adjusting may unfairly penalize facilities that treat sicker, more disabled residents. There may be a middle ground using a combination of stratification and risk-adjustment approaches. No consensus was reached in the discussion on whether or not PAH should be risk-adjusted.

6. Individual PAH diagnoses may provide better information than overall PAH rates: If the diagnoses are grouped, the utility of the PAH measure may suffer because it would be more difficult to uncover the specific reasons for differences in a given condition and take action. Grouping might mask important differences between facilities for specific conditions.

7. Context is important in interpreting PAH: The CCC environment differs in many ways from other forms of LTC in Canada. There are also important differences between the long-stay and the short-stay residents that must be considered (e.g., type and severity of clinical conditions, likelihood of discharge home). Additionally, there are methodological differences in measuring PAH in Canada compared to the U.S. due to differences in the coding of hospital diagnoses that may affect PAH rate interpretations.

The group came to an initial consensus on the diagnoses that should be included in a revised definition of PAH. To measure the extent of agreement, participants rated the relevance of each diagnosis to an overall measure of PAH. A summary of the initial ACSC list, the PAH list achieved by discussion, and the results of the rating process are included in Table 4.8 on page 127. The detailed ratings and disagreement scores are presented in Table 4.9 (page 128). One condition that resulted in disagreement was hypoglycaemia. The disagreement stemmed from a lack of consensus on whether hypoglycaemia should be considered a distinct condition separate from diabetes as most cases of hypoglycaemia occur among diabetics being treated with insulin or certain oral agents. It was decided to include it in the overall list of recommended conditions.

During the discussion, panellists recommended several modifications to the list of diagnostic ICD-9-CM codes used to define the original ACSC list. Specifically, they

recommended excluding surgical treatment of angina and adding ICD-9-CM codes 402 and 404 to congestive heart failure. Also with respect to diagnostic coding, there was uncertainty expressed about diagnosis typing and whether type 1 (contributing) diagnoses should be included in addition to type M (most-responsible). There were several questions about coding practices and the hierarchy of decision-making for certain codes. Specific questions were raised with respect to urinary tract infection, septicaemia, dehydration, and gastroenteritis.

The panel requested that further discussion with diagnostic coding experts be undertaken to receive direction on a number of the potential changes. The specific questions posed to the coding experts are included as Appendix L on page 267. The coders recommended inclusion of type 1 diagnoses in addition to type M (excluding those that are also listed as type 2) to avoid missing conditions that may have prompted a hospital admission but did not end up being the most responsible for the length of stay or resource use. They also agreed that septicaemia should be included as it arguably reflects a more severe illness and/or a delay in the treatment of cases of local infection such as UTI or pneumonia. In addition, the coders assisted with the development of an approach to capture falls and fracture. The final list of ICD-9-CM diagnosis types and codes for the revised PAH definition is included in Table 4.10 on page 129.

4.3 Phase 3 Results: Potentially Avoidable Hospitalization in CCC Residents

Between April 1, 1997 and March 31, 2002, there were a total of 90954 episodes of chronic care admission to 150 CCC facilities in Ontario where residents were assessed using the MDS 2.0 instrument. Of these episodes, 76629 were for residents age 65 and over at the time of admission and 61818 were for first-time CCC admissions. Of the

76629 episodes, 8885 (12%) resulted in a hospitalization before March 31, 2002. Figure 4.3 on page 148 shows that 55% of the 8885 hospitalizations were classified as a PAH (40% where the PAH was the most-responsible diagnosis).

The ten most frequent case mix groups (CMG) for hospitalizations were: Simple Pneumonia & Pleurisy, Respiratory Infections & Inflammations, Femur or Pelvic Procedures for Trauma, Other Factors Causing Hospitalization, Heart Failure, Lower Urinary Tract Infection, Septicaemia, Specific Cerebrovascular Disorders Except Transient Ischemia Attacks, Amputation of Lower Limb Except Toe, Gastrostomy & Colostomy Procedures, Gastrointestinal Haemorrhage, Esophagitis/Gastroenteritis & Miscellaneous Digestive Disease, and Gastrointestinal Obstruction. Figure 4.4 on page 149 shows that the largest proportion of hospitalizations was classified into the Simple Pneumonia and Pleurisy CMG in each year of observation. Over time, hospitalizations for Femur or Pelvic Procedures for Trauma appeared to be decreasing relative to other CMGs. Respiratory Infections and Inflammation and Other Factors Causing Hospitalization seemed to be increasing.

The occurrences of the most frequent individual ICD-9-CM diagnosis codes that contributed to the PAH definition are shown in Table 4.11 (page 130). The most common individual diagnosis codes were for congestive heart failure (987 occurrences), unspecified pneumonia (840 occurrences), and urinary tract infection (811 occurrences). These were followed by diabetes without complication, chronic airway obstruction, unspecified hypertension, fracture of lower limb, and blood volume depletion. The new codes added in the PAH definition added 524 occurrences of lower limb fracture, 197 of other lower limb fracture, and 184 of septicaemia.

4.3.1 Facility-Level Analysis of PAH Rates

Description of CCC Facilities

Of the 99 facilities with facility specific information, 80 (80.1%) were adjoined to an acute site, 65 (65.7%) were small, and 65 (65.7%) were rural.

The average number of clinical practice guidelines that each CCC corporation identified in the Hospital Report System Integration and Change (SIC) Surveys over 1999/2000 and 2001/02 was significantly higher (p=0.0428) for freestanding CCCs (3.8) than for adjoined CCCs (2.9). The number of practice guidelines in place within the CCC was not significantly different in large CCCs compared with small CCCs (p=0.205). Rural facilities had a lower average number of practice guidelines than urban CCCs (2.5 versus 3.3, p=0.023). Average nursing wage did not differ by freestanding status (p=0.407) or by size (p=0.155).

Rural CCCs had a significantly lower average nursing wage ($25.60 versus $28.60 per hour, p=0.0009). Twenty-four percent of rural facilities fell into the poorest performing group for the "ADL improvement" QI compared with 14% of the urban CCCs. For the "ADL loss" QI, equal proportions of rural and urban facilities were in the poor performing group (23% of urban and 24% of rural CCCs). Rural CCCs had a higher proportion with poor performance on the "antipsychotic medication use" QI (29% compared with 20% for urban CCCs). In contrast, 18% of rural CCCs were poor performers on the "catheter use" QI compared to 29% of urban CCCs.

Hospitalization and PAH Rates

One facility showed evidence of outlier status based on the Cochran test for outliers. When this facility was excluded, there were 76593 chronic care episodes for 61785

individuals in 149 CCC facilities. Over the five study years, the overall hospitalization rate was 42 per 100 resident-years (95%CI: 42 to 43) and the first hospitalization rate was 37 per 100 resident-years (95%CI: 36 to 38). There was, however, variation in the rates for individual CCC facilities, as shown in Figure 4.5 (page 150). Six (4%) of the facilities transferred no residents to acute care during the study period. Fifty percent of the facilities had hospitalization rates between 17 and 58 per 100 resident-years. The highest rate was 328 per 100 resident-years. The distribution of rates was positively skewed. This means that the median value is below the mean value and that there are a small number of facilities with very high rates.

Over the five years of follow-up, there were 4865 PAHs of residents aged 65 and over (excluding the outlying CCC facility). The overall PAH rate for all facilities combined over the five years of follow-up was 23 per 100 resident-years, approximately half the rate of overall hospitalizations. Facility-specific rates for PAH showed a positive skew and wide variation (see Figure 4.6 on page 151). The range was from zero to 110 per 100 resident-years, with a median of 14 per 100 resident-years.

Because the facility-specific distribution of rates was positively skewed, the median rates for each quarter best measured the central tendency of the data. Figure 4.7 (page 152) shows the differences between the median overall rates for any hospitalization and the rates for the first hospitalization within each episode. Both displayed similar patterns and increased between April 1997 and March 2002.The median quarterly facility-specific PAH rates were all equal to zero, with one exception. Thus, to provide a sense of the trends in rates over time, the mean quarterly PAH rates are presented in Figure 4.8 on page 153. Figure 4.8 shows the changes in mean PAH and overall hospitalization rates

over time. The mean PAH rate increased from 17 per 100 resident-years in fiscal year 1997/98 to 31 per 100 resident-years in fiscal year 2001/02. The mean quarterly rates were highly unstable at the facility level, with the 95% confidence interval for all quarters including zero.

Relationship between Hospitalization/PAH Rates and Quality Indicators

Description of Facility Sample

There were 99 CCC sites for which facility-specific characteristics were available. Overall, the mean of the facility-level QI scores did not change between 1998/99 and 2002/03 (see Figure 4.9 on page 154). The average facility-specific QI scores for 1999/2000 and 2001/02 are summarized in Table 4.12 on page 132. The most common quality issue was bladder or bowel incontinence, which affected an average of 67.4% of residents over the 1999/2000 and 2001/02 fiscal years.

The mean facility-specific hospitalization rate for the 1999/2000 and 2001/02 fiscal years was 57 per 100 resident-years. The facility-specific rate for PAH hospitalization was 31 per 100 resident-years. The average nursing wage per hour for the 1999/2000 and 2001/02 fiscal years was $27.60.

Large and small CCCs did not differ according to the average number of practice guidelines they had in place ($t=-1.28$, $p=0.205$) nor according to average nursing wage ($t=-1.70$, $p=0.093$). The average nursing hourly wage also did not differ significantly between freestanding and adjoined sites ($t=0.83$, $p=0.407$). Freestanding sites had a higher number of care practice guidelines in place on average ($t=2.05$, $p=0.043$). Rural CCCs had a lower average number of care practice guidelines in place ($t=2.30$, $p=0.023$).

Rural sites also had a lower nursing hourly wage ($23.91) than urban CCCs ($27.64) (t=3.48, p=0.001).

Cross-tabulations of several CCC characteristics at the facility level revealed problems with small cell sizes and colinearity. For example, there were zero CCCs that were rural and freestanding. There was only one facility that was freestanding and small and only one that was rural and large.

The unadjusted relationship between rural status and QI performance is displayed in Table 4.13 (page 133). Rural facilities had higher restraint use and were more than three times more likely to be among the poor performers on the restraint use QI than urban facilities (OR=3.41, 95%CI: 1.07 to 11.01).

Negative Binomial Models

The unadjusted relationships of PAH and overall hospitalization rates with QIs, facility characteristics and care practice guidelines are presented in Table 4.14 (page 134). Facilities with lower proportions of incontinent residents showed higher rates of both PAH and hospitalization for the 1999/2000 and 2001/02 fiscal years. Facilities with fewer residents showing signs of depression/anxiety and pain had higher rates of PAH but not hospitalization overall. Higher rates of PAH and hospitalization were also observed for facilities with poor performance on the “ADL loss”, “depressed & anxious”, “worsening locomotion”, “urinary tract infection”, and “walking improvement” QIs. PAH rates were not statistically related to any facility characteristics or care practice guidelines in place.

When adjustments were made in multivariate negative binomial models (Table 4.15. page 136), superior performance on the “depressed & anxious” and “pain” QIs remained

predictive of higher PAH rates. In addition, similar to our bivariate models, poor performance on the "ADL loss", "depressed & anxious" and "walking improvement" QIs were related to higher PAH rates. Of these QIs that displayed relationships with PAH rates, poor performance on the "depressed & anxious" QI and both superior and poor performance on the "walking improvement" QI predicted higher hospitalization rates.

In summary, the facility-level analysis showed that PAH rates were approximately half the rate of overall hospitalization from CCC and that both increased over the study period. PAH rates did not show a consistent pattern with QIs. Higher adjusted PAH rates were associated with superior performance on the "depressed & anxious" and "pain" QIs and inferior performance on the "ADL loss", "depressed & anxious" and "walking improvement" QIs.

4.3.2 Resident-Level Analysis of Predictors of PAH

Description of Sub-Sample

There were 34266 non-palliative patients aged 65 and over admitted to a CCC facility in Ontario between April 1, 1997 and March 31, 2001. Within one year of admission, 1783 residents (5.2%) experienced a PAH, 1559 (4.5%) had other hospitalizations, and 11067 (32.3%) died (refer to Table 4.16 on page 137). The mean time spent in the CCC before experiencing a specific outcome was 76 days for a PAH (standard deviation (sd) = 79 days, range = 1 to 365 days), 69 days for an other hospitalization (sd = 71 days, range = 2 to 365 days), and 128 days before death (sd = 97 days, range= 0 to 365 days).

As shown in Table 4.16 on page 137, the mean age of the sample was 80.2 years. The sample was 59.5% female. Only 7.0% of residents had no contact with family

members and over 65% of the residents were classified as short-stay. The reduced physical functioning RUG was the largest group with an overall proportion of 40.8%. Overall, 57.3% of the new admissions had one of the seven available ACSCs checked on the admission MDS form. The most common of these were hypertension (30.0% of all residents), diabetes (19.9%), congestive heart failure (CHF) (15.2%), and chronic obstructive pulmonary disease (COPD) (14.7%). Advanced directives, in the form of "do not hospitalize" and "do not resuscitate", were recorded for 35.5 % of the sample.

Over two-thirds of residents showed some level of cognitive impairment, with 41.5% displaying high levels of impairment. Most of the sample fell into the lowest and highest ADL dependency groups with 34.8% independent and 42.7% dependent. Eight percent of the sample had high health instability and 47% of the sample had at least moderate instability. Over the study period, there was an increase in health instability as measured by the CHESS score. The mean value rose 0.23 points from 1.45 to 1.68 between the first and last quarters of study (Figure 4.10, page 155). Similar trends were not observed for mean CPS and ADL-Hierarchy scores between April 1997 and March 2001 (a 0.13 decrease and 0.1 increase, respectively).

Psychotropic medications were used by 54.3% of all residents on admission and were associated with a higher proportion experiencing death and other hospitalization. Communication difficulty on admission was present in 61.4% of residents and behaviour difficulty in 26.3%. Overall, 42.7% of the sample had four or more chronic conditions listed on the admission MDS assessment.

Between April 1, 1997 and March 31, 2001, 39.0% of CCC admissions were to small CCCs, 32.8% were admitted to freestanding CCCs that did not have an adjoined acute facility, and 17.7% were admitted to a CCC in a rural area.

Bivariate Results

When the four-level multinomial outcome was reconstructed using the revised PAH (PAH, other hospitalization, death, or no outcome), we found that PAH was related to: younger age, male sex, longer length of CCC stay, advanced directives, communication difficulty, behaviour difficulty, borderline cognitive impairment, ADL dependency, clinical instability, depression and a higher number of chronic conditions. Residents from large, freestanding, and urban CCCs showed an increased risk for PAH (refer to Tables 4.16 and 4.17 on pages 137 and 139). The absolute differences between risk of PAH and no outcome within one year were small. Length of CCC stay showed the greatest difference in risk at 0.12. ADL dependency and clinical instability had differences of 0.05.

Those with advanced directives, family contact, cognitive impairment, ADL impairment, depressive symptoms, psychotropic medication use, communication difficulty and behaviour problems were more likely to be long-stay than short-stay residents (see Table 4.18, page 140). Table 4.19 on page 141 shows the outcomes by length of stay group and covariates.

Multivariate Model Development

As noted, the predictors of PAH and other hospitalization were expected to be different for short-stay versus long-stay residents. A stratified full model was carried out

and the predictors were found to vary by length of stay. Thus, all subsequent models were done separately for short and long-stay residents.

Base models, adjusted for age and sex, showed that there were significant interactions between the level of cognitive status and both health instability and depression in their effects on PAH for both long and short-stay residents. No interactions were found between cognitive status or comorbidity and ADL function, and between depression and health instability. Thus, the models were stratified by the three collapsed CPS score categories for each of the outcomes.

Full GEE models for each CPS category were run separately for long and short-stay resident groups. Psychotropic medication use, communication difficulty, behaviour difficulty, and contact with family were dropped from the modelling process because they were not significant predictors of any outcomes for both long and short stay residents in multivariate models. The presence of depressive symptoms was not a significant predictor of any of the outcomes for long-stay residents; hence, it was dropped from the modelling process for this stratum.

Multivariate Results for the Long-Stay Resident Population

This section outlines the predictors of PAH, other hospitalization, and death from the stratified multivariate models for the long-stay residents. These results are summarized in Table 4.20 (page 142).

Predictors of PAH among Long-Stay Residents

Younger age was associated with increased odds of PAH for long-stay residents with intact and borderline cognitive impairment. However, age was not a significant predictor

of PAH for cognitively impaired residents. Male sex was associated with increased odds of PAH among the cognitively impaired group only.

The presence of "do not hospitalize" and/or "do not resuscitate" orders on admission to CCC was related to decreased odds of PAH for cognitively impaired long-stay residents. ADL impairment was not significantly related to the odds of PAH. However, lower levels of health instability were associated with significantly decreased PAH, regardless of cognition. Being admitted to an adjoined CCC was associated with decreased odds of PAH within one year among the borderline impaired group only.

Predictors of Other Hospitalization among Long-Stay Residents

The odds of other hospitalization were not statistically related to age, sex, and the presence of advanced directives. Having no or mild ADL impairment decreased the odds of hospitalization for the intact cognition group. While PAH did not show a relationship with number of chronic conditions, fewer chronic conditions increased the odds of experiencing other hospitalization in the cognitively intact group. Lower levels of health instability were associated with significantly decreased odds of other hospitalization across cognitive groups. CCC freestanding status was not associated with either an increased or a decreased likelihood of other hospitalization in any group.

Predictors of Death among Long-Stay Residents

Younger age was associated with increased odds of death among the cognitively intact residents but decreased odds among the cognitively impaired group. In all groups, males and those with advanced directives were more likely to die within one year of admission.

Lower levels of ADL impairment were associated with decreased odds of death for all groups except for no ADL impairment in the intact and borderline cognitively impaired groups (see Table 4.20 on page 142). Likewise, lower levels of health instability were associated with significantly decreased odds of death. Among the borderline impairment group, having fewer than four chronic conditions increased the odds of death.

Multivariate Results for the Short-Stay Resident Population

This section outlines the predictors of PAH, other hospitalization, and death from the stratified multivariate models for the short-stay residents. These results are summarized in Table 4.21 (page 144).

Predictors of PAH among Short-Stay Residents

Age was not a significant predictor of PAH for short-stay residents, regardless of cognition. Male sex was associated with increased odds of PAH among borderline cognitively impaired and cognitively impaired residents. The presence of advanced directives was not related to the odds of PAH.

Lower ADL impairment was associated with decreased odds of PAH for all cognition groups except for mild ADL impairment in the cognitively intact group. Lower levels of health instability were associated with significantly decreased odds of PAH across most cognition groups. The exception was in the cognitively impaired group where those with medium health instability scores did not have significantly decreased odds of PAH compared with the most unstable group.

The presence of depressive symptoms was not related to the odds of experiencing a PAH. Having fewer than four chronic conditions at admission significantly reduced the risk of experiencing a PAH for the borderline cognitively impaired group. Being admitted

to an adjoined CCC was associated with decreased odds of experiencing PAH, among cognitively impaired residents.

Predictors of Other Hospitalization among Short-Stay Residents

Younger age was associated with increased odds of other hospitalization for short-stay residents with intact cognition and cognitive impairment. Males were at higher risk for other hospitalizations in all cognitive groups. Other hospitalization was not predicted by the presence of advanced directives.

Residents with no ADL impairment had decreased odds of other hospitalization across all cognitive groups. Short-stay residents with mild ADL impairment had lower odds of hospitalization in the cognitively impaired group. Lower levels of health instability were associated with significantly decreased odds of other hospitalization for most groups. Similar to the relationship with PAH, the cognitively impaired residents with medium health instability scores did not have significantly decreased odds of other hospitalization compared with the most unstable group. The presence of depressive symptoms increased the odds of experiencing other hospitalization in the cognitively intact group.

CCC freestanding status was not associated with either an increased or a decreased likelihood of other hospitalization in any group.

Predictors of Death among Short-Stay Residents

Younger age was associated with decreased odds of death for the borderline and cognitively impaired groups. In all cognitive groups, males and those with advanced directives were at higher risk for death.

Lower levels of ADL impairment and health instability were associated with significantly decreased odds of death for all cognitive groups. In the cognitively intact group, residents with depressive symptoms had increased odds of experiencing death. Among the cognitively intact and borderline groups, residents with fewer than four chronic conditions had increased odds of death. Residents in the cognitively impaired group had lower odds of death in adjoined CCCs compared with freestanding facilities.

Key Determinants of PAH

In summary, among long-stay residents with no cognitive impairment, younger age and high health instability predicted increased odds of PAH. These two factors, along with being from a freestanding CCC predicted increased PAH among long-stay residents with borderline cognitive impairment. For those who were cognitively impaired, higher odds of PAH were predicted by male sex, the absence of advanced directives, and high health instability but not younger age or CCC freestanding status.

The predictors of increased PAH risk among short-stay residents were ADL impairment and health instability for those with no cognitive impairment. For short-stay residents with borderline cognitive impairment, the above two variables plus male sex and the presence of four or more chronic conditions predicted increased odds of PAH. Among those who were cognitively impaired, ADL impairment, health instability, male sex, and residing in a freestanding CCC were associated with higher odds of PAH. The presence of four or more chronic conditions did not predict PAH in this cognitively impaired group.

4.4 Comparison of ACSC (Phase 1) and PAH (Phase 3) Results

The results summarized in Section 4.1 were the result of analyses conducted using the original list of ACSC diagnosis codes. Section 4.3 described results using the revised definition of PAH developed by the expert panel. This section will highlight key similarities and differences in results obtained with the two approaches.

The ACSC definition included four conditions that were not retained in the revised PAH definition: immunization-preventable conditions, nutritional deficiency, severe ear/nose/throat infections, and tuberculosis. The first three in this list were excluded because the specific diagnoses included were not considered applicable to older persons. Tuberculosis was not included by the expert panel for the following reasons: the condition was not likely to be contracted in the CCC; in most cases, relapses could not be attributed to the quality of preventive care in the CCC; and, the identification of most active cases should occur before admission to the facility. The ACSC list did not include falls/fractures and septicaemia, which were added to the revised PAH definition.

The ACSC definition categorized a lower proportion of hospitalizations as potentially avoidable. Forty-seven percent of the 8885 hospitalizations were for one of the original ACSC diagnoses. This is in contrast to the 55% that were classified as a PAH. However, similar proportions were identified based on the most-responsible diagnosis (40% for ACSC and 40% for PAH). The same five most frequent ICD-9-CM codes contributed to the ACSC and PAH definitions. However, falls/fractures codes were in the top ten of the codes for PAH. The resident groups displaying the biggest differences were the cognitive RUG group (34.9% with an ACSC hospitalization vs.

52.4% with a PAH), those with no family contact (38.1% versus 52.9%), and those from a rural CCC (36.0% versus 50.5%).

4.4.1 Facility-Level Analysis of ACSC Rates versus PAH Rates

The overall ACSC hospitalization rate for all facilities combined over the four years of follow-up was similar to the PAH rate (20 per 100 resident-years versus 23 for PAH). The medians and means for ACSC hospitalization rates showed similar trends as those for PAH.

When adjustments were made in multivariate negative binomial models, the observed relationships between ACSC rates and "ADL loss", "pain" and "walking improvement" QI performance were consistent with the findings for PAH. In contrast, PAH rates were higher for facilities with both higher and lower proportions of depressed/anxious residents.

4.4.2 Resident-Level Analysis of Predictors of ACSC Hospitalization versus PAH

Bivariate Similarities and Differences

Bivariate relationships between ACSC and sociodemographic, resource use, health/functional status, and facility characteristics were generally similar to those for PAH except for psychotropic medication use, communication and behaviour problems, which were associated with significantly higher risk of PAH but not ACSC.

Where the relationships were similar, the observed relationships were marginally stronger with ACSC than with PAH. This occurred for borderline cognitive impairment (RR=1.23 versus 1.19 for PAH), high ADL dependency (RR=1.90 versus 1.76), high health instability (1.92 versus 1.87 for PAH), the presence of four or more chronic

conditions (1.44 versus 1.33 for PAH), large CCCs (1.78 versus 1.60 for PAH), freestanding CCCs (1.59 versus 1.45 for PAH), rural CCCs (0.62 versus 0.73).

Multivariate Similarities and Differences

Multivariate predictors showed similar overall patterns using the two definitions. Exceptions are discussed below.

When the ACSC definition was used, the risk of other hospitalization did not increase with younger age in the long-stay group. Those with advanced directives were at a significantly decreased risk of other hospitalization in the long-stay cognitively impaired group when the ACSC definition was used.

Lower ADL impairment was related to decreased odds of ACSC hospitalization in long-stay residents in addition to the short-stay cognitively impaired residents. In addition, the mild ADL impairment group showed decreased odds of other hospitalization in the long-stay intact cognition group.

4.5 Sensitivity Analysis

Because the literature review revealed disagreement on whether to include pneumonia and CHF in the list of ACSCs for older people, the analyses were conducted excluding those two conditions from the original definition. When they were excluded, there were 1141 ACSC hospitalizations and 2201 other hospitalizations within one year of admission to CCC. The multivariate analyses showed that the exclusion of CHF and pneumonia did not substantially alter the predictors of ACSC hospitalization. The results are included in Appendix M on page 268.

Table 4.1: Unadjusted analysis of the relationships between performance on quality indicators & facility characteristics and hospitalization / ACSC hospitalization rates for Complex Continuing Care facilities in Ontario during the 1999/2000 and 2001/02 fiscal years. (Risk ratio (95% Confidence interval))

Quality Indicator Performance[&]	Hospitalization	ACSC Hosp
ADL Improvement - Poor	0.93 (0.66 to 1.31)	1.06 (0.72 to 1.57)
ADL Improvement - Superior	**1.37 (1.01 to 1.88)**	1.23 (0.86 to 1.76)
ADL Loss - Poor	**1.74 (1.29 to 2.34)**	**1.63 (1.15 to 2.32)**
ADL Loss - Superior	0.96 (0.68 to 1.33)	1.26 (0.86 to 1.84)
Antipsychotic Use - Poor	0.80 (0.57 to 1.12)	0.77 (0.53 to 1.13)
Antipsychotic Use - Superior	1.20 (0.85 to 1.70)	1.20 (0.81 to 1.78)
Indwelling Catheter - Poor	**1.57 (1.15 to 2.16)**	1.30 (0.90 to 1.89)
Indwelling Catheter - Superior	1.13 (0.80 to 1.59)	1.16 (0.78 to 1.72)
Worsening Communication - Poor	1.19 (0.86 to 1.66)	1.15 (0.80 to 1.67)
Worsening Communication - Superior	0.93 (0.66 to 1.30)	1.21 (0.84 to 1.76)
Depressed & Anxious - Poor	**1.49 (1.09 to 2.04)**	1.39 (0.98 to 1.97)
Depressed & Anxious - Superior	1.25 (0.90 to 1.74)	**1.72 (1.21 to 2.45)**
Falls - Poor	**1.52 (1.12 to 2.07)**	1.18 (0.82 to 1.70)
Falls - Superior	1.29 (0.88 to 1.90)	1.27 (0.80 to 2.00)
Incontinence - Poor	0.90 (0.65 to 1.23)	0.96 (0.67 to 1.38)
Incontinence - Superior	**1.55 (1.13 to 2.13)**	1.43 (0.99 to 2.06)
Infection - Poor	1.24 (0.88 to 1.74)	1.03 (0.70 to 1.52)
Infection - Superior	0.76 (0.56 to 1.04)	0.80 (0.56 to 1.14)
Worsening Locomotion - Poor	**1.49 (1.10 to 2.02)**	1.40 (0.99 to 1.98)
Worsening Locomotion - Superior	0.84 (0.57 to 1.24)	0.88 (0.56 to 1.39)
Pain - Poor	0.99 (0.73 to 1.35)	0.98 (0.70 to 1.38)
Pain - Superior	1.42 (0.98 to 1.08)	**1.73 (1.14 to 2.62)**
Pressure Ulcer - Poor	1.31 (0.94 to 1.81)	1.25 (0.86 to 1.80)
Pressure Ulcer - Superior	1.26 (0.89 to 1.77)	1.33 (0.91 to 1.95)
Urinary Tract Infection - Poor	**1.44 (1.04 to 1.99)**	1.39 (0.96 to 2.02)
Urinary Tract Infection - Superior	0.91 (0.66 to 1.25)	1.13 (0.79 to 1.63)
Restraint Use - Poor	0.89 (0.62 to 1.27)	0.69 (0.45 to 1.05)
Restraint Use - Superior	0.78 (0.56 to 1.07)	0.76 (0.53 to 1.09)
Worsening Bladder Continence - Poor	1.14 (0.98 to 1.53)	1.12 (0.80 to 1.56)
Worsening Bladder Continence - Superior	0.89 (0.59 to 1.35)	0.99 (0.63 to 1.57)
Walking Improvement - Poor	**1.69 (1.16 to 2.44)**	**1.98 (1.29 to 3.03)**
Walking Improvement - Superior	0.77 (0.57 to 1.04)	0.99 (0.71 to 1.39)

[&] Related to average performance (middle 50% of CCCs). Superior = best 25% of CCCs, Poor = poorest 25% of CCCs

Table 4.1 continued

Facility Characteristics	**Hospitalization**	**ACSC Hosp**
Nursing Hour Wage	1.01 (0.97 to 1.05)	1.01 (0.96 to 1.06)
Rural	1.06 (0.80 to 1.42)	0.92 (0.65 to 1.29)
Freestanding	0.79 (0.57 to 1.08)	1.09 (0.77 to 1.55)
Large Size	0.94 (0.71 to 1.24)	0.78 (0.58 to 1.05)
Clinical Practice Guidelines in Place		
Number of Practice Guidelines	1.02 (0.94 to 1.10)	1.02 (0.93 to 1.11)
Incontinence Practice Guideline	0.98 (0.74 to 1.29)	0.99 (0.72 to 1.35)
UTI Practice Guideline	0.85 (0.63 to 1.16)	0.77 (0.55 to 1.09)
Behaviour Practice Guideline	0.96 (0.73 to 1.26)	0.87 (0.65 to 1.18)
Falls Practice Guideline	0.94 (0.72 to 1.24)	0.94 (0.70 to 1.27)
Pressure Ulcer Practice Guideline	0.81 (0.55 to 1.22)	0.71 (0.45 to 1.12)
Physical Restraints Practice Guideline	0.89 (0.60 to 1.32)	0.95 (0.59 to 1.51)
Pain Practice Guideline	1.16 (0.89 to 1.52)	1.25 (0.93 to 1.68)
Psychotropic Medication Practice Guideline	0.98 (0.74 to 1.32)	0.92 (0.67 to 1.27)

Table 4.2: Adjusted analysis of the relationships between facility-level performance on quality indicators and hospitalization and ACSC hospitalization rates for Complex Continuing Care facilities in Ontario during the 1999/2000 and 2001/02 fiscal years. **(Risk ratio (95% Confidence interval))**

Quality Indicator Performance[&]	Hospitalization	ACSC Hosp
ADL Improvement - Poor	0.96 (0.65 to 1.42)	1.04 (0.66 to 1.62)
ADL Improvement - Superior	**1.51 (1.03 to 2.20)**	1.33 (0.86 to 2.06)
ADL Loss - Poor	**1.83 (1.28 to 2.61)**	**1.78 (1.16 to 2.74)**
ADL Loss - Superior	0.95 (0.65 to 1.38)	1.27 (0.82 to 1.97)
Antipsychotic Use - Poor	0.82 (0.56 to 1.22)	0.75 (0.48 to 1.16)
Antipsychotic Use - Superior	1.40 (0.93 to 2.13)	1.45 (0.90 to 2.34)
Indwelling Catheter - Poor	**1.66 (1.12 to 2.47)**	1.46 (0.91 to 2.34)
Indwelling Catheter - Superior	1.05 (0.73 to 1.52)	1.08 (0.70 to 1.67)
Worsening Communication - Poor	1.18 (0.80 to 1.75)	1.15 (0.74 to 1.79)
Worsening Communication - Superior	0.90 (0.62 to 1.33)	1.10 (0.72 to 1.67)
Depressed & Anxious - Poor	**1.49 (1.04 to 2.14)**	1.36 (0.91 to 2.03)
Depressed & Anxious - Superior	1.36 (0.91 to 2.02)	**1.81 (1.18 to 2.77)**
Falls - Poor	1.39 (0.95 to 2.04)	1.09 (0.70 to 1.71)
Falls - Superior	1.09 (0.66 to 1.79)	1.17 (0.64 to 2.12)
Incontinence - Poor	0.78 (0.54 to 1.13)	0.84 (0.55 to 1.30)
Incontinence - Superior	**1.58 (1.12 to 2.25)**	1.30 (0.85 to 1.97)
Infection - Poor	1.15 (0.78 to 1.70)	0.87 (0.56 to 1.35)
Infection - Superior	0.83 (0.57 to 1.23)	0.85 (0.55 to 1.31)
Worsening Locomotion - Poor	**1.47 (1.03 to 2.09)**	1.45 (0.96 to 2.19)
Worsening Locomotion - Superior	0.74 (0.48 to 1.13)	0.74 (0.45 to 1.19)
Pain - Poor	1.04 (0.72 to 1.51)	1.03 (0.68 to 1.54)
Pain - Superior	1.47 (0.93 to 2.31)	**1.81 (1.09 to 3.01)**
Pressure Ulcer - Poor	1.14 (0.75 to 1.72)	1.08 (0.68 to 1.72)
Pressure Ulcer - Superior	1.19 (0.81 to 1.74)	1.27 (0.84 to 1.94)
Urinary Tract Infection - Poor	1.37 (0.94 to 1.99)	1.31 (0.85 to 2.01)
Urinary Tract Infection - Superior	0.91 (0.62 to 1.33)	1.17 (0.76 to 1.79)
Restraint Use - Poor	0.95 (0.62 to 1.48)	0.64 (0.38 to 1.06)
Restraint Use - Superior	0.76 (0.51 to 1.12)	0.71 (0.47 to 1.07)
Worsening Bladder Continence - Poor	1.08 (0.77 to 1.54)	1.04 (0.70 to 1.53)
Worsening Bladder Continence - Superior	0.77 (0.49 to 1.21)	0.86 (0.51 to 1.44)
Walking Improvement - Poor	**1.69 (1.07 to 2.66)**	**1.86 (1.09 to 3.15)**
Walking Improvement - Superior	0.71 (0.51 to 0.98)	0.82 (0.56 to 1.20)

[&] Related to average performance (middle 50% of CCCs). Superior = best 25% of CCCs, Poor = poorest 25% of CCCs
Adjusted for the average number of practice guidelines, nursing hourly wage, and rural/urban status.

Table 4.3: Demographic, clinical, and functional description of admission characteristics for Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001. Reported by outcome within one year of admission using the *original ACSC definition* (number and percent, unless otherwise indicated)

Admission Characteristic	Overall (% of sample)	One-Year Outcome			
		ACSC	Other Hospitalization	Death	No Outcome
Total	34266	1476 (4.3)	1866 (5.4)	11067 (32.3)	19857 (58.0)
Sociodemographic Variables					
Age (mean years(s.d.))*	80.2 (7.4)	78.76 (7.19)	79.38 (7.28)	80.8 (7.7)	80.1 (7.4)
Sex*					
Male	13888 (40.5)	662 (4.8)	848 (6.1)	5106 (36.8)	7272 (52.4)
Female	20378 (59.5)	814 (4.0)	1018 (5.0)	5961 (29.3)	12585 (61.8)
Contact with Family					
No	2389 (7.0)	98 (4.1)	159 (6.7)	768 (32.2)	1364 (57.1)
Yes	31877 (93.0)	1378 (4.3)	1707 (5.4)	10299 (32.3)	18493 (58.0)
Resource Use Variables					
Length of CCC Stay*					
Long-stay	11870 (34.6)	955 (8.0)	1196 (10.1)	3422 (28.8)	6297 (53.1)
Short-stay	22396 (65.4)	521 (2.3)	670 (3.0)	7645 (34.1)	13560 (60.6)
Resource Utilization Group*					
Extensive	2548 (7.4)	190 (7.5)	178 (7.0)	1343 (52.7)	837 (32.9)
Special	4860 (14.2)	262 (5.4)	313 (6.4)	1626 (33.5)	2659 (54.7)
Clinically Complex	9245 (27.0)	447 (4.8)	480 (5.2)	3982 (43.1)	4336 (46.9)
Cognitive	3235 (9.4)	94 (2.9)	175 (5.4)	624 (19.3)	2342 (72.4)
Behavioural	383 (1.1)	17 (4.4)	20 (5.2)	82 (21.4)	264 (68.9)
Reduced Physical	13995 (40.8)	466 (3.3)	700 (5.0)	3410 (24.4)	9419 (67.3)
Health and Functional Status					
ACSC on MDS*					
No	14635 (42.7)	383 (2.6)	844 (5.8)	4527 (30.9)	8881 (60.7)
Yes	19631 (57.3)	1093 (5.6)	1022 (5.2)	6540 (33.3)	10976 (55.9)
DNH or DNR*					
No	22120 (64.6)	1071 (4.8)	1314 (5.9)	4732 (21.4)	15003 (67.8)
Yes	12146 (35.5)	405 (3.3)	552 (4.5)	6335 (52.2)	4854 (40.0)
Cognitive Status*					
Intact (CPS = 0)	9440 (27.6)	387 (4.1)	516 (5.5)	2368 (25.1)	6169 (65.4)
Borderline (CPS = 1 to 2)	10591 (30.9)	538 (5.1)	590 (5.6)	3206 (30.3)	6257 (59.1)
Impaired (CPS = 3 to 6)	14253 (41.5)	551 (3.9)	760 (5.3)	5493 (38.6)	7431 (52.2)

Table 4.3 continued

Admission Characteristic	Overall (% of sample)	One-Year Outcome			
		ACSC	Other Hospitalization	Death	No Outcome
ADL Status*					
Independent (ADL Hierarchy=0 to 2)	11914 (34.8)	400 (3.4)	542 (4.5)	2511 (21.1)	8461 (71.0)
Borderline (ADL Hierarchy=3 to 4)	7705 (22.5)	341 (4.4)	481 (6.2)	2081 (27.0)	4802 (62.3)
Dependent (ADL Hierarchy = 5 to 6)	14647 (42.7)	735 (5.0)	843 (5.8)	6475 (44.2)	6594 (45.0)
Health instability *					
Low (CHESS=0 to 1)	18172 (53.0)	691 (3.8)	933 (5.1)	3835 (21.1)	12713 (70.0)
Medium (CHESS=2 to 3)	13115 (38.3)	659 (5.0)	787 (6.0)	5192 (39.6)	6477 (49.4)
High (CHESS=4 to 5)	2979 (8.7)	126 (4.2)	146 (4.9)	2040 (68.5)	667 (22.4)
Depressive Symptoms *					
No (DRS < 3)	27779 (81.6)	1152 (4.1)	1500 (5.4)	8591 (30.9)	16536 (59.5)
Yes (DRS >= 3)	6274 (18.4)	315 (5.0)	361 (5.8)	2330 (37.1)	3268 (52.1)
Psychotropic Medication Use*					
No	15670 (45.7)	697 (4.4)	799 (5.1)	4787 (30.6)	9387 (59.9)
Yes	18596 (54.3)	779 (4.2)	1067 (5.7)	6280 (33.8)	10470 (56.3)
Communication Difficulty*					
No	13237 (38.6)	596 (4.5)	723 (5.5)	3555 (26.9)	8363 (63.2)
Yes	21029 (61.4)	880 (4.2)	1143 (5.4)	7512 (35.7)	11494 (54.7)
Behaviour Difficulty*					
No	25267 (73.7)	1112 (4.4)	1340 (5.3)	7664 (30.3)	15151 (60.0)
Yes	8999 (26.3)	364 (4.0)	526 (5.8)	3403 (37.8)	4706 (52.3)
Chronic Conditions *					
<4	19641 (57.3)	713 (3.6)	1091 (5.6)	6300 (32.1)	11537 (58.7)
4 or more	14625 (42.7)	763 (5.2)	775 (5.3)	4767 (32.6)	8320 (56.9)
No. Chronic Conditions* (mean (s.d.))		3.94 (2.41)	3.39 (2.19)	3.5 (2.2)	3.3 (2.1)
CCC Facility Characteristics					
CCC Size *					
Small	13377 (39.0)	383 (2.9)	655 (4.6)	4525 (33.8)	7814 (58.4)
Large	20889 (61.0)	1093 (5.2)	1211 (5.8)	6542 (31.3)	12043 (57.7)
CCC Freestanding Status *					
Adjoined	23018 (67.2)	827 (3.6)	1223 (5.3)	7522 (32.7)	13446 (58.4)
Freestanding	11248 (32.8)	649 (5.8)	643 (5.7)	3545 (31.5)	6411 (57.0)
CCC Location *					
Non-rural	28205 (82.3)	1298 (4.6)	1549 (5.5)	9188 (32.6)	16170 (57.3)
Rural	6061 (17.7)	178 (2.9)	317 (5.2)	1879 (31.0)	3687 (60.8)

* Statistically significant based on multinomial outcome p<0.0001

Table 4.4: Unadjusted relative risk of experiencing ACSC versus no outcome by admission characteristics for Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001 (n=34266) *using the original ACSC definition*.

Admission Characteristic	Overall Number (% of sample)	Relative Risk of ACSC versus No Outcome (95% Confidence Interval)	Risk Difference
Sociodemographic Variables			
Age 80 years +	671 (45.5)	0.75 (0.68 to 0.82)	-0.02 (-0.03 to -0.01)
Female Sex	20378 (59.5)	0.73 (0.66 to 0.80)	-0.02 (-0.03 to -0.02)
No Contact with Family	2389 (7.0)	0.97 (0.79 to 1.18)	-0.002 (-0.02 to 0.01)
Resource Use Variables			
Short Length of CCC Stay	22396 (65.4)	0.28 (0.25 to 0.31)	-0.09 (-0.10 to -0.09)
Health and Functional Status Variables			
Presence of DNH or DNR	12146 (35.5)	1.16 (1.04 to 1.29)	0.01 (0.00 to 0.02)
Borderline Cognitive Status	10591 (30.9)	1.23 (1.11 to 1.36)	0.01 (0.01 to 0.02)
ADL Dependent	14647 (42.7)	1.90 (1.72 to 2.09)	0.05 (0.04 to 0.06)
Health instability	16094 (47.0)	1.92 (1.74 to 2.12)	0.05 (0.04 to 0.06)
Depressive Symptoms	6274 (18.4)	1.35 (1.20 to 1.52)	0.02 (0.01 to 0.03)
Psychotropic Medication Use	18596 (54.3)	1.00 (0.91 to 1.11)	0.00 (-0.01 to 0.01)
Communication Difficulty	21029 (61.4)	1.07 (0.97 to 1.18)	0.00 (-0.00 to 0.01)
Behaviour Difficulty	8999 (26.3)	1.05 (0.94 to 1.18)	0.00 (-0.00 to 0.01)
4 or more Chronic Conditions	14625 (42.7)	1.44 (1.31 to 1.59)	0.03 (0.02 to 0.03)
CCC Facility Characteristics			
Large CCC Size	20889 (61.0)	1.78 (1.59 to 1.99)	0.04 (0.03 to 0.04)
Adjoined CCC	23018 (67.2)	0.63 (0.57 to 0.70)	-0.03 (-0.04 to -0.03)
Rural CCC Location	6061 (17.7)	0.62 (0.53 to 0.72)	-0.03 (-0.04 to -0.02)

Table 4.5: Bivariate analysis of one-year outcomes *using the original ACSC definition* by length of stay among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001. (number and percent, unless otherwise indicated)

		Long-Stay			Short-Stay		
		ACSC	**Other**	**Death**	**ACSC**	**Other**	**Death**
Total		955 (8.1)	1196 (10.1)	3422 (28.8)	521 (2.3)	670 (3.0)	7645 (34.1)
Sociodemographic Variables							
Age	<80 years	533 (9.3)	626 (10.9)	1560 (27.2)	272 (2.7)	335 (3.3)	3304 (32.5)
	80 years +	422 (6.9)	570 (9.3)	1862 (30.4)	249 (2.0)	335 (2.7)	4341 (35.5)
Sex	Female	521 (7.8)	641 (9.6)	1813 (27.2)	293 (2.1)	377 (2.8)	4148 (30.3)
	Male	434 (8.4)	555 (10.7)	1609 (31.0)	228 (2.6)	293 (3.4)	3497 (40.2)
Contact with Family	No	68 (7.5)	108 (12.0)	228 (25.2)	30 (2.0)	51 (3.4)	540 (36.4)
	Yes	887 (8.1)	1088 (9.9)	3194 (29.1)	491 (2.4)	619 (3.0)	7105 (34.0)
Health and Functional Status							
DNH or DNR	No	672 (9.5)	822 (11.6)	1470 (20.7)	399 (2.7)	492 (3.3)	3262 (21.7)
	Yes	283 (5.9)	374 (7.8)	1952 (40.9)	122 (1.7)	178 (2.4)	4383 (59.5)
Cognition	Intact	246 (10.0)	318 (12.9)	672 (27.2)	141 (2.0)	198 (2.8)	1696 (24.3)
	Borderline	344 (9.9)	391 (11.3)	966 (27.8)	194 (2.7)	199 (2.8)	2240 (31.5)
	Impaired	365 (6.2)	487 (8.2)	1784 (30.1)	186 (2.2)	273 (3.3)	3709 (44.6)
ADL Impairment	No	238 (7.9)	331 (11.1)	731 (24.4)	162 (1.8)	211 (2.4)	1780 (20.0)
	Mild	227 (7.9)	320 (11.2)	675 (23.6)	114 (2.4)	161 (3.3)	1406 (29.0)
	Severe	490 (8.2)	545 (9.1)	2016 (33.5)	245 (2.8)	298 (3.5)	4459 (51.6)
Health instability	Low	462 (7.4)	610 (9.8)	1329 (21.3)	229 (1.9)	323 (2.7)	2506 (21.0)
	Medium	407 (8.7)	491 (10.5)	1599 (34.0)	252 (3.0)	296 (3.5)	3593 (42.7)
	High	86 (9.1)	95 (10.1)	494 (52.3)	40 (2.0)	51 (2.5)	1546 (20.2)
Depressive Symptoms	No	727 (7.8)	939 (10.1)	2662 (28.7)	425 (2.3)	561 (3.0)	5929 (32.0)
	Yes	221 (8.8)	253 (10.1)	730 (29.0)	94 (2.5)	108 (2.9)	1600 (42.6)
Psychotropic Meds	No	443 (8.4)	510 (9.6)	1503 (28.3)	254 (2.5)	289 (2.8)	3284 (31.7)
	Yes	512 (7.8)	686 (10.5)	1919 (29.2)	267 (2.2)	381 (3.2)	4361 (36.3)
Communication Diffic.	No	374 (9.7)	444 (11.5)	1049 (27.2)	222 (2.4)	279 (3.0)	2506 (26.7)
	Yes	581 (7.3)	752 (9.4)	2373 (29.6)	299 (2.3)	391 (3.0)	5139 (39.5)
Behaviour Difficulty	No	705 (8.6)	840 (10.3)	2365 (28.9)	407 (2.4)	500 (2.9)	5299 (31.0)
	Yes	250 (6.8)	356 (9.7)	1057 (28.7)	114 (2.1)	170 (3.2)	2346 (44.1)
Chronic Conditions	1 to 3	438 (7.0)	695 (11.1)	1828 (29.1)	275 (2.1)	396 (3.0)	4472 (33.5)
	4 or more	517 (9.3)	501 (9.0)	1594 (28.6)	246 (2.7)	274 (3.0)	3173 (35.1)

Table 4.5 continued

		Long-Stay			Short-Stay		
		ACSC	**Other**	**Death**	**ACSC**	**Other**	**Death**
CCC Facility Characteristics							
CCC Size	Small	224 (5.8)	408 (10.6)	1220 (31.7)	159 (1.7)	247 (2.6)	3305 (34.7)
	Large	731 (9.1)	788 (9.8)	2202 (27.5)	362 (2.8)	423 (3.3)	4340 (33.7)
CCC Freestanding	Yes	471 (9.7)	465 (9.6)	1340 (27.6)	178 (2.8)	178 (2.8)	2205 (28.8)
	No	484 (6.9)	731 (10.4)	2082 (29.7)	343 (2.1)	492 (3.1)	5440 (34.0)
CCC Location	non-Rural	843 (8.5)	986 (10.0)	2867 (29.0)	455 (2.5)	563 (3.1)	6321 (34.5)
	Rural	112 (5.7)	210 (10.6)	555 (28.1)	66 (1.6)	107 (2.6)	1324 (32.4)

Table 4.6: Multivariate analysis of predictors of one-year outcomes for *long-stay* residents by cognition status *using the original ACSC definition* among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001. (n=11870) (Odds Ratio (95% Confidence Interval). Odds Ratios are adjusted for the other covariates listed and for year of admission to CCC.

Long-stay, Intact Cognition n=2469

	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	**1.45 (1.13-1.87)**	1.06 (0.77-1.46)	**1.26 (1.01-1.57)**
Male Sex	1.09 (0.78-1.52)	1.09 (0.79-1.50)	**1.27 (1.03-1.58)**
Advanced Directives	0.98 (0.70-1.37)	0.92 (0.68-1.26)	**2.74 (2.17-3.44)**
No ADL Impairment (vs Impaired)	0.83 (0.58-1.18)	**0.71 (0.56-0.90)**	0.93 (0.75-1.14)
Mild ADL Impairment (vs Impaired)	0.76 (0.51-1.13)	0.76 (0.55-1.06)	**0.69 (0.52-0.92)**
CHESS=0-1 (vs 4 and up)	**0.21 (0.11-0.43)**	**0.38 (0.17-0.86)**	**0.18 (0.09-0.35)**
CHESS=2-3 (vs 4 and up)	**0.35 (0.17-0.75)**	0.53 (0.25-1.13)	**0.45 (0.23-0.86)**
Depressive Symptoms	**-**	-	**-**
0-3 Chronic Conditions (vs 4 and up)	0.84 (0.64-1.11)	**1.49 (1.14-1.93)**	1.25 (0.99-1.58)
From Adjoined CCC	0.94 (0.71-1.24)	1.03 (0.74-1.42)	1.03 (0.78-1.36)

Table 4.6 continued

Long-stay, Borderline Cognitively Impaired (n=3476)			
	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	**1.46 (1.14-1.87)**	1.21 (0.93-1.56)	1.12 (0.92-1.38)
Male Sex	1.13 (0.84-1.51)	1.16 (0.91-1.47)	**1.37 (1.13-1.65)**
Advanced Directives	1.06 (0.83-1.35)	1.08 (0.87-1.33)	**2.35 (1.98-2.78)**
No ADL Impairment (vs Impaired)	0.79 (0.60-1.04)	1.05 (0.81-1.36)	0.93 (0.74-1.17)
Mild ADL Impairment (vs Impaired)	0.74 (0.54-1.01)	0.98 (0.74-1.28)	**0.79 (0.66-0.95)**
CHESS=0-1 (vs 4 and up)	**0.21 (0.14-0.26)**	**0.33 (0.20-0.53)**	**0.18 (0.13-0.25)**
CHESS=2-3 (vs 4 and up)	**0.37 (0.24-0.59)**	**0.47 (0.28-0.80)**	**0.35 (0.26-0.48)**
Depressive Symptoms	**-**	-	**-**
0-3 Chronic Conditions (vs 4 and up)	0.83 (0.66-1.05)	1.25 (0.98-1.59)	**1.34 (1.10-1.63)**
From Adjoined CCC	**0.58 (0.41-0.83)**	1.08 (0.78-1.48)	0.83 (0.64-1.07)
Long-stay, Cognitively Impaired (n=5925)			
	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.02 (0.83-1.24)	1.12 (0.93-1.36)	**0.71 (0.62-0.83)**
Male Sex	**1.36 (1.06-1.74)**	**1.56 (1.28-1.91)**	**1.53 (1.37-1.72)**
Advanced Directives	**0.58 (0.42-0.81)**	**0.77 (0.61-0.98)**	**1.90 (1.65-2.18)**
No ADL Impairment (vs Impaired)	**0.69 (0.52-0.92)**	0.99 (0.76-1.29)	**0.62 (0.48-0.79)**
Mild ADL Impairment (vs Impaired)	**0.73 (0.57-0.94)**	1.07 (0.86-1.33)	**0.63 (0.53-0.75)**
CHESS=0-1 (vs 4 and up)	**0.39 (0.25-0.61)**	**0.34 (0.24-0.47)**	**0.28 (0.21-0.36)**
CHESS=2-3 (vs 4 and up)	**0.64 (0.45-0.91)**	**0.58 (0.42-0.81)**	**0.45 (0.37-0.56)**
Depressive Symptoms	**-**	-	**-**
0-3 Chronic Conditions (vs 4 and up)	**0.74 (0.56-0.96)**	1.14 (0.94-1.37)	1.01 (0.90-1.13)
From Adjoined CCC	**0.67 (0.46-0.97)**	1.09 (0.84-1.43)	1.06 (0.88-1.27)

Table 4.7: Multivariate analysis of predictors of one-year outcomes for *short-stay* residents by cognition status u*sing the original ACSC definition* among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001 (n=22296). (Odds Ratio (95% Confidence Interval). Odds Ratios are adjusted for the other covariates listed and for year of admission to CCC.

Short-stay, Intact Cognition (n=6871)

	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.11 (0.73-1.69)	**1.47** **(1.11-1.95)**	1.04 (0.92-1.17)
Male Sex	1.35 (0.96-1.90)	**1.46** **(1.14-1.87)**	**1.79** **(1.57-2.05)**
Advanced Directives	1.14 (0.63-2.06)	1.24 (0.82-1.88)	**4.54** **(3.86-5.34)**
No ADL Impairment (vs Impaired)	**0.58** **(0.38-0.87)**	**0.46** **(0.35-0.60)**	**0.50** **(0.41-0.60)**
Mild ADL Impairment (vs Impaired)	0.77 (0.49-1.23)	0.78 (0.48-1.25)	**0.54** **(0.44-0.66)**
CHESS=0-1 (vs 4 and up)	**0.17** **(0.04-0.80)**	**0.12** **(0.05-0.30)**	**0.05** **(0.03-0.09)**
CHESS=2-3 (vs 4 and up)	0.41 (0.09-1.78)	**0.21** **(0.08-0.54)**	**0.13** **(0.07-0.22)**
Depressive Symptoms	1.52 (0.88-2.61)	**1.71** **(1.08-2.71)**	**1.45** **(1.19-1.77)**
0-3 Chronic Conditions (vs 4 and up)	0.78 (0.53-1.14)	0.99 (0.73-1.35)	**1.20** **(1.04-1.39)**
From Adjoined CCC	0.82 (0.56-1.22)	1.08 (0.66-1.78)	1.03 (0.79-1.34)

Table 4.7 continued

Short-stay, Borderline Cognitively Impaired (n=7115)			
	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.31 (0.89-1.92)	0.80 (0.57-1.11)	**0.88** **(0.79-0.98)**
Male Sex	**1.86** **(1.36-2.55)**	**1.43** **(1.12-1.82)**	**1.66** **(1.48-1.86)**
Advanced Directives	1.07 (0.77-1.48)	1.37 (0.92-2.05)	**3.44** **(4.18-2.84)**
No ADL Impairment (vs Impaired)	**0.32** **(0.23-0.43)**	**0.51** **(0.35-0.74)**	**0.48** **(0.41-0.56)**
Mild ADL Impairment (vs Impaired)	**0.47** **(0.33-0.69)**	0.70 (0.46-1.06)	**0.53** **(0.45-0.62)**
CHESS=0-1 (vs 4 and up)	**0.23** **(0.13-0.42)**	**0.20** **(0.11-0.34)**	**0.11** **(0.07-0.16)**
CHESS=2-3 (vs 4 and up)	**0.49** **(0.29-0.84)**	**0.28** **(0.16-0.46)**	**0.25** **(0.17-0.35)**
Depressive Symptoms	1.14 (0.79-1.65)	1.08 (0.73-1.61)	1.07 (0.89-1.29)
0-3 Chronic Conditions (vs 4 and up)	**0.76** **(0.60-0.95)**	0.91 (0.68-1.23)	**1.13** **(1.01-1.26)**
From Adjoined CCC	**0.65** **(0.43-0.99)**	0.97 (0.58-1.61)	0.90 (0.69-1.17)
Short-stay, Cognitively Impaired (n=8310)			
	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.27 (0.91-1.77)	1.37 (0.98-1.79)	**0.88** **(0.79-0.97)**
Male Sex	**1.39** **(1.08-1.79)**	**1.57** **(1.07-2.29)**	**1.71** **(1.55-1.89)**
Advanced Directives	0.97 (0.71-1.34)	1.12 (0.83-1.51)	**2.54** **(2.25-2.88)**
No ADL Impairment (vs Impaired)	**0.45** **(0.39-0.73)**	**0.46** **(0.34-0.62)**	**0.34** **(0.30-0.39)**
Mild ADL Impairment (vs Impaired)	**0.58** **(0.20-0.86)**	**0.55** **(0.42-0.72)**	**0.42** **(0.37-0.48)**
CHESS=0-1 (vs 4 and up)	**0.37** **(0.46-0.68)**	**0.53** **(0.32-0.88)**	**0.23** **(0.18-0.28)**
CHESS=2-3 (vs 4 and up)	0.74 (0.69-1.18)	0.97 (0.64-1.45)	**0.40** **(0.33-0.49)**
Depressive Symptoms	1.07 (0.79-1.65)	0.87 (0.63-1.08)	1.10 (0.95-1.27)
0-3 Chronic Conditions (vs 4 and up)	0.87 (0.46-1.24)	1.17 (0.93-1.48)	1.02 (0.91-1.15)
From Adjoined CCC	**0.38** **(0.19-0.77)**	0.63 (0.37-1.07)	**0.68** **(0.55-0.84)**

Table 4.8: Summary of the conditions included in the initial list of Ambulatory Care Sensitive Conditions (ACSC), the revised lit of Potentially Avoidable Hospitalization (PAH) conditions resulting from the expert panel's discussion, the revised PAH list resulting from the expert panel members' formal rating process, and the final revised PAH list after discussion with coding experts.

(deletions from the initial ACSC list are highlighted in bold and additions to the final PAH list are highlighted in bold italics)

Conditions Considered in Discussion	Initial ACSC List	Revised PAH list from discussion	Revised PAH list from rating	Final PAH list
Angina	Yes	Yes	Yes	Yes
Asthma	Yes	Yes	Yes	Yes
Cellulitis	Yes	No consensus	Yes	Yes
COPD	Yes	Yes	Yes	Yes
Congestive Heart Failure	Yes	Yes	Yes	Yes
Dehydration	Yes	No consensus	Yes	Yes
Dental Conditions	Yes	Yes	Yes	Yes
Diabetes	Yes	Yes	Yes	Yes
Gastroenteritis	Yes	Yes	Yes	Yes
Grand mal seizure disorders	Yes	Yes	Yes	Yes
Hypertension	Yes	Yes	Yes	Yes
Hypoglycemia	Yes	No consensus	No consensus	Yes
Immunization-preventable conditions	**Yes**	**No**	**No**	**No**
Urinary tract infection	Yes	No consensus	Yes	Yes
Nutritional deficiency	**Yes**	**No**	**No**	**No**
Pneumonia	Yes	Yes	Yes	Yes
Severe ear, nose, throat infections	**Yes**	**No**	**No**	**No**
Tuberculosis	**Yes**	**No**	**No**	**No**
Fractures	***No***	***Yes***	***Yes***	***Yes***
Decubitus ulcers	No	No	No	No
Behaviour / Mental Health	No	No	No	No
Septicemia	***No***	***Yes***	***Yes***	***Yes***
Cardiovascular accidents	No	No	No	No

Table 4.9: Results of the expert panel (n=9) rating process for potential inclusion of diagnoses into a Potentially Avoidable Hospitalization (PAH) measure.

Condition	Median Rating*	Disagreement**	Recommendation for PAH
Angina	7	No	Yes
Asthma	6	No	Yes
Cellulitis	5	No	Yes
COPD	8	No	Yes
Congestive Heart Failure	8	No	Yes
Dehydration	8.5	No	Yes
Dental Conditions	6	No	Yes
Diabetes	8	No	Yes
Gastroenteritis	8	No	Yes
Grand mal seizure disorders	4	No	Yes
Hypertension	6	No	Yes
Hypoglycemia	7	Yes	Yes
Immunization-preventable conditions	1	No	No
Urinary tract infection	8	No	Yes
Nutritional deficiency	3	No	No
Pneumonia	9	No	Yes
Severe ear, nose, throat infections	1	No	No
Tuberculosis	1	No	No
Fractures	8	No	Yes
Decubitus ulcers	3	No	No
Behaviour / Mental Health	2	No	No
Septicemia	8	No	Yes
Cardiovascular accidents	3	No	No

***** Rating score: 1 = "Unsuitable for PAH definition" to 9 = "Essential for PAH definition".
****** Disagreement occurred when at least three panelists rated in the 1-3 region and at least three panelists rated in the 7-9 region.

Table 4.10: Final list of ICD-9 codes included in revised PAH definition – Based on the advice of a nine-member expert panel and consultation with four Canadian coding experts.

Medical Condition	Diagnosis Type	ICD-9 Codes
Angina pectoris	M (excl. 2), 1	411.1, 411.8, 413
Asthma	M (excl. 2), 1	493
Cellulitis	M (excl. 2), 1	681, 682, 683, 686
Chronic obstructive pulmonary disease	M (excl. 2), 1	466, 491, 492, 494, 496
Congestive heart failure	M (excl. 2), 1	428, 518.4, 402, 404
Dehydration	M (excl. 2), 1	276.5
Dental conditions	M (excl. 2), 1	521-523, 525, 528
Diabetes with ketoacidosis or hypersmolar coma	M (excl. 2), 1	250.1-250.3
Diabetes with specified manifestations	M (excl. 2), 1	250.8, 250.9
Diabetes without specified complications	M (excl. 2), 1	250.0
Gastroenteritis	M (excl. 2), 1	558.9. 009.0, 009.1
Grand mal seizure disorders	M (excl. 2), 1	345, 780.3
Hypertension	M (excl. 2), 1	401.0, 401.9, 402.0, 402.1, 402.9
Hypoglycemia	M (excl. 2), 1	251.2
Kidney/urinary tract infection	M (excl. 2), 1	590, 599.0, 599.9
Pneumonia	M (excl. 2), 1	486, 481, 482.2, 482.3, 482.9, 483
Injuries from falls / Fractures	M (excl. 2), 1	E880-E888 *OR* 800-829
Septicemia	M (excl. 2), 1	0031, 0223, 038, 0545

Table 4.11: Overall frequency of specific ICD-9 codes (Types 1 and M without 2) for Potentially Avoidable Hospitalization (PAH) conditions.

Note that only frequencies of six or greater are shown for privacy reasons.

PAH Condition	ICD-9-CM Code	Description	Frequency
CHF	428.0	Congestive Heart Failure	987
Pneumonia	486 & 486.0	Pneumonia, Organism unspecified	840
Kidney/urinary tract infection	599.0	Urinary Tract Infection, unspecified	811
Diabetes	250.0	Diabetes Mellitus without mention of complication	727
COPD	496 & 496.0	Chronic Airway Obstruction, not elsewhere classified	555
Hypertension	401.9	Hypertension, unspecified	540
Falls/Fractures	820.2	Fracture of lower limb	524
Dehydration	276.5	Volume Depletion	494
Diabetes	250.3	Diabetes with Other Coma	203
Falls/Fractures	820.0	Fracture of lower limb	197
COPD	491.2	Chronic Bronchitis	191
Septicemia	038.9	Septicemia	184
CHF	428.1	Left Heart Failure	142
Grand mal seizure disorders	780.3	Convulsions	134
Angina	413 & 413.0	Angina decubitus Prinzmetal angina Angina Pectoris not elsewhere classified / unspecified	80
Septicemia	038.4	Septicemia	75
Septicemia	038.1	Septicemia	73
COPD	492 & 492.0	Emphysema	62
Asthma	493.9	Asthma, unspecified	60
Cellulitis	682.6	Cellulitis of Buttock	52
Pneumonia	481 & 481.0	Pneumococcal Pneumonia	48
Pneumonia	485.0	Brochopneumonia, organizism unspecified	46
Pneumonia	482.1	Other Bacterial Pneumonia	42
Falls/Fractures	820.8	Fracture of lower limb	42
Falls/Fractures	821.0	Fracture of lower limb	27
Diabetes	250.2	Diabetes with Hyperosmolarity	25
Pneumonia	482.4	Other Bacterial Pneumonia	24
CHF	518.4	Acute Lung Edema, unspecified	23
Hypertension	402.9	Unspecified Hypertensive Heart Disease without Heart Failure	21
Grand mal seizure disorders	345.1	Generalized Nonconvulsive Epiliepsy	20
Grand mal seizure disorders	345.9	Epilepsy, unspecified	20
Diabetes	250.9	Diabetes with Unspecified Complications	19
Pneumonia	482.0	Other Bacterial Pneumonia	18
Septicemia	038.8	Septicemia	18
Falls/Fractures	852.0	Intracranial injury (non-fracture)	17

Table 4.11 continued

PAH Condition	ICD-9-CM Code	Description	Frequency
Septicemia	038.0	Septicemia	17
Kidney/urinary tract infection	590.8	Infection of Kidney	14
COPD	466.0	Acute Bronchitis and Bronchiolitis	13
CHF	428.9	Heart Failure, unspecified	13
Cellulitis	682.2	Cellulitis of Neck	12
Dental Conditions	521.0	Hard Tissue Diseases of the Teeth, unspecified	12
Grand mal seizure disorders	345.3	Petit Mal Status	12
Falls/Fractures	812.0	Fracture of upper limb	12
Cellulitis	682.7	Cellulitis of Leg	10
Pneumonia	482.3	Streptococcal Pneumonia	10
Pneumonia	482.8	Other Bacterial Pneumonia	10
Falls/Fractures	808.2	Fracture of neck and trunk	10
Cellulitis	682.3	Cellulitis of Trunk	9
Hypoglycemia	251.2	Hypoglycemia, unspecified	9
Kidney/urinary tract infection	590.1	Infection of Kidney	9
Hypertension	404.9	Unspecified Hypertensive Heart and Renal Disease with Heart and/or Renal Failure	8
Falls/Fractures	813.0	Fracture of upper limb	8
Falls/Fractures	821.2	Fracture of lower limb	8
Septicemia	038.3	Septicemia	8
COPD	494.0	Bronchiectas	6
Falls/Fractures	805.4	Fracture of neck and trunk	6
Falls/Fractures	823.0	Fracture of lower limb	6
Falls/Fractures	824.2	Fracture of lower limb	6
Falls/Fractures	854.0	Intracranial injury (non-fracture)	6

Table 4.12: Mean facility-specific Quality Indicator (QI) scores for Complex Continuing Care facilities in Ontario during the 1999/2000 and 2001/02 fiscal years. (Mean percentage of residents flagging on the QI, standard deviation)

MDS-derived Quality Indicator	Mean Facility-Specific QI Score
Had rehabilitation potential and improved in the performance of activities of daily living	28.7% (0.19)
Unexpected loss of function in some basic daily activities	28.8% (0.21)
On antipsychotic medication without a diagnosis of psychosis	17.4% (0.15)
Indwelling catheters	20.3% (0.19)
Declined in ability to communicate	16.4% (0.12)
Became more depressed or anxious	21.6% (0.13)
Fell within 30 days prior to assessment, among those without prior recent history of falling	5.1% (0.09)
Bladder or bowel incontinent	67.4% (0.25)
Infection	23.1% (0.16)
Declined in ability to locomote	23.0% (0.18)
Pain	28.8% (0.18)
Pressure sore	20.6% (0.15)
Urinary tract infection	11.6% (0.12)
In physical restraints daily	29.4% (0.20)
Bladder continence worsened	22.1% (0.15)
Walks as well or better than the previous assessment	66.8% (0.27)

Table 4.13: Bivariate relationship between Rural Status and Quality Indicator Performance for Complex Continuing Care facilities in Ontario during the 1999/2000 and 2001/02 fiscal years. (Odds Ratio (95% Confidence Interval)).

QI in Poorest Performing 25% of CCCs	Odds of Rural
ADL Improvement	1.91 (0.57 to 6.28)
ADL Loss	1.06 (0.32 to 3.25)
Antipsychotic Use	1.63 (0.55 to 4.70)
Indwelling Catheter	0.52 (0.15 to 1.57)
Worsening Communication	1.20 (0.40 to 3.42)
Depressed & Anxious	1.52 (0.52 to 4.30)
Falls	0.79 (0.25 to 2.36)
Incontinence	1.20 (0.40 to 3.42)
Infection	*
Worsening Locomotion	1.10 (0.37 to 3.11)
Pain	0.52 (0.17 to 1.48)
Pressure Ulcer	1.59 (0.56 to 4.39)
Urinary Tract Infection	*
Restraint Use	**3.41 (1.07 to 11.01)**
Worsening Bladder Continence	1.28 (0.45 to 3.53)
Walking Improvement	1.43 (0.41 to 4.68)

*Cell size of less than 6 in contingency table. Restricted from reporting results.

Table 4.14: Unadjusted analysis of the relationship between facility-level performance on QIs & facility characteristics and hospitalization and PAH rates for Complex Continuing Care facilities in Ontario during the 1999/2000 and 2001/02 fiscal years. (Risk ratio (95% Confidence interval))

Quality Indicator Performance[&]	Hospitalization	PAH
ADL Improvement - Poor	0.93 (0.66 to 1.31)	1.08 (0.75 to 1.56)
ADL Improvement - Superior	**1.37 (1.01 to 1.88)**	1.31 (0.94 to 1.82)
ADL Loss - Poor	**1.74 (1.29 to 2.34)**	**1.80 (1.30 to 2.48)**
ADL Loss - Superior	0.96 (0.68 to 1.33)	1.21 (0.85 to 1.72)
Antipsychotic Use - Poor	0.80 (0.57 to 1.12)	0.83 (0.58 to 1.19)
Antipsychotic Use - Superior	1.20 (0.85 to 1.70)	1.30 (0.90 to 1.89)
Indwelling Catheter - Poor	**1.57 (1.15 to 2.16)**	1.30 (0.92 to 1.84)
Indwelling Catheter - Superior	1.13 (0.80 to 1.59)	1.23 (0.85 to 1.78)
Worsening Communication - Poor	1.19 (0.86 to 1.66)	1.15 (0.81 to 1.63)
Worsening Communication - Superior	0.93 (0.66 to 1.30)	1.14 (0.80 to 1.62)
Depressed & Anxious - Poor	**1.49 (1.09 to 2.04)**	**1.55 (1.12 to 2.14)**
Depressed & Anxious - Superior	1.25 (0.90 to 1.74)	**1.69 (1.21 to 2.36)**
Falls - Poor	**1.52 (1.12 to 2.07)**	1.29 (0.92 to 1.81)
Falls - Superior	1.29 (0.88 to 1.90)	1.27 (0.82 to 1.94)
Incontinence - Poor	0.90 (0.65 to 1.23)	0.97 (0.69 to 1.36)
Incontinence - Superior	**1.55 (1.13 to 2.13)**	**1.51 (1.07 to 2.13)**
Infection - Poor	1.24 (0.88 to 1.74)	1.10 (0.77 to 1.59)
Infection - Superior	0.76 (0.56 to 1.04)	0.82 (0.59 to 1.15)
Worsening Locomotion - Poor	**1.49 (1.10 to 2.02)**	**1.39 (1.00 to 1.93)**
Worsening Locomotion - Superior	0.84 (0.57 to 1.24)	0.90 (0.59 to 1.38)
Pain - Poor	0.99 (0.73 to 1.35)	1.03 (0.75 to 1.42)
Pain - Superior	1.42 (0.98 to 1.08)	**1.68 (1.14 to 2.49)**
Pressure Ulcer - Poor	1.31 (0.94 to 1.81)	1.28 (0.91 to 1.80)
Pressure Ulcer - Superior	1.26 (0.89 to 1.77)	1.40 (0.98 to 2.00)
Urinary Tract Infection - Poor	**1.44 (1.04 to 1.99)**	**1.41 (1.00 to 2.01)**
Urinary Tract Infection - Superior	0.91 (0.66 to 1.25)	1.13 (0.80 to 1.60)
Restraint Use - Poor	0.89 (0.62 to 1.27)	0.78 (0.53 to 1.16)
Restraint Use - Superior	0.78 (0.56 to 1.07)	0.76 (0.54 to 1.07)
Worsening Bladder Continence - Poor	1.14 (0.98 to 1.53)	1.18 (0.86 to 1.63)
Worsening Bladder Continence - Superior	0.89 (0.59 to 1.35)	0.96 (0.62 to 1.48)
Walking Improvement - Poor	**1.69 (1.16 to 2.44)**	**2.03 (1.37 to 3.02)**
Walking Improvement - Superior	0.77 (0.57 to 1.04)	0.95 (0.69 to 1.30)

[&] Related to average performance (middle 50% of CCCs).

Table 4.14 continued

Facility Characteristics	Hospitalization	PAH
Nursing Hour Wage	1.01 (0.97 to 1.05)	1.00 (0.96 to 1.04)
Rural	1.06 (0.80 to 1.42)	1.03 (0.73 to 1.37)
Freestanding	0.79 (0.57 to 1.08)	1.00 (0.72 to 1.39)
Large Size	0.94 (0.71 to 1.24)	0.84 (0.63 to 1.12)
Practice Guidelines in Place		
Number of Practice Guidelines	1.02 (0.94 to 1.10)	1.01 (0.93 to 1.10)
Incontinence Practice Guideline	0.98 (0.74 to 1.29)	0.96 (0.71 to 1.29)
UTI Practice Guideline	0.85 (0.63 to 1.16)	0.73 (0.53 to 1.01)
Behaviour Practice Guideline	0.96 (0.73 to 1.26)	0.81 (0.61 to 1.08)
Falls Practice Guideline	0.94 (0.72 to 1.24)	0.89 (0.67 to 1.18)
Pressure Ulcer Practice Guideline	0.81 (0.55 to 1.22)	0.74 (0.48 to 1.15)
Physical Restraints Practice Guideline	0.89 (0.60 to 1.32)	0.97 (0.62 to 1.51)
Pain Practice Guideline	1.16 (0.89 to 1.52)	1.25 (0.94 to 1.66)
Psychotropic Medication Practice Guideline	0.98 (0.74 to 1.32)	0.88 (0.65 to 1.19)

Table 4.15: Adjusted analysis of the relationships between facility-level performance on quality indicators and hospitalization and PAH rates for Complex Continuing Care facilities in Ontario during the 1999/2000 and 2001/02 fiscal years. (Risk ratio (95% Confidence interval))

Quality Indicator Performance[&]	Hospitalization	PAH
ADL Improvement - Poor	0.96 (0.65 to 1.42)	1.06 (0.69 to 1.62)
ADL Improvement - Superior	**1.51 (1.03 to 2.20)**	1.36 (0.90 to 2.06)
ADL Loss - Poor	**1.83 (1.28 to 2.61)**	**1.89 (1.27 to 2.80)**
ADL Loss - Superior	0.95 (0.65 to 1.38)	1.17 (0.77 to 1.76)
Antipsychotic Use - Poor	0.82 (0.56 to 1.22)	0.78 (0.51 to 1.18)
Antipsychotic Use - Superior	1.40 (0.93 to 2.13)	1.50 (0.96 to 2.35)
Indwelling Catheter - Poor	**1.66 (1.12 to 2.47)**	1.43 (0.92 to 2.24)
Indwelling Catheter - Superior	1.05 (0.73 to 1.52)	1.13 (0.75 to 1.69)
Worsening Communication - Poor	1.18 (0.80 to 1.75)	1.11 (0.73 to 1.70)
Worsening Communication - Superior	0.90 (0.62 to 1.33)	1.05 (0.70 to 1.57)
Depressed & Anxious - Poor	**1.49 (1.04 to 2.14)**	**1.49 (1.02 to 2.18)**
Depressed & Anxious - Superior	1.36 (0.91 to 2.02)	**1.77 (1.18 to 2.65)**
Falls - Poor	1.39 (0.95 to 2.04)	1.16 (0.77 to 1.77)
Falls - Superior	1.09 (0.66 to 1.79)	1.10 (0.62 to 1.93)
Incontinence - Poor	0.78 (0.54 to 1.13)	0.86 (0.57 to 1.28)
Incontinence - Superior	**1.58 (1.12 to 2.25)**	1.41 (0.95 to 2.09)
Infection - Poor	1.15 (0.78 to 1.70)	0.97 (0.63 to 1.47)
Infection - Superior	0.83 (0.57 to 1.23)	0.89 (0.59 to 1.34)
Worsening Locomotion - Poor	**1.47 (1.03 to 2.09)**	1.43 (0.96 to 2.11)
Worsening Locomotion - Superior	0.74 (0.48 to 1.13)	0.75 (0.47 to 1.19)
Pain - Poor	1.04 (0.72 to 1.51)	1.11 (0.75 to 1.64)
Pain - Superior	1.47 (0.93 to 2.31)	**1.75 (1.08 to 2.83)**
Pressure Ulcer - Poor	1.14 (0.75 to 1.72)	1.06 (0.68 to 1.65)
Pressure Ulcer - Superior	1.19 (0.81 to 1.74)	1.30 (0.88 to 1.94)
Urinary Tract Infection - Poor	1.37 (0.94 to 1.99)	1.33 (0.88 to 2.00)
Urinary Tract Infection - Superior	0.91 (0.62 to 1.33)	1.13 (0.75 to 1.69)
Restraint Use - Poor	0.95 (0.62 to 1.48)	0.72 (0.45 to 1.16)
Restraint Use - Superior	0.76 (0.51 to 1.12)	0.70 (0.47 to 1.04)
Worsening Bladder Continence - Poor	1.08 (0.77 to 1.54)	1.09 (0.97 to 1.58)
Worsening Bladder Continence - Superior	0.77 (0.49 to 1.21)	0.87 (0.53 to 1.42)
Walking Improvement - Poor	**1.69 (1.07 to 2.66)**	**1.90 (1.16 to 3.11)**
Walking Improvement - Superior	**0.71 (0.51 to 0.98)**	0.80 (0.56 to 1.15)

[&] Related to average performance (middle 50% of CCCs). Superior = best 25% of CCCs, Poor = poorest 25% of CCCs
Adjusted for the average number of practice guidelines, nursing hourly wage, and rural/urban status.

Table 4.16: Demographic, clinical, and functional description of admission characteristics for Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001. Reported by outcome within one year of admission using the Revised PAH Definition (number and percent, unless otherwise indicated)

Admission Characteristic	Overall (% of sample)	One-Year Outcome			
		PAH	Other Hospitalization	Death	No Outcome
Total	34266	1783 (5.2)	1559 (4.5)	11067 (32.3)	19857 (58.0)
Sociodemographic Variables					
Age (mean years(s.d.))*	80.2 (7.4)	79.2 (7.2)	79.1 (7.1)	80.8 (7.7)	80.1 (7.4)
Sex*					
Male	13888 (40.5)	770 (5.5)	740 (5.3)	5106 (36.8)	7272 (52.4)
Female	20378 (59.5)	1013 (5.0)	819 (4.0)	5961 (29.3)	12585 (61.8)
Contact with Family					
No	2389 (7.0)	136 (5.7)	121 (5.1)	768 (32.2)	1364 (57.1)
Yes	31877 (93.0)	1647 (5.2)	1438 (4.5)	10299 (32.3)	18493 (58.0)
Resource Use Variables					
Length of CCC Stay*					
Long-stay	11870 (34.6)	1180 (9.9)	971 (8.2)	3422 (28.8)	6297 (53.1)
Short-stay	22396 (65.4)	603 (2.7)	588 (2.6)	7645 (34.1)	13560 (60.6)
Resource Utilization Group*					
Extensive	2548 (7.4)	212 (8.3)	156 (6.1)	1343 (52.7)	837 (32.9)
Special	4860 (14.2)	302 (6.2)	273 (5.6)	1626 (33.5)	2659 (54.7)
Clinically Complex	9245 (27.0)	524 (5.7)	403 (4.4)	3982 (43.1)	4336 (46.9)
Cognitive	3235 (9.4)	141 (4.4)	128 (4.0)	624 (19.3)	2342 (72.4)
Behavioural	383 (1.1)	20 (5.2)	17 (4.4)	82 (21.4)	264 (68.9)
Reduced Physical	13995 (40.8)	584 (4.2)	582(4.2)	3410 (24.4)	9419 (67.3)
Health and Functional Status					
ACSC on MDS*					
No	14635 (42.7)	531 (3.6)	696 (4.8)	4527 (30.9)	8881 (60.7)
Yes	19631 (57.3)	1252 (6.4)	863 (4.4)	6540 (33.3)	10976 (55.9)
DNH or DNR*					
No	22120 (64.6)	1283 (5.8)	1102 (5.0)	4732 (21.4)	15003 (67.8)
Yes	12146 (35.5)	500 (4.1)	457 (3.8)	6335 (52.2)	4854 (40.0)
Cognitive Status*					
Intact (CPS = 0)	9440 (27.6)	437 (4.6)	466 (4.9)	2368 (25.1)	6169 (65.4)
Borderline (CPS = 1 to 2)	10591 (30.9)	636 (6.0)	492 (4.7)	3206 (30.3)	6257 (59.1)
Impaired (CPS = 3 to 6)	14253 (41.5)	710 (5.0)	601 (4.2)	5493 (38.6)	7431 (52.2)
ADL Status*					
Independent (ADL Hierarchy = 0 to 2)	11914 (34.8)	489 (4.1)	435 (3.8)	2511 (21.1)	8461 (71.0)
Borderline (ADL Hierarchy = 3 to 4)	7705 (22.5)	439 (5.7)	383 (5.0)	2081 (27.0)	4802 (62.3)
Dependent (ADL Hierarchy = 5 to 6)	14647 (42.7)	855 (5.8)	723 (4.9)	6475 (44.2)	6594 (45.0)

Table 4.16 continued

Admission Characteristic	Overall (% of sample)	One-Year Outcome			
		PAH	Other Hospitalization	Death	No Outcome
Health instability *					
Low (CHESS=0 to 1)	18172 (53.0)	842 (4.6)	782 (4.3)	3835 (21.1)	12713 (70.0)
Medium (CHESS=2 to 3)	13115 (38.3)	782 (6.0)	664 (5.1)	5192 (39.6)	6477 (49.4)
High (CHESS=4 to 5)	2979 (8.7)	113 (3.8)	146 (4.9)	2040 (68.5)	667 (22.4)
Depressive Symptoms *					
No (DRS < 3)	27779 (81.6)	1392 (5.0)	1260 (4.5)	8591 (30.9)	16536 (59.5)
Yes (DRS >= 3)	6274 (18.4)	382 (6.1)	294 (4.7)	2330 (37.1)	3268 (52.1)
Psychotropic Medication Use*					
No	15670 (45.7)	804 (5.1)	692 (4.4)	4787 (30.6)	9387 (59.9)
Yes	18596 (54.3)	979 (5.3)	867 (4.7)	6280 (33.8)	10470 (56.3)
Communication Difficulty*					
No	13237 (38.6)	679 (5.1)	640 (4.8)	3555 (26.9)	8363 (63.2)
Yes	21029 (61.4)	1104 (5.3)	919 (4.4)	7512 (35.7)	11494 (54.7)
Behaviour Difficulty*					
No	25267 (73.7)	1305 (5.2)	1147 (4.5)	7664 (30.3)	15151 (60.0)
Yes	8999 (26.3)	478 (5.3)	412 (4.6)	3403 (37.8)	4706 (52.3)
Chronic Conditions *					
<4	19641 (57.3)	897 (4.6)	907 (4.6)	6300 (32.1)	11537 (58.7)
4 or more	14625 (42.7)	886 (6.1)	652 (4.5)	4767 (32.6)	8320 (56.9)
No. Chronic Conditions* (mean (s.d.))		3.8 (2.4)	3.4 (2.3)	3.5 (2.2)	3.3 (2.1)
CCC Facility Characteristics					
CCC Size *					
Small	13377 (39.0)	501 (3.8)	537 (4.0)	4525 (33.8)	7814 (58.4)
Large	20889 (61.0)	1282 (6.1)	1022 (4.9)	6542 (31.3)	12043 (57.7)
CCC Freestanding Status *					
Adjoined	23018 (67.2)	1034 (4.5)	1016 (4.4)	7522 (32.7)	13446 (58.4)
Freestanding	11248 (32.8)	749 (6.7)	543 (4.8)	3545 (31.5)	6411 (57.0)
CCC Location *					
Urban	28205 (82.3)	1533 (5.4)	1314 (4.7)	9188 (32.6)	16170 (57.3)
Rural	6061 (17.7)	250 (4.1)	245 (4.0)	1879 (31.0)	3687 (60.8)

* Statistically significantly related to multinomial outcome p<0.0001

Table 4.17: Unadjusted relative risk of experiencing PAH versus no outcome by admission characteristics for Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001 (n=34266) using the Revised PAH Definition.

Admission Characteristic	Overall Number (% of sample) (unless otherwise indicated)	Relative Risk of PAH versus No Outcome (95% Confidence Interval)	Risk Difference
Sociodemographic Variables			
Age 80 years +	671 (45.5)	0.80 (0.74 to 0.88)	-0.02 (-0.03 to -0.01)
Female Sex	20378 (59.5)	0.78 (0.71 to 0.85)	-0.02 (-0.03 to -0.01)
No Contact with Family	2389 (7.0)	1.11 (0.94 to 1.31)	0.01 (-0.01 to 0.02)
Resource Use Variables			
Short Length of CCC Stay	22396 (65.4)	0.27 (0.25 to 0.30)	-0.12 (-0.12 to -0.11)
Health and Functional Status Variables			
Presence of Advanced Directive	12146 (35.5)	1.19 (1.07 to 1.31)	0.02 (0.01 to 0.02)
Borderline Cognitive Status	10591 (30.9)	1.19 (1.08 to 1.30)	0.01 (0.01 to 0.02)
ADL Dependent	14647 (42.7)	1.76 (1.61 to 1.92)	0.05 (0.04 to 0.06)
Clinically unstable	16094 (47.0)	1.87 (1.71 to 2.05)	0.05 (0.05 to 0.06)
Depressive Symptoms	6274 (18.4)	1.35 (1.21 to 1.50)	0.03 (0.02 to 0.04)
Psychotropic Medication Use	18596 (54.3)	1.08 (0.99 to 1.19)	0.01 (-0.00 to 0.01)
Communication Difficulty	21029 (61.4)	1.17 (1.06 to 1.28)	0.01 (0.01 to 0.02)
Behaviour Difficulty	8999 (26.3)	1.16 (1.05 to 1.29)	0.01 (0.00 to 0.02)
4 or more Chronic Conditions	14625 (42.7)	1.33 (1.22 to 1.46)	0.02 (0.02 to 0.03)
CCC Facility Characteristics			
Large CCC Size	20889 (61.0)	1.60 (1.45 to 1.76)	0.04 (0.03 to 0.04)
Adjoined CCC	23018 (67.2)	0.68 (0.62 to 0.75)	-0.03 (-0.04 to -0.02)
Rural CCC Location	6061 (17.7)	0.73 (0.64 to 0.83)	-0.02 (-0.03 to -0.01)

Table 4.18: Clinical and functional characteristics of long versus short-stay residents among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001. (number (percent of length of stay group))

Admission Characteristic	Long-Stay	Short-Stay
Total	11870 (100)	22396 (100)
Presence of Advanced Directives *	4775 (40.2)	7371 (32.9)
No Contact with Family*	904 (7.6)	1485 (6.6)
Cognitive Status*		
Intact (CPS = 0)	2469 (20.8)	6971 (31.1)
Borderline (CPS = 1 to 2)	3476 (29.3)	7115 (31.2)
Impaired (CPS = 3 to 6)	5925 (49.9)	8310 (37.1)
ADL Status*		
No impairment (ADL Hier = 0 to 2)	2996 (25.2)	8918 (39.8)
Mild impairment (ADL Hier = 3 to 4)	2861 (24.1)	4844 (21.6)
High impairment (ADL Hier = 5 to 6)	6013 (50.7)	8634 (38.6)
Clinically Unstable (CHESS >= 4) *	944 (8.0)	2035 (9.1)
Presence of Depressive Symptoms *	2518 (21.4)	3756 (16.9)
Psychotropic Medication Use*	6565 (55.3)	12031 (53.7)
Communication Difficulty*	8016 (67.5)	13013 (58.1)
Behaviour Difficulty*	3680 (31.0)	5319 (23.8)

* Statistically significantly different between long and short-stay residents $p<0.01$

Table 4.19: Bivariate analysis of one-year outcomes *using the Revised PAH Definition* by length of stay among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001. (number and percent, unless otherwise indicated)

		Long-Stay			Short-Stay		
		PAH	**Other**	**Death**	**PAH**	**Other**	**Death**
Total		1180 (9.9)	971 (8.2)	3422 (28.8)	603 (2.7)	588 (2.6)	7645 (34.1)
Sociodemographic Variables							
Age	<80 years	639 (11.1)	520 (9.1)	1560 (27.2)	299 (2.9)	308 (3.0)	3304 (32.5)
	80 years +	541 (8.8)	451 (7.4)	1862 (30.4)	304 (2.5)	280 (2.3)	4341 (35.5)
Sex	Female	665 (10.0)	497 (7.5)	1813 (27.2)	255 (2.9)	266 (3.1)	4148 (30.3)
	Male	515 (9.9)	474 (9.1)	1609 (31.0)	348 (2.5)	322 (2.4)	3497 (40.2)
Contact with Family	No	101 (11.2)	75 (8.3)	228 (25.2)	35 (2.4)	46 (3.1)	540 (36.4)
	Yes	1079 (9.8)	896 (8.2)	3194 (29.1)	568 (2.7)	542 (2.6)	7105 (34.0)
Health and Functional Status							
DNH or DNR	No	828 (11.7)	666 (9.4)	1470 (20.7)	455 (3.0)	436 (2.9)	3262 (21.7)
	Yes	352 (7.4)	305 (6.4)	1952 (40.9)	148 (2.0)	152 (2.1)	4383 (59.5)
Cognition	Intact	279 (11.3)	285 (11.5)	672 (27.2)	158 (2.3)	181 (2.6)	1696 (24.3)
	Borderline	412 (11.9)	323 (9.3)	966 (27.8)	224 (3.2)	169 (2.4)	2240 (31.5)
	Impaired	489 (8.3)	363 (6.1)	1784 (30.1)	221 (2.7)	238 (2.9)	3709 (44.6)
ADL Impairment	No	303 (10.1)	266 (8.9)	731 (24.4)	186 (2.1)	187 (2.1)	1780 (20.0)
	Mild	299 (10.5)	248 (8.7)	675 (23.6)	140 (2.9)	135 (3.8)	1406 (29.0)
	Severe	578 (9.6)	457 (7.6)	2016 (33.5)	277 (3.2)	266 (3.1)	4459 (51.6)
Health instability	Low	567 (9.1)	505 (8.1)	1329 (21.3)	275 (2.3)	277 (2.3)	2506 (21.0)
	Medium	502 (10.7)	396 (8.4)	1599 (34.0)	280 (3.3)	268 (3.2)	3593 (42.7)
	High	111 (11.8)	70 (7.4)	494 (52.3)	48 (2.4)	43 (2.1)	1546 (20.2)
Depressive Symptoms	No	899 (9.7)	767 (8.3)	2662 (28.7)	493 (2.7)	493 (2.7)	5929 (32.0)
	Yes	274 (10.9)	200 (7.9)	730 (29.0)	108 (2.9)	94 (2.5)	1600 (42.6)
Psychotropic Meds	No	521 (9.8)	432 (8.1)	1503 (28.3)	283 (2.7)	260 (2.5)	3284 (31.7)
	Yes	659 (10.0)	539 (8.2)	1919 (29.2)	320 (2.7)	328 (2.7)	4361 (36.3)
Communication Diffic.	No	429 (11.1)	389 (10.1)	1049 (27.2)	250 (2.7)	251 (2.7)	2506 (26.7)
	Yes	751 (9.4)	582 (7.3)	2373 (29.6)	353 (2.7)	337 (2.6)	5139 (39.5)
Behaviour Difficulty	No	840 (10.3)	705 (8.6)	2365 (28.9)	465 (2.7)	442 (2.6)	5299 (31.0)
	Yes	340 (9.2)	266 (7.2)	1057 (28.7)	138 (2.6)	146 (2.7)	2346 (44.1)
Chronic Conditions	1 to 3	572 (9.1)	561 (8.9)	1828 (29.1)	325 (2.4)	346 (2.6)	4472 (33.5)
	4 or more	608 (10.9)	410 (7.4)	1594 (28.6)	278 (3.1)	242 (2.7)	3173 (35.1)
CCC Facility Characteristics							
CCC Size	Small	310 (8.1)	322 (8.4)	1220 (31.7)	191 (2.0)	215 (2.3)	3305 (34.7)
	Large	870 (10.9)	649 (8.1)	2202 (27.5)	412 (3.2)	373 (2.9)	4340 (33.7)
CCC Freestanding	Yes	552 (11.4)	384 (7.9)	1340 (27.6)	197 (3.1)	159 (2.5)	2205 (28.8)
	No	628 (9.0)	587 (8.4)	2082 (29.7)	406 (2.5)	429 (2.7)	5440 (34.0)
CCC Location	Urban	1015 (10.3)	814 (8.2)	2867 (29.0)	518 (2.8)	500 (2.7)	6321 (34.5)
	Rural	165 (8.4)	157 (8.0)	555 (28.1)	85 (2.1)	88 (2.2)	1324 (32.4)

Table 4.20: Multivariate analysis of predictors of one-year outcomes for *long-stay* residents by cognition status u*sing the Revised PAH Definition* among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001 (n=11870). (Odds Ratio (95% Confidence Interval). Odds Ratios are adjusted for the other covariates listed and for year of admission to CCC.

Long-stay, Intact Cognition n=2469

	PAH vs. No outcome	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	**1.36 (1.06-1.75)**	1.10 (0.80-1.50)	**1.26 (1.01-1.57)**
Male Sex	0.98 (0.71-1.35)	1.20 (0.86-1.67)	**1.27 (1.03-1.58)**
Advanced Directives	0.99 (0.73-1.34)	0.91 (0.65-1.27)	**2.74 (2.17-3.44)**
No ADL Impairment (vs Impaired)	0.80 (0.58-1.09)	**0.73 (0.58-0.91)**	0.93 (0.75-1.14)
Mild ADL Impairment (vs Impaired)	0.84 (0.59-1.20)	**0.70 (0.50-0.98)**	**0.69 (0.52-0.92)**
CHESS=0-1 (vs 4 and up)	**0.24 (0.12-0.48)**	**0.35 (0.15-0.80)**	**0.18 (0.09-0.35)**
CHESS=2-3 (vs 4 and up)	**0.42 (0.20-0.89)**	**0.46 (0.21-0.99)**	**0.45 (0.23-0.86)**
Depressive Symptoms	**-**	**-**	**-**
0-3 Chronic Conditions (vs 4 and up)	0.87 (0.67-1.12)	**1.54 (1.18-2.00)**	1.25 (0.99-1.58)
From Adjoined CCC	1.03 (0.80-1.31)	0.97 (0.70-1.35)	1.03 (0.78-1.36)

Table 4.20 continued

Long-stay, Borderline Cognitively Impaired (n=3476)			
	PAH vs. No outcome	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	**1.34 (1.06-1.69)**	1.29 (0.98-1.68)	1.12 (0.92-1.38)
Male Sex	1.03 (0.80-1.33)	1.29 (0.99-1.69)	**1.37 (1.13-1.65)**
Advanced Directives	1.05 (0.87-1.27)	1.08 (0.86-1.36)	**2.35 (1.98-2.78)**
No ADL Impairment (vs Impaired)	0.93 (0.73-1.18)	0.92 (0.72-1.19)	0.93 (0.74-1.17)
Mild ADL Impairment (vs Impaired)	0.81 (0.60-1.09)	0.93 (0.70-1.24)	**0.79 (0.66-0.95)**
CHESS=0-1 (vs 4 and up)	**0.21 (0.14-0.32)**	**0.36 (0.22-0.59)**	**0.18 (0.13-0.25)**
CHESS=2-3 (vs 4 and up)	**0.37 (0.25-0.58)**	**0.49 (0.29-0.83)**	**0.35 (0.26-0.48)**
Depressive Symptoms	-	-	-
0-3 Chronic Conditions (vs 4 and up)	0.95 (0.76-1.18)	1.15 (0.88-1.51)	**1.34 (1.10-1.63)**
From Adjoined CCC	**0.65 (0.47-0.90)**	1.06 (0.77-1.46)	0.83 (0.64-1.07)
Long-stay, Cognitively Impaired (n=5925)			
	PAH vs. No outcome	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.05 (0.89-1.23)	1.11 (0.88-1.41)	**0.71 (0.62-0.83)**
Male Sex	**1.24 (1.00-1.53)**	**1.85 (1.42-2.42)**	**1.53 (1.37-1.72)**
Advanced Directives	**0.61 (0.47-0.78)**	0.81 (0.62-1.04)	**1.90 (1.65-2.18)**
No ADL Impairment (vs Impaired)	0.87 (0.68-1.11)	0.83 (0.59-1.17)	**0.62 (0.48-0.79)**
Mild ADL Impairment (vs Impaired)	0.91 (0.72-1.14)	0.93 (0.74-1.16)	**0.63 (0.53-0.75)**
CHESS=0-1 (vs 4 and up)	**0.35 (0.25-0.49)**	**0.38 (0.25-0.57)**	**0.28 (0.21-0.36)**
CHESS=2-3 (vs 4 and up)	**0.54 (0.40-0.74)**	0.70 (0.49-1.00)	**0.45 (0.37-0.56)**
Depressive Symptoms	-	-	-
0-3 Chronic Conditions (vs 4 and up)	0.85 (0.70-1.03)	1.09 (0.89-1.33)	1.01 (0.90-1.13)
From Adjoined CCC	0.77 (0.57-1.04)	1.06 (0.75-1.48)	1.06 (0.88-1.27)

Table 4.21: Multivariate analysis of predictors of one-year outcomes for *short-stay* residents by cognition status u*sing the revised PAH definition* among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001. (Odds Ratio (95% Confidence Interval). Odds Ratios are adjusted for the other covariates listed and for year of admission to CCC.

Short-stay, Intact Cognition (n=6871)

	PAH vs. No outcome	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.18 (0.77-1.82)	**1.43** **(1.06-1.93)**	1.04 (0.92-1.17)
Male Sex	1.34 (0.98-1.84)	**1.48** **(1.14-1.92)**	**1.79** **(1.57-2.05)**
Advanced Directives	1.17 (0.68-2.02)	1.22 (0.80-1.89)	**4.54** **(3.86-5.34)**
No ADL Impairment (vs Impaired)	**0.59** **(0.40-0.87)**	**0.44** **(0.33-0.60)**	**0.50** **(0.41-0.60)**
Mild ADL Impairment (vs Impaired)	0.90 (0.61-1.35)	0.69 (0.42-1.15)	**0.54** **(0.44-0.66)**
CHESS=0-1 (vs 4 and up)	**0.10** **(0.03-0.33)**	**0.17** **(0.06-0.51)**	**0.05** **(0.03-0.09)**
CHESS=2-3 (vs 4 and up)	**0.23** **(0.07-0.72)**	**0.32** **(0.11-0.97)**	**0.13** **(0.07-0.22)**
Depressive Symptoms	1.63 (0.98-2.71)	**1.67** **(1.00-2.78)**	**1.45** **(1.19-1.77)**
0-3 Chronic Conditions (vs 4 and up)	0.83 (0.59-1.16)	0.95 (0.68-1.34)	**1.20** **(1.04-1.39)**
From Adjoined CCC	0.81 (0.53-1.25)	1.14 (0.72-1.80)	1.03 (0.79-1.34)

Table 4.21 continued

Short-stay, Borderline Cognitively Impaired (n=7115)			
	PAH vs. No outcome	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.09 (0.76-1.55)	0.93 (0.66-1.30)	**0.88** **(0.79-0.98)**
Male Sex	**1.67** **(1.26-2.21)**	**1.57** **(1.18-2.10)**	**1.66** **(1.48-1.86)**
Advanced Directives	1.08 (0.80-1.47)	1.37 (0.93-2.03)	**3.44** **(2.84-4.18)**
No ADL Impairment (vs Impaired)	**0.35** **(0.26-0.46)**	**0.48** **(0.33-0.71)**	**0.48** **(0.41-0.56)**
Mild ADL Impairment (vs Impaired)	**0.53** **(0.37-0.75)**	0.65 (0.41-1.03)	**0.53** **(0.45-0.62)**
CHESS=0-1 (vs 4 and up)	**0.24** **(0.13-0.44)**	**0.18** **(0.10-0.32)**	**0.11** **(0.07-0.16)**
CHESS=2-3 (vs 4 and up)	**0.45** **(0.26-0.77)**	**0.28** **(0.16-0.48)**	**0.25** **(0.17-0.35)**
Depressive Symptoms	1.10 (0.77-1.56)	1.11 (0.71-1.73)	1.07 (0.89-1.29)
0-3 Chronic Conditions (vs 4 and up)	**0.79** **(0.64-0.99)**	0.89 (0.66-1.20)	**1.13** **(1.01-1.26)**
From Adjoined CCC	0.74 (0.51-1.08)	0.92 (0.55-1.55)	0.90 (0.69-1.17)
Short-stay, Cognitively Impaired (n=8310)			
	PAH vs. No outcome	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.14 (0.81-1.61)	**1.47** **(1.08-1.99)**	**0.88** **(0.79-0.97)**
Male Sex	**1.34** **(1.05-1.19)**	**1.66** **(1.10-2.50)**	**1.71** **(1.55-1.89)**
Advanced Directives	1.05 (0.78-1.42)	1.06 (0.77-1.44)	**2.54** **(2.25-2.88)**
No ADL Impairment (vs Impaired)	**0.44** **(0.29-0.67)**	**0.47** **(0.33-0.66)**	**0.34** **(0.30-0.39)**
Mild ADL Impairment (vs Impaired)	**0.60** **(0.42-0.86)**	**0.53** **(0.40-0.69)**	**0.42** **(0.37-0.48)**
CHESS=0-1 (vs 4 and up)	**0.41** **(0.23-0.73)**	**0.50** **(0.29-0.88)**	**0.23** **(0.18-0.28)**
CHESS=2-3 (vs 4 and up)	0.75 (0.49-1.13)	0.98 (0.66-1.46)	**0.40** **(0.33-0.49)**
Depressive Symptoms	1.01 (0.76-1.53)	0.89 (0.65-1.07)	1.10 (0.95-1.27)
0-3 Chronic Conditions (vs 4 and up)	0.91 (0.65-1.26)	1.18 (0.93-1.49)	1.02 (0.91-1.15)
From Adjoined CCC	**0.44** **(0.23-0.83)**	0.60 (0.34-1.04)	**0.68** **(0.55-0.84)**

Figure 4.1: Number and proportion of Complex Continuing Care (CCC) episodes (among residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001) where residents were hospitalized, hospitalized for an ACSC, and hospitalized for a most-responsible ACSC before April 1 2002.

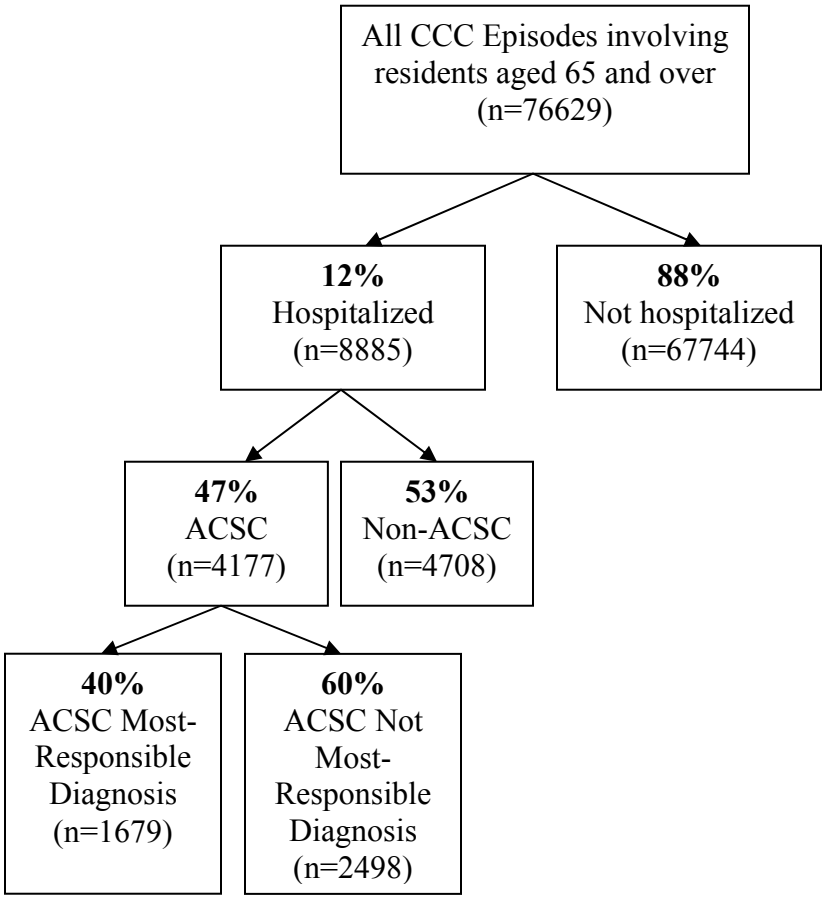


Figure 4.2: Mean quarterly Complex Continuing Care (CCC) facility-specific hospitalization rates and ACSC hospitalization rates among residents aged 65 and over in Ontario between April 1, 1997 and March 31, 2002

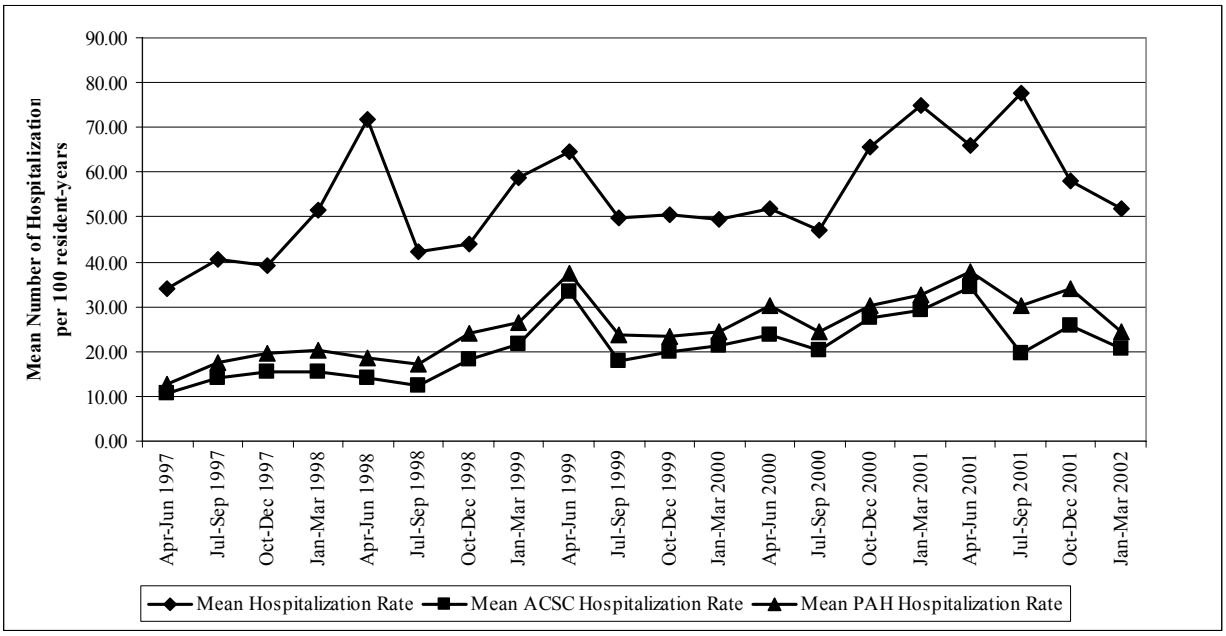


Figure 4.3: Number and proportion of Complex Continuing Care (CCC) episodes (among residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001) where residents were hospitalized, hospitalized for a Potentially Avoidable Hospitalization (PAH), and hospitalized for a most-responsible PAH before April 1 2002.

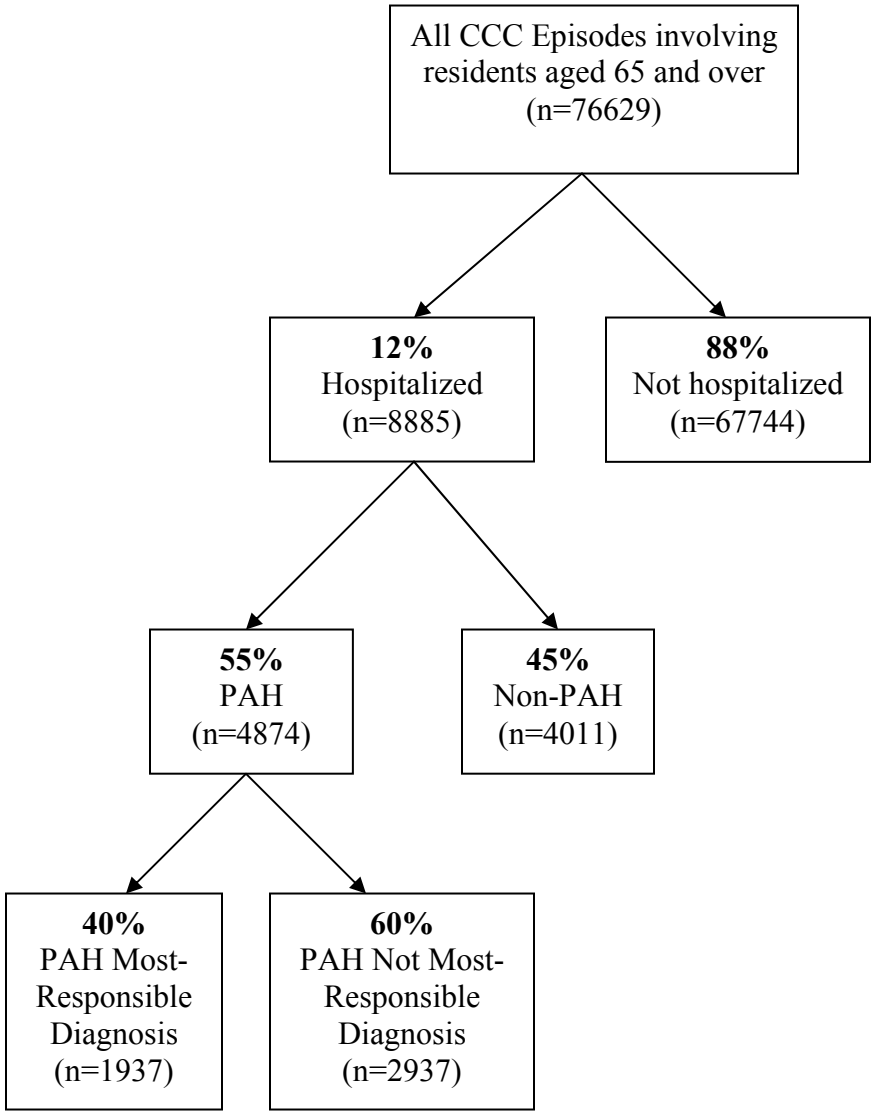


Figure 4.4: Percent of hospitalizations occurring before April 1 2002 among residents aged 65 and over admitted to a CCC in Ontario between April 1, 1997 and March 31, 2001 due to most common Case Mix Groups (CMG) by fiscal year.

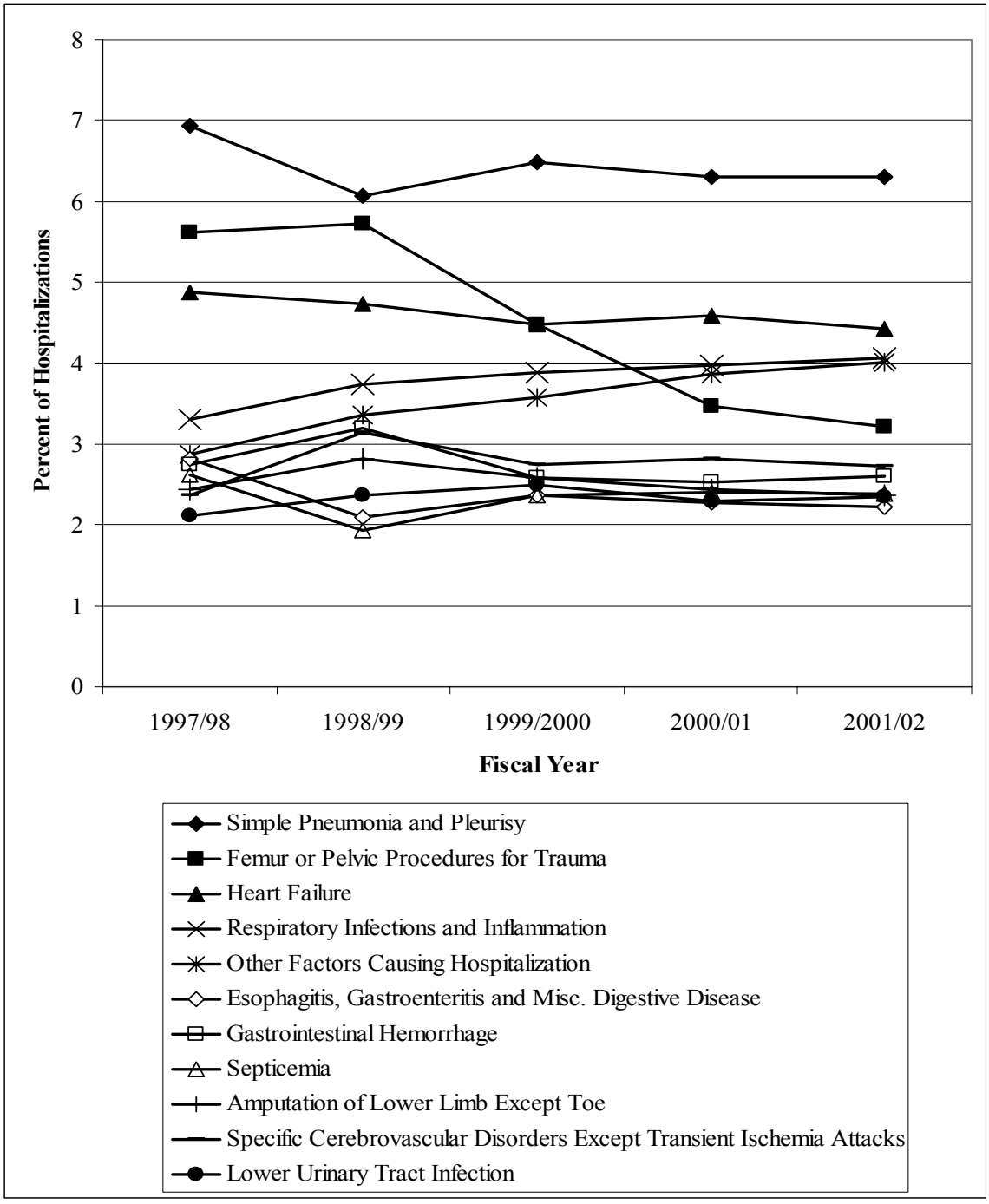
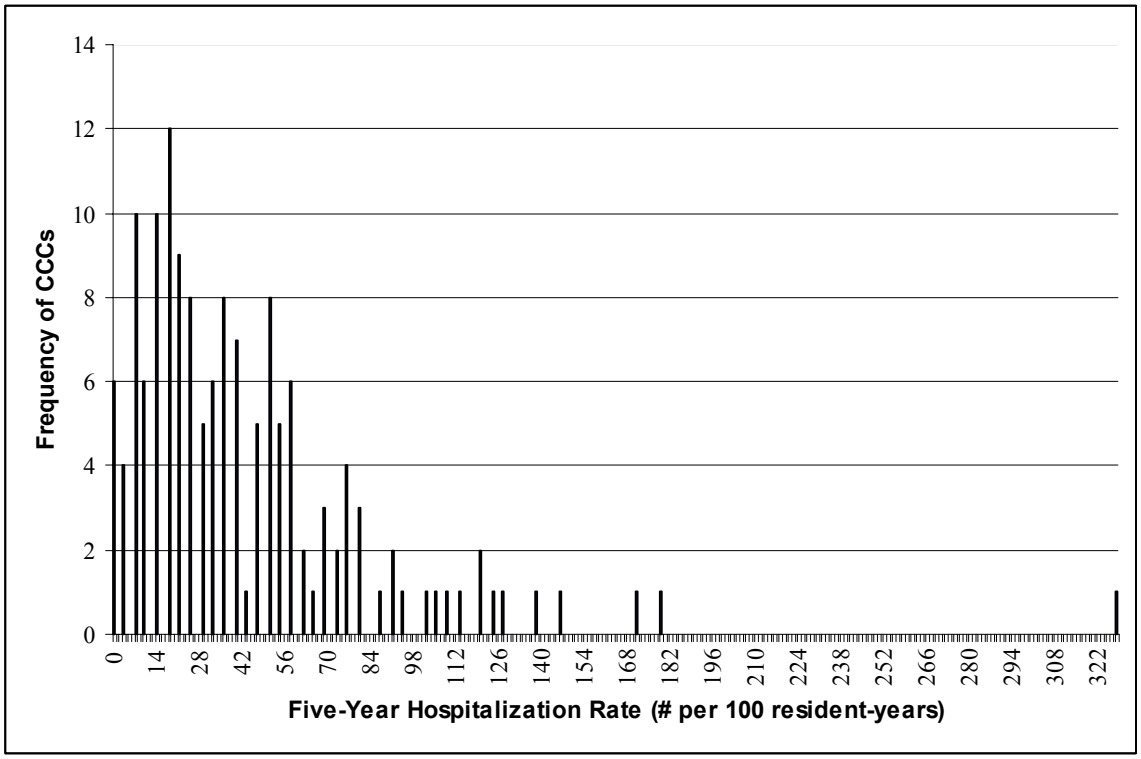
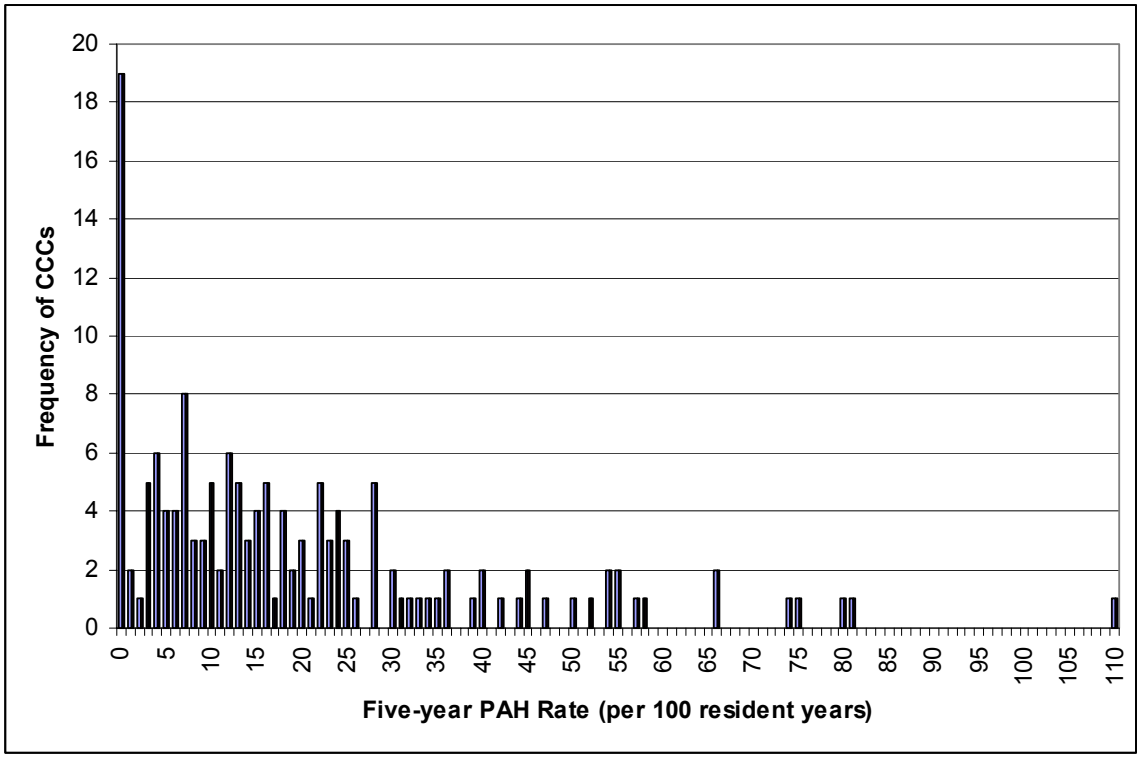


Figure 4.5: Frequency distribution of Complex Continuing Care (CCC) facility-specific overall hospitalization rates among residents aged 65 and over in Ontario between April 1, 1997 and March 31, 2002*



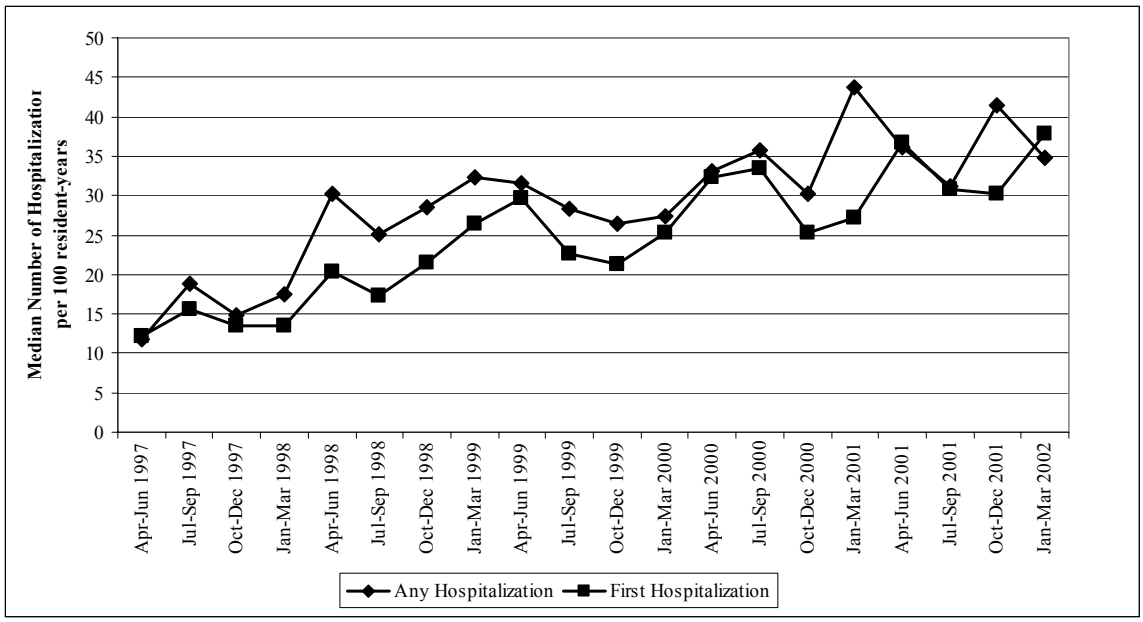
* one outlying facility excluded

Figure 4.6: Frequency distribution of Complex Continuing Care (CCC) facility-specific PAH rates among residents aged 65 and over in Ontario between April 1, 1997 and March 31, 2002*



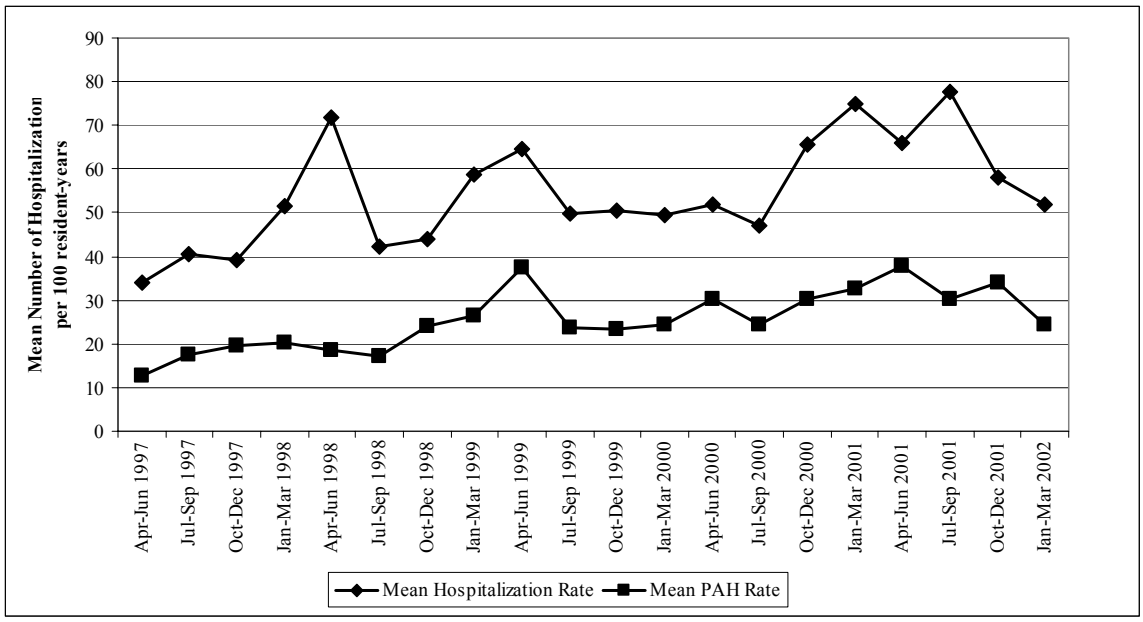
* one outlying facility excluded

Figure 4.7: Median quarterly Complex Continuing Care (CCC) facility-specific hospitalization rates for any and first hospitalization within each episode among residents aged 65 and over in Ontario between April 1, 1997 and March 31, 2002*



* one outlying facility excluded

Figure 4.8: Mean quarterly Complex Continuing Care (CCC) facility-level hospitalization rates and Potentially Avoidable Hospitalization (PAH) rates among residents aged 65 and over in Ontario between April 1, 1997 and March 31, 2002*



* one outlying facility excluded

Figure 4.9: Mean Complex Continuing Care (CCC) facility-specific Quality Indicators (QI) scores over time for all CCC residents residing in facilities in Ontario.

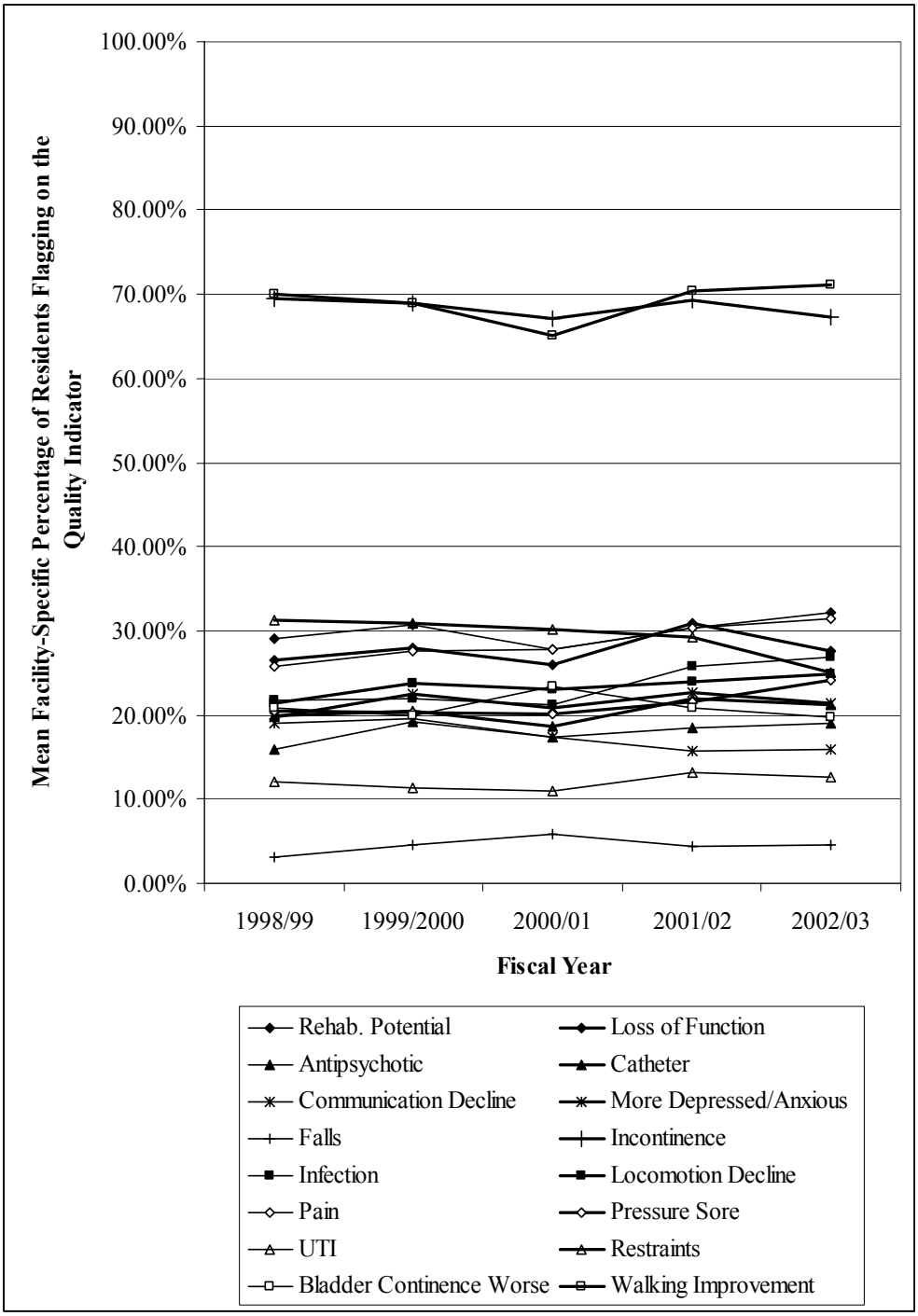
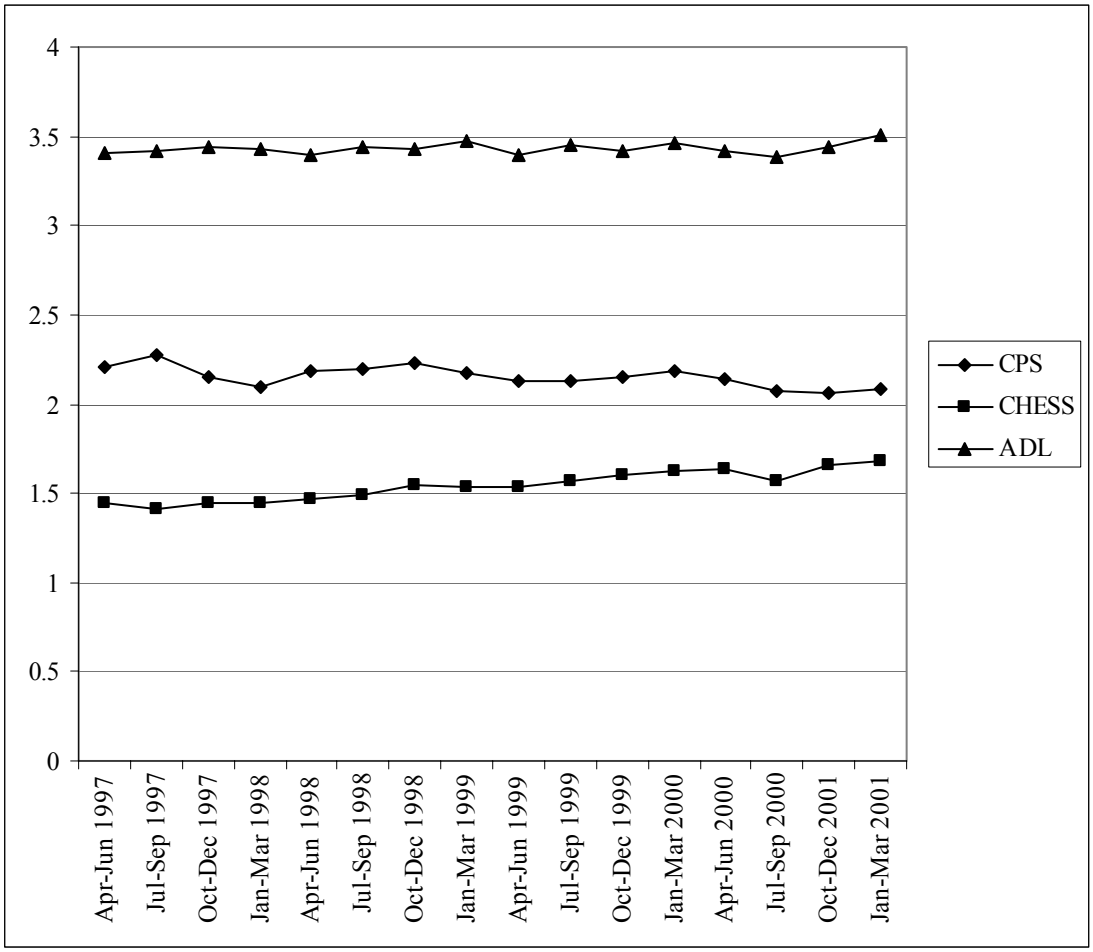


Figure 4.10: Mean quarterly admission Changes in End-stage disease and Signs and Symptoms (CHESS), Activities of Daily Living (ADL)-Hierarchy, and Cognitive Performance Scale (CPS) scores among residents aged 65 and over admitted to a CCC in Ontario between April 1997 to March 2002.



CHAPTER FIVE: Discussion

5.1 Key Findings and Contributions

This study is the first to examine the rate and predictors of potentially avoidable hospitalizations (PAH) of older persons from continuing care settings in Canada. A particular strength of the study is the use of linked data from acute care and continuing care facilities to capture hospitalizations for all residents of complex continuing care (CCC) facilities in Ontario over five years. The analysis applied a modification of ambulatory care sensitive condition (ACSC) methodology, a widely used measure of access to primary care.[19, 20, 26, 33, 34, 80, 81, 83] We adapted the methodology for use in CCC facilities to examine the potential under use of preventive care and to create a refined measure of PAH. The major contributions of the study include a measure of PAH designed for continuing care in Canada based on readily available data and an improved understanding of the rates and predictors of PAH among continuing care residents.

The adaptation of the ACSC measure involved the contribution of a respected group of experts who underscored the importance of developing a measure of PAH for continuing care. The revised PAH measure included septicaemia and falls/fractures in addition to a modified list of the original ACSCs. The key difference in the results obtained through the use of the two measures was that the PAH measure classified more hospitalizations as potentially avoidable. This suggests that it may be a more sensitive measure, capturing more hospitalizations that may have been avoidable, but less specific, classifying more unavoidable hospitalizations as potentially avoidable.[98] Because this measure was not intended to be used at an individual level, these properties are acceptable and desirable as a screening tool at the facility level.

Variations in PAH rates over time and among facilities and jurisdictions could prompt further investigation into the diverse reasons underlying the differences. Variations may arise due to failures within facilities to manage chronic conditions, conduct care conferences with families, review advanced directives, or monitor and address early warning signs of illness. The PAH measure was developed to identify these types of opportunities for improved preventive care in continuing care facilities. However, additional factors may underlie variations in PAH rates. For example, there may be discrepancies in the services available to the continuing care facility such as complicated therapies, intravenous therapy, antibiotic administration and diagnostic capacity. Also, there may be environmental circumstances specific to one facility in a brief period, such as an outbreak of *C. dificil.,* that makes prevention, identification and management of acute episodes excessively taxing on limited staff resources. Continuing care facilities, due to resource limitations or otherwise, may also inappropriately rely on hospital care rather than delivering effective early intervention to manage chronic illness. The PAH measure is not intended to specifically address the appropriateness of the decision to hospitalize an individual resident among this population (i.e., overuse of hospitals). According to the expert panel, the circumstances, symptoms, and status of the resident play a greater role in the decision to hospitalize than the diagnoses. This is because diagnoses are often not evident until discharge from the hospital when the abstract is completed. This assertion underscores the fundamental limitation of capturing appropriateness using administrative hospitalization data.

Preventive care is an important role for continuing care facilities as summarized in Section 2.2.2. In our sample, 57% of residents had a pre-existing ACSC recorded on their

MDS 2.0. In many cases, hospitalization for these conditions can be prevented with appropriate recognition, management, and monitoring for progression or exacerbation. In addition, risks for the occurrence of new conditions, such as pneumonia and dehydration, can be mitigated with preventive and proactive care as well as close monitoring.

5.1.1 Rates of Hospitalization and PAH

We found that 12% of admissions to CCC resulted in a hospital admission over the five study years for an overall hospitalization rate of 42 per 100 resident years. Our findings show some consistency with other findings from Canada and elsewhere. One found a three-year hospitalization rate of between 32 and 67% in Quebec.[167] Others have shown one year rates ranging from 19.4 to 60.1%.[1, 2, 4, 5] Comparisons between skilled nursing facilities (analogous to Ontario's CCCs) and nursing homes in the U.S. have demonstrated that residents of skilled nursing facilities are hospitalized less frequently than nursing home residents.[10] Thus, we might expect to see higher rates in different levels of continuing care, including LTC and assisted living facilities.

Of the hospitalizations in our study, 47% were classified as ACSC using the original definition (19% if we used only the most-responsible diagnosis). This estimate is higher than previous investigators have found using data from U.S. hospitals. The two previous U.S. studies of ACSC hospitalizations from continuing care have measured ACSC using the principal diagnosis, which is assigned to the condition that prompted the hospital admission.[19, 32] Carter estimated that 11% of hospitalizations were for ACSC and Intrator and colleagues placed the estimate at 37%.[19, 32] Overall, approximately 15% of hospitalizations were for an ACSC in the general population[94] and among the

community-dwelling older population, an estimated 10 to 21.6% of hospitalizations were for an ACSC.[20, 26]

This discrepancy in findings is likely related to differences in the coding conventions between the U.S. and Canada. Canadian coders assign a diagnosis that is, at the time of discharge, determined to be the condition responsible for the largest portion of resources consumed during the hospital stay (most-responsible diagnosis).[169] This differs from the American coding standards where a principal diagnosis is assigned that best reflects the reason for admission to hospital.[207] American studies typically only apply the ACSC definition to principal diagnoses to ensure that the condition was pre-existing and did not occur after admission to hospital. However, Canadian coding standards specify diagnosis types for each diagnosis listed on the hospital discharge abstract.[169] These diagnosis types differentiate the conditions that were active and existed prior to hospitalization versus those that occurred post-admission. For this reason, the Canadian coding experts, consulted as part of the expert panel process, recommended including any type 1 diagnoses (pre-existing, active conditions) and excluding most-responsible diagnoses that were also listed as type 2 diagnoses (post-admission, active conditions). This definition is more inclusive and results in a higher proportion of hospitalizations being classified as ACSC than are found in previous research. Only 40% of the hospitalizations classified as ACSC had a most-responsible diagnosis on the ACSC list. Sixty percent were captured due to type 1 diagnoses that was not considered most responsible for length of stay or resource use in the acute facility. However, sensitivity analyses showed that the predictors of ACSC hospitalization did not differ substantially if only most-responsible

ACSC diagnosis was used (results not shown). Thus, the more inclusive measure is preferred due to its presumed higher sensitivity.

In the existing research literature, two expert reviews of the avoidability of hospitalization estimated that between 11 and 27% of hospitalizations were potentially preventable.[3, 21] Both studies were small and each used a different definition of preventable. Finucane's definition bordered on appropriateness because it focused on whether the facility was equipped to address the acute event rather than whether the acute event could have been prevented.[21] Coleman and colleagues provided the only expert review that defined avoidable in a similar way to the PAH definition.[3] They found that four of the 15 hospitalizations reviewed were possibly preventable. This investigation was limited due to small numbers and lack of explicit criteria presented.[3] One example of a highly structured expert review was Saliba's investigation of inappropriate admissions from skilled nursing facilities in the U.S. This study found that 40% of hospital admissions were unnecessary.[24]

We observed an increase in the rate of hospitalization of CCC residents over time. This is in contrast to the rates for the general Canadian population where hospitalization rates are decreasing.[17] The rate of ACSC hospitalizations and PAH also increased over time, in agreement with McCall's work in the U.S.[91] We found that the mean MDS-CHESS (health instability) score increased over time despite decreased CPS and stable ADL-Hierarchy scores. A recent report from CIHI using the same OCCPS data concluded that ADL impairment was increasing in this population.[208] The CIHI analysis examined the proportion of residents falling into each of the 6 ADL-Hierarchy categories and found that the proportions in the lowest impairment group decreased over time and

increased in the highest impairment group. Thus, our examination of mean ADL scores over time may have disguised an underlying trend. The increasing health instability and functional impairment on admission may account for the increasing hospitalization rate over time.

5.1.2 Revised PAH Definition

A substantial contribution of this investigation is the development of a new definition of PAH for the Canadian continuing care context derived by an expert panel. The expert panel was composed of Canadian and American methodological, clinical, and administrative experts in the continuing care to acute care interface. The methodology for the expert panel incorporated an in-person meeting where the definition of PAH was discussed. Brown and colleagues previously found that panel methodology that incorporated an in-person meeting resulted in agreement on a more comprehensive list of ACSCs than panels with no personal interaction with one another.[35] This supports our in-person design because the resulting PAH list is likely to be broader and to provide a higher level of sensitivity than would have been achieved otherwise.

Previous Canadian researchers assumed that any emergency department (ED) visit that resulted in admission to hospital was appropriate and unavoidable in the context of the Canadian health care system.[28] Our expert panel disagreed and asserted that PAH admissions do occur in Canada and can be identified using administrative data. The expert panel retained the ACSC concept when creating the revised PAH definition. The panel reviewed and excluded several of the original ACSC categories including immunization preventable conditions, nutritional deficiencies, ear/nose/throat infections, and tuberculosis (TB). Within PAH, the panel included two new categories of diagnoses:

falls/fractures and septicaemia. Several additional conditions were considered by the expert panel but were not included in the PAH definition. A more detailed discussion of the expert panel's recommendations follows.

Review of Original ACSCs

Of the original ACSC list, most conditions were retained in the PAH definition (refer to Table 4.8 on page 127 for a summary). The expert panel chose to include pneumonia and CHF despite previous research having excluded these from the list of ACSCs in older populations.[34, 88, 94] The expert panel expected a higher hospitalization rate for both conditions in the older, institutionalized population than in the younger, community population. Nonetheless, they felt that variation in the rate between facilities would indicate the availability and quality of preventive care. The group disagreed that all hospitalizations for CHF were a normal part of aging and stated that good medication and lifestyle monitoring is needed to prevent the progression of CHF to the point where hospitalization is necessary. The group also stated that pneumonia was a preventable condition and could generally be controlled in the continuing care facility to avoid extended hospital stays. Hospitalization for pneumonia typically lasts more than one week and an estimated 68% of older community-acquired pneumonia patients stay longer than expected due to exacerbation or complications, particularly if they were at high risk of poor outcomes to begin with.[209] In addition to preventive care, the panel felt that hospitalization for pneumonia could represent an indicator of the quality of end of life care for continuing care facility residents.

The conditions that were removed from the definition were rare and accounted for only 0.5% of all ACSCs in the sample. Several of the excluded ACSCs were comprised

of diagnostic codes more applicable to children, such as immunization preventable conditions, nutritional deficiencies, and ear/nose/throat infections. Immunizations for influenza and pneumonia were considered important by the panel. However, both were captured by the inclusion of pneumonia as a PAH. Nutritional deficiency was raised as a serious concern for this population. However, it is not a condition that was thought to be well captured by hospital data. The condition was omitted rather than revised. TB was not included in the revised definition because, with mandatory screening for TB before admission, the issues were thought to be more staff-related and non-preventable.

Consideration of New Conditions

Several other conditions were proposed and considered by the expert panel including falls/fractures, septicaemia, decubitus ulcers, mental health and behaviour disorders, and stroke. The panel decided to include septicaemia and falls/fractures in the revised definition of PAH. Inclusion of septicaemia is consistent with previous attempts to refine ACSCs for older persons[91] and for the Canadian context.[35] There is somewhat conflicting support in the literature for the position of the expert panel on the potential preventability of hospitalizations for falls/fractures. In at least two previous studies conducted in younger populations, hip fractures were considered insensitive to preventive care.[83, 87] Our expert panel disagreed with this and recommended classifying hip fracture as a PAH in the institutionalized elderly population. Continuing care residents contribute a disproportionate amount to the total number of fall-related hospitalizations in Canada's older population.[210] The expert panel felt that this was an area that was sensitive to the quality of preventive care in CCC because it reflects both fall prevention[131, 132] and management of osteoporosis in continuing care.[133] In addition, evidence-based practice

guidelines for fall prevention are in place in many jurisdictions and among several professional groups in Canada.[210] In general, if clinical conditions are sensitive to differences in care, they should be known to have a high rate of variation.[211] Fall-related hospitalizations range from 3.4% of hospitalizations originating in continuing care in the Territories to14.8% in Saskatchewan.[212]

The expert panel chose not to include decubitus ulcers, mental health and behaviour disorders, and stroke. Decubitus ulcers were not added for several reasons. The expert panel felt that residents were likely to be admitted to CCC with existing advanced ulcers, limiting the preventability of this condition. In addition, the recorded prevalence of ulcers is not currently a good indicator of preventive care due to suspected changes in reporting practices. Despite increased attention to pressure ulcer prevention among older people in home care, continuing care, and hospitals, there has been no observed decline in pressure ulcer incidence.[213] It is hypothesized that the increased attention is improving the identification and reporting of decubitus ulcers.[213] The expert panel identified that decubitus ulcers are not well captured by administrative hospital data. This has been supported in previous U.S. research where only 30.8% of known ulcers were recorded at the time of hospital discharge.[214] In addition, the panel felt that decubitus ulcers are already captured in the existing QIs.

Similarly, mental health / behavioural disorders and stroke were not included because their preventability was questioned and because they were poorly recorded on hospital abstracts.[215] The panel also felt that CCC residents with stroke were not often admitted to hospital so they would be missed by the hospital data.

Diagnosis Types

As previously discussed, on the advice of the diagnostic coding experts consulted, PAH conditions were identified using most-responsible and type 1 diagnoses recorded on the hospital discharge abstract. When only the most-responsible diagnosis was used, pneumonia and CHF accounted for over half of ACSC hospitalizations. This was consistent with previous literature from the U.S. using the principal diagnosis.[153] When the diagnostic types included were expanded to type 1 diagnoses, there was an increase in the contribution of diabetes and hypertension to the ACSC definition. These are more likely to be co-existing conditions that are not accountable for the largest proportion of resource use during the hospitalization. If only most-responsible diagnoses were included in the definition of PAH, then the proportion of hospitalizations that were considered preventable would drop from 47% to 19%.

Over the study period, the recording of types 1 and 2 diagnoses increased.[216] This may contribute to an increased number of hospitalizations categorized as PAH. However, Figure 4.8 on page 153 shows a constant gap between the mean hospitalization and PAH rates over time, indicating that there has not likely been a disproportionate increase in PAH. Assuming that the expert panel was correct in including the type 1 cases in the definition of PAH, any effect of the increased coding would likely result in increased sensitivity (true positive rate)[217] of the measure over time because more of the true preventable hospitalizations would be captured as PAH. However, the false positive rate may also have increased. If both true and false positives increased, then there would be a resulting decrease in specificity (true negative rate).[217] Alternatively, if only the true positives increased, with no concurrent increase in false positives, then the specificity

would be unaffected because the probability of correctly classifying the truly non-preventable cases would not change. Because the role of the PAH measure is to serve as an indicator of *potential* quality issues, a more inclusive definition with higher sensitivity is desirable despite the potential for an increased false positive rate.

5.1.3 PAH as a (Quality) Indicator of Preventive Care

Our facility-level analyses were intended to explore the extent of overlap between the new PAH indicator and existing QIs. In general, QIs in continuing care tend to be related to organizational, facility-level factors such as ownership, size, staffing, age distribution, and types of care provided.[218] Previous research has indicated that elements of staff training, human resources and availability of specialized services affect the likelihood of PAH.[19, 32, 80] To date, no other studies have looked at the relationship between QIs and PAH rates.

We compared facilities with better than average (indicating potentially "superior quality") and worse than average (indicating potentially "poorer quality") performance on the QIs to those with average performance. We found that the PAH rate was independent from most of the QIs and the few relationships observed did not show a consistent pattern. For example, both superior and poorer quality performance on the "depressed & anxious" QI predicted increased PAH rates. This supports the idea that the PAH measure may be accessing an element of quality that is distinct from those already captured by the existing QIs. However, one cannot discount the possibility that the examination of aggregate PAH with individual QIs may have contributed to the null and inconsistent findings. The general aim of this study was to explore the independence of the PAH measure from exisiting QIs. Had the aim been to investigate associations between

indicators of the quality of care in facilities and subsequent hospitalization for PAH conditions, then a different approach would have been undertaken. For example, individual PAH conditions would have been examined and a longitudinal (versus cross-sectional) approach would have been employed. An alternate approach to address our question of independence may have been to aggregate the QIs (i.e., the number of QIs on which a facility ranked poorly) as well as the PAH. This approach may be considered for future work although it risks further masking relationships and also does not assess the relationship between PAH and the individual QIs in their commonly used form. The exploratory results of this study indicate that PAH rates may offer an independent measure of quality of preventive care in the continuing care setting. However, further analyses and application of the indicator are necessary to confirm this hypothesis.

At a facility level, the three facility characteristics available showed substantial overlap and there were few large, freestanding facilities. For these reasons, rural location was chosen as a control variable in this part of the analysis. Previous research has indicated that there may be a weaker relationship between primary care and ACSC rates in rural areas for general population.[84] In our sample, rural CCC facilities were more likely to have poor performance on the "restraint use" QI.

In addition to rural status, we adjusted for the number of clinical practice guidelines in place and average nursing hourly wage (proxy for nursing skill mix). In quality measurement, risk-adjustment must be handled very carefully in order to avoid over-adjusting and masking differences in quality.[35] For this reason, other QIs were not included in the model for each QI. One risk of our adjustment strategy is that the number of clinical practice guidelines and nursing skill mix may also be considered elements of

the quality of preventive care provided. However, our interest was in establishing whether the QIs had independent relationships with PAH rates. Although none of the potential confounders were significant predictors of PAH rates at the bivariate level, only the "ADL loss" (poorer quality), "depressed & anxious" (both superior and poorer quality), "pain" (superior quality), and "walking improvement" (poorer quality) QIs were related to increased PAH rate after adjustment. The "incontinence" (superior quality), "worsening locomotion" (poorer quality), and "urinary tract infection" (poorer quality) QIs were all affected by the adjustment. Neither the adjusted nor the unadjusted analyses showed consistent relationships between any of the QIs and the PAH rates.

Facility-level PAH rates are the visible tip of the preventive care iceberg. As such, the PAH measure likely underestimates the overall rate of potentially preventable illness and many other individual residents may be experiencing a similar lack of preventive care. However, the PAH measure is intended to capture the most serious of these and variations in facility-specific rates may indicate the extent and quality of preventive care provided in continuing care. Research into the underlying sources of variation in performance indicators across continuing care facilities has been identified as a priority for policy development in Canada.[219, 220] The development of an indicator for use in the measurement of the quality of preventive care provided in continuing care facilities contributes to this research. It provides an additional tool to measure the various dimensions of quality and to make sense of a complex interplay of many factors affecting quality of care.

5.1.4 Predictors of Resident-level PAH

Interactions: Cognitive Impairment and Length of CCC Stay

Previous work has demonstrated that residents with **cognitive impairment** are less likely to be hospitalized than those without impairment.[1, 6, 19, 32, 155] However, the literature also suggests that the risk for PAH may be increased with the presence of cognitive impairment.[90] Carter found no relationship between cognition and PAH.[19] Our bivariate results showed that the highest risk of PAH was found in the borderline cognitively impaired group. Thus, differing cut-offs for cognition may be responsible for conflicting results in the previous literature. In both the ACSC and PAH models, there were significant interactions between cognitive impairment and several other predictors. Younger age among long-stay residents became a weaker predictor of ACSC and PAH with increasing cognitive impairment. However, most of the interactions with increasing cognitive impairment resulted in stronger predictions of ACSC and PAH (such as male sex, advanced directives, and chronic conditions). Previous research has shown that facility-level effects are stronger predictors of variation in hospitalization rates among older institutionalized people with dementia than those without.[221] Bravo and colleagues found that cognitive status modified the relationship between the quality of care provided in Canadian continuing care facilities and survival of residents.[167] Residents with lower cognitive status received care of lesser quality and had poorer outcomes.[167] Thus, cognitive status may affect the quality of preventive care that residents receive, resulting in a stronger role for demographic and clinical predisposing factors.

At a bivariate level, long **length of CCC stay** was a very strong predictor of higher risk for PAH. This is in contrast with Carter's finding that length of nursing home stay

did not affect PAH risk[19] and in stark contrast with the studies that have observed a higher risk of hospitalization for short-stay residents.[9, 19, 59, 150] Long-stay residents were more functionally impaired and more likely to be transferred to an acute facility for a PAH or other hospitalization. Short-stay residents were a more clinically unstable group, likely post-acute, and were likely to either die or have none of the outcomes of interest in this study, possibly recovered and discharged home. CIHI reported that 31% of short-stay CCC residents were discharged to home in 2004/05 versus 16% of long-stay.[14] This profile of short-stay CCC residents is atypical of the traditional continuing care resident. The relevance of the predictor variables for the ACSC and PAH measures varied substantially by length of CCC stay. For example, age and advanced directives only decreased the odds of PAH/ACSC for long-stay residents. In contrast, the risk among short-stay residents was significantly impacted by ADL impairment to a greater extent than long-stay residents. These interactions with length of stay were supported by the discussions of the expert panel, who expressed the need to investigate short and long-stay groups separately.

Sociodemographic Predictors of PAH

Although younger age was a statistically significant predictor of PAH in bivariate and multivariate analyses, there was little spread in mean age over the outcome groups (from 79.1 for non-PAH to 80.8 for death within one year). We found that younger age predicted PAH for long-stay residents without cognitive impairment. Other findings from community-based seniors conflict with ours and show that older age predicted PAH.[20, 26, 90, 91, 153] Carter's was the only previous study to report on the role of age on ACSC hospitalization from continuing care and she found no relationship.[19]

Our results showed that male CCC residents who were cognitively impaired had a higher risk of PAH. Females were not at higher risk in any stratum. The literature has shown conflicting findings with respect to sex. In two investigations examining residents of continuing care, males had a lower risk for PAH.[19, 90] However, the risk for males appeared to vary by condition because McCall found that males had a lower risk of hospitalization for chronic lung disease but not for CHF or dehydration.[91] Our sample differed from most continuing care samples with respect to sex distribution. Because many of Ontario's CCCs are veterans' hospitals, they house a disproportionate number of men. Forty percent of our sample was male versus 23% in Intrator's sample[32] and 21% of Carter's sample[19]. In congruence with previous findings,[20, 153] we observed that marital status was not a significant predictor of PAH risk. Zimmerman found that the frequency of visitors at a facility-level was predictive of a lower PAH risk.[80] However, we found that contact with family and friends was not a significant predictor of outcomes at the individual resident level.

Health and Functional Status Predictors of PAH

Over half of all older persons admitted to a CCC facility in Ontario had at least one **pre-existing chronic ACSC** recorded on the MDS 2.0 assessment. Not surprisingly, this placed residents at higher risk for PAH but not other hospitalization. Similarly, McCall found that the strongest indicator of ACSC hospitalization was the occurrence of an ACSC hospitalization in the prior year.[91] This indicator of pre-existing ACSC was not used in multivariate modelling because it was felt to be defined too closely to the PAH outcome.

The presence of a "do not hospitalize" or "do not resuscitate" **advanced directive** decreased the proportion of residents who experienced both PAH and other hospitalization in bivariate analyses. Despite this, the bivariate risk of experiencing PAH was higher among those with an advanced directive when compared to the risk of experiencing no outcome. This was due, in large part, to the high risk of death in that group. In multivariate modelling, a decreased relevance of advanced directives in predicting PAH risk became more evident. The presence of advanced directives was protective against PAH for long-stay cognitively impaired residents only. This corresponds with findings from Intrator and colleagues who noted that long-stay residents from facilities with high levels of recorded advanced directives had lower risk for PAH.[32]

In bivariate analyses, **ADL impairment** appeared to play an important role in increasing the risk of PAH among CCC residents. In multivariate analyses, decreasing ADL impairment was related to decreasing risk of PAH but only for short-stay residents. Short-stay residents were less impaired with respect to ADL than long-stay residents. However, the impact of that impairment appeared to be greater. Contrasting results have been found in the literature. In general, increased ADL impairment has been associated with increased risk[6, 9, 32] or no risk[19, 59, 151] for overall hospitalization. Our results suggest that similar relationships exist for PAH. However, in her examination of long-term care facility residents, Carter found that the risk of ACSC hospitalization was decreased with ADL impairment.[19]

For all length of stay and cognitive groups, MDS-CHESS score, indicating **health instability**, was the strongest predictor of PAH and hospitalization. This finding was consistent with previous work from Fried and Mor who showed that the most frail

residents were the most likely to be hospitalized.[6] The health instability score does not directly represent frailty. Instead, it measures health instability as an outcome of frailty, based on deterioration of ADL function or cognitive status, shortness of breath, dehydration, edema, and vomiting, end-stage disease, weight loss, and not eating.[186] It is a strong and independent predictor of death in older institutionalized residents[186] and has been shown to predict hospitalization in older home care clients.[222] The health state that is captured by this measure is common in the CCC environment with almost half of all residents scoring at a level of two or higher on the 0-5 range scale. The CHESS was developed to serve as a trigger for more intensive preventive care to avoid the tipping of the tenuous balance toward adverse outcomes.[186] Because the measure was published in 2003, after the study period of interest, it was clearly not being used as a screening tool for intensive preventive care within Ontario's CCCs during the time period measured. One important implication of this finding is that the most clinically unstable residents, who may be the least likely to benefit from hospitalization and the most vulnerable to adverse effects of transfer and hospitalization, are the most likely to be hospitalized.

The impact of **depression** on PAH has not been extensively studied. In our multivariate models, we found that the presence of depression was not a significant predictor of PAH in any stratum. Likewise, Carter found that there was no relationship between mental illness and ACSC hospitalization from LTC.[19] In contrast, Niefeld found that among diabetic community-based older persons, depression increased the risk for PAH.[90] Our results indicate that there may be an increased risk of other hospitalization and death for short-stay cognitively intact residents who display symptoms of depression. Thus, the role of depression in predicting outcomes for continuing care residents may

depend on the presence of specific chronic conditions and the types of care that the residents require. Although 18% of the sample showed scores indicative of depression, depressive symptoms may be under recognized and underreported among older persons.[223] This may have contributed to non-differential misclassification of residents' depressive status, resulting in a tendency to observe null findings.

Our findings indicated that there was no significant relationship between **psychotropic medication use** and PAH. In the original ACSC analysis, a higher proportion of residents using psychotropic medications experienced other hospitalization than ACSC hospitalization. With the addition of falls in the revised PAH measure, there was a higher proportion with PAH than other hospitalizations. This was expected because psychotropic medication use is a known risk factor for falls. This reversal was not sufficient to demonstrate a significant relationship with PAH.

The presence of a trigger for the **communication and behaviour difficulty** Resident Assessment Protocols (RAPs) predicted a slightly higher risk in bivariate analyses. However, multivariate analyses showed that they were not independent predictors of risk for PAH, other hospitalization, or death. This is consistent with Barker and colleagues who found that abusive and wandering behaviour did not predict hospitalization from skilled nursing facilities in the U.S.[10]

In general, we found no relationship between the presence of four or more **chronic condition**s and increased risk for PAH except among short-stay patients with borderline cognitive impairment. This was an unexpected finding given previously reported relationships between the number of comorbid conditions and the likelihood of PAH.[26, 90, 91] For example, Wolff found that four or more chronic conditions increased the risk of

ACSC hospitalization by 98.5 (95%CI: 86.1 to 112.7) compared to no chronic conditions.[26] However, these studies were conducted among community-based populations where management of multiple conditions would be more fragmented than in a CCC facility. Niefeld and colleagues reported that older persons with 10 comorbidities consulted with an average of 28 different physicians in one year compared with 6 for those with only diabetes.[90] Also, adherence to and coordination among multiple treatment regimens may be alleviated somewhat in institutionalized populations where the care is more streamlined. The inverse relationship between the number of chronic conditions and death in several strata was also surprising. One possible explanation may be that CCC residence with a small number of conditions may be a marker for the severity of those conditions.

CCC Facility Predictors of PAH

The proportion of residents who experienced a PAH was higher for large, urban and freestanding CCC facilities. These characteristics were highly correlated with one another. For that reason, one characteristic was chosen for the resident-level analyses. Because prior studies have examined only freestanding continuing care facilities,[19, 32] the freestanding versus adjoined facilities characteristic was selected as the most relevant for the analysis. In addition, because adjoined CCC facilities may consist of just a few beds or one ward within an acute care hospital, the resources available to adjoined facilities were felt to exceed those in freestanding facilities.

Residing in an adjoined CCC was protective against PAH in bivariate analysis. This persisted in the multivariate analysis for two strata only: the long-stay borderline cognitively impaired and the short-stay cognitively impaired. The direction of the effect

was as anticipated. When an acute event or complication of ongoing chronic condition occurs within an adjoined CCC that has little distinction from the acute hospital, limited acute resources may be used without reassigning the resident to acute care services. Thus, the risk of PAH was reduced. However, of note, the risk of other hospitalizations were unaffected by adjoined status. This is congruent with Murtaugh's finding that adjoined status of the facility did not predict the likelihood of hospitalization.[9] There seems to be a specific effect on PAH in the presence of cognitive impairment. Further investigation into the differences in practices between the adjoined and freestanding facilities would assist our understanding of this complex finding.

In summary, the results support the importance of cognitive impairment in determining risk for PAH. Across all strata, the risk was highest for those with high levels of health instability. The CHESS score, on which the health instability definition was based, was developed to highlight potential for prevention efforts. Thus, these results further support a focus on CHESS to avoid poor outcomes.

5.1.5 Differences between ACSC and PAH Results

Overall, the predictors of the revised PAH showed a similar pattern as the relationships observed with the original ACSC approach. However, there were some notable differences. Most of the differences between the results using the ACSC and PAH measures can be at least partially explained by the inclusion of falls in the definition of PAH. For instance, one difference was that the PAH definition classified a higher proportion of residents into the impaired cognition RUG group. A review of predictors of falls in older persons revealed that cognitive impairment is a predictor of both falls overall and falls causing injury.[224]

At a facility level, analyses showed that higher rates of PAH were associated with poorer performance on the "depressed & anxious" QI. Depression has been associated with increased risk of falls in older persons.[224, 225] However, in multivariate analyses, superior performance on this QI also predicted higher rates of PAH. This apparently contradictory finding cannot be readily explained by the inclusion of falls or septicaemia in the definition of PAH. One possibility is that some facilities providing poor preventive care (as measured by high PAH rates) also rely heavily on hospital services, transferring their residents before their individual QI triggers have an impact on the facility's overall QI score.

While most of the differences between the ACSC and PAH relationships can be attributed to the inclusion of falls/fractures, the inclusion of septicaemia also had an impact on the observed predictors. PAH rates showed bivariate relationships with superior performance on the "incontinence" QI and poorer performance on the "UTI infection" QI. UTI is a common cause of septicaemia in older institutionalized populations.[226] The opposite relationships between PAH and these two QIs suggest that incontinence and UTI may have an inverse relationship. The MDS 2.0 classifies catheterized residents as continent. If facilities are performing better on the incontinence QI, then they may be using more catheters, which can increase the risk of UTI.

Discrepancies between the odds of PAH and other hospitalizations was generally lower in the revised analysis. This indicates that there may be weaker relationships with the resident characteristics with the more inclusive PAH measure.

5.2 Study Limitations

The data used for this study were administrative health data mandated by the Government of Ontario for monitoring and financial purposes. One limitation of using these data is that they were collected for non-research purposes, resulting in a potential lack of refinement of the variables, coding errors and missing information. However, a benefit of using administrative data is that they require fewer resources than primary data collection, provide complete coverage of CCCs in the province of Ontario, and allow for longitudinal follow-up of individuals. We were able to link data across settings, providing a more complete picture of the continuing care experience over multiple years. Data that were collected by the hospital were used to examine CCC practices, limiting the potential for biased reporting by CCCs. For this specific project, the benefits of using administrative data outweighed the limitations. Using readily available data to define PAH helps to ensure that the measure will be practical and more likely to be used and further refined over time.

One potential limitation was introduced by the application of ACSC methodology to Canadian hospital data. The Canadian hospital diagnostic coding standards are based on resource use and do not specifically identify the condition that prompted the hospital admission as the U.S. standards do. As such, there is a possibility that pre-existing ACSCs (identified in over half of CCC admissions) that are exacerbated by other non-preventable conditions or by the hospital stay itself will be captured and mistakenly attributed to a deficiency in preventive care provided in the continuing care facility. This misclassification could be further exacerbated by including the Type 1 conditions in addition to the Type Ms. However, despite this potential limitation, the inclusion of Type

1 in addition to pre-existing Type M diagnoses in the definition of PAH provides an advantage over the U.S. approach of only including the principal diagnosis. This approach ensures that all preventable conditions, regardless of whether or not they were retrospectively determined to be the reason prompting hospitalization or the most responsible for hospital resource use, are captured as PAHs.

There will always be PAHs that were not actually preventable, resulting in misclassification of a hospitalization as potentially preventable. The approach taken in the development of the PAH indicator was to aim for greater capture of hospitalizations that could potentially have been avoided. That is, the focus was on the sensitivity of the measure rather than the specificity. The result is an indicator that classifies over 50% of hospitalizations from continuing care as potentially avoidable. While this is a high number of cases to consider for intervention and may raise questions about the utility of the indicator, the goal was to narrow the focus for continuing care facilities to begin to ascertain why their rates of PAH may be higher or lower than peer facilities. By comparing a narrower category of hospitalizations rather than the overall hospitalization rates, the effect of the case-mix within the continuing care facilities is lowered.

In our analysis, we used an aggregate measure of PAH, introducing potential limitations in the analysis and the long-term practical use of the measure. First, comparisons of rates for individual conditions may be more helpful for targeted intervention than comparisons of overall hospitalization rates. However, comparisons that focus on individual PAH conditions may take prevention focus away from other conditions. Second, use of the aggregate PAH to indicate the quality of preventive care may allow continuing care facilities to compensate for poor preventive care in one area

by establishing high quality preventive care in another. This risk can be mitigated by using the aggregate PAH rate along with individual PAH rates in practice. Third, in our analyses, use of the aggregate measure may have contributed to an aggregation bias. For instance, if psychotropic drug use is related to increased risk of hospitalization for falls but lower risk of hospitalization for UTI, then the overall finding may be no relationship between drug use and PAH. However, because the purpose of this study was to examine the aggregate PAH measure as a potential indicator of the quality of preventive care, the decision was made to maintain the aggregate measure. For more focused research and policy questions about the underlying causes of high PAH rates, examining the individual PAH conditions would be a more useful approach.

Decisions about categorizing predictor variables (e.g., cognitive status, ADL status) were made based on clinical input, published literature, and the distribution of the data. The coding choices made may have impacted the findings and masked relationships that may have existed. However, altering these cut-offs based on the results observed is not appropriate.

In assessing the validity and attributes of the PAH measure, the present study was limited by the content of the administrative data available. Using the DAD and MDS 2.0 data, we were unable to measure other potentially relevant factors such as market characteristics, physician practices and availability, past health history (e.g., preventive health practices, socio-economic indicators, among others), satisfaction with care, and severity of illness. However, previous research examining market and detailed facility-level variables have not found these factors to be clearly relevant. While the MDS 2.0 contained general information on the number of medications and the use of psychotropic

medications, we lacked specific drug data to look at the relationship between PAH rates and the appropriateness of prescribing in continuing care. The MDS 2.0 has an optional section for recording medication information but this is not mandated for use in Ontario at the present time.

We also lacked the ability to investigate availability of specialized medical services in the CCC facilities. These factors, such as laboratory testing and respirator capability, were indicated by the expert panel to be important in the prevention of ACSC hospitalization. They were also central to the definition that Finucane and colleagues used to define avoidable hospitalizations in their expert review of continuing care hospitalizations.[21] A recently published evaluation of a clinical pathway showed that hospitalizations for pneumonia were reduced by enhancing the ability of continuing care facilities to treat pneumonia.[227] However, studies led by Zimmerman and Intrator found that the availability of intravenous therapy and laboratory or x-ray on-site did not predict ACSC hospitalization.[32, 80] This may be because diagnostic and treatment facilities are more relevant to the appropriateness of the decision to hospitalize a resident once the condition has deteriorated to the point where intervention is necessary. While these findings may seem counterintuitive, they may indicate that ACSC measures the effectiveness of preventing deterioration rather than the ability of the continuing care facility to treat acutely ill residents. However, further research will be necessary to confirm the role of on-site medical service availability on ACSC and PAH rates.

To accurately measure the prevalence of preventable acute events or to untangle their web of causation would require detailed information at the local or continuing care facility level with comprehensive knowledge of the role of market-level factors.

However, surveillance and detection of variations in care, potential areas for quality improvement, and monitoring of resource allocation should be based on routinely available data at the national, provincial or regional level.[78] In an effort to preserve scarce quality improvement dollars in the Canadian health system, more costly and detailed initiatives designed to assess individual situations and improve care in a single facility can be first informed by large-scale indicators, such as PAH, designed to flag potential areas of concern. Until the elements of effective preventive care are better understood, variations in PAH rates may be difficult to interpret. However, uptake and use of the PAH measure will contribute to further knowledge about the nature of effective preventive care.

The PAH indicator itself should be periodically re-examined as new continuing care policy and research findings emerge. The PAH indicator was developed by nine experts who represented their own state of knowledge and experience at a single point in time. Although the results of the expert panel demonstrate a high level of consistency with the existing research literature and previous definitions, a different group of experts may have come to a different consensus.

5.2.1 Generalizability of Predictors to Other Continuing Care Settings

Although the PAH measure was generated to be applicable to residents of continuing care generally, including non-hospital-based LTC facilities, our study setting and population differed in some ways from typical LTC residents. Unlike traditional continuing care facilities, many CCCs in Ontario are adjoined to acute facilities. In some small towns, CCC beds may be within regular acute care units. The diagnostic, staffing, and therapeutic resources available in these CCC settings is likely different from

freestanding facilities, including most other continuing care facilities. To address this, we adjusted for freestanding status in our analysis of predictors of PAH, hospitalization, and death.

In Nova Scotia's nursing homes, MDS 2.0 data are submitted to CIHI as part of the same reporting system that holds the OCCPS data. CIHI reported that, for the 2004/05 fiscal year, the hospital-based CCC population in Ontario differed from the nursing home-based population in Nova Scotia.[14] They reported that nursing homes had an older population and fewer residents with a length of stay less than 92 days than CCCs. Nursing homes also had fewer residents who were admitted from acute facilities, died in the facility, were discharged home, were diagnosed with cancer, and had high resource intensity. The average scores for health instability, ADL impairment, and depression were lower in nursing homes. There were also more residents discharged to acute care and a higher proportion with dementia. The cognitive performance scores were similar between nursing homes and CCCs.[14]

Of these differences, the key factors that may influence the transferability of the PAH measure are the differences in length of stay, because length of stay interacts with many of the predictors of PAH, and the differences in health instability, because it was the strongest predictor of PAH. When applying the PAH indicator to a non-hospital continuing care setting, the predictors will likely follow the long-stay profile more closely, with cognition and health instability playing key roles in predicting PAH. Because CCC residents have higher levels of health instability and ADL impairment, we may expect the rates of PAH to be higher in CCCs. Conversely, CCCs have fewer discharges to acute care, perhaps because they have more resources for providing

complex medical care. Thus, given similar patients, nursing homes are likely to have higher rates of PAH. These resource availability factors are critical in interpreting observed differences in PAH rates between hospital and non-hospital based continuing care. Because CCCs are part of the public hospital sector, there may be less of a role of choice than in the LTC sector. CCCs in large centres often specialize and there are few in smaller towns, resulting in a more rigid system. Thus, different factors may affect LTC facilities compared with CCC facilities and bed availability may matter to a different extent.

Some evidence suggests that residents who receive a comprehensive assessment, such as the MDS 2.0, have a lower probability of hospitalization.[151] Thus, the measurement tool may influence exposure to hospitalizations and ACSC hospitalizations. However, in this instance, the assessment could not act as a confounder because all patients studied will have been assessed with the MDS 2.0. Instead, it affects the generalizability of the rates to other continuing care settings that are not using a comprehensive assessment such as the MDS 2.0.

5.3 Implications and Opportunities

5.3.1 Further Research

The proposed PAH indicator is based on data from residents who were hospitalized for their conditions to draw inferences about the quality of preventive care and management of chronic conditions in continuing care. This indicator provides an accessible and inexpensive method of monitoring potential quality concerns in continuing care. However, a clearer picture of the management of chronic conditions begs data collection within the continuing care setting itself. The most pressing need for further

research in this area is further validation of the PAH indicator by conducting a detailed chart review to validate the administrative data-based definition of PAH against objective criteria. The extent of capture of "true" avoidable hospitalizations could be assessed and the role of the PAH measure in decision-making and planning could be clarified. Despite this gap, the introduction of PAH rates as a potential measure of the quality of preventive care need not be delayed. Use of the indicator and exploration of the variations between resident groups and facilities will contribute to the ongoing validation of the measure.

Before the measure can be validated against gold standard detailed criteria for PAH, our understanding of effective primary care and the elements that contribute to it must be honed.[211] Collection of data specifically targeting elements of quality preventive care would be helpful in isolating the effect of each element on different PAH conditions.[35] For example, rehabilitation, patient adherence, timely diagnosis, timing of treatment seeking and monitoring for early signs of exacerbation may all contribute to the quality of preventive care of chronic conditions. More in-depth detail on these elements would help to further refine the PAH measure to reflect the elements of effective preventive and management of chronic conditions outside of the hospital.

In addition to investigating the specific elements that contribute to effective preventive care, future research in this area must also turn attention to the outcomes of hospitalizations that could have been avoided. Hospitalization of continuing care residents has been found to be accompanied by ADL decline,[4, 228] cognitive decline,[228] and mortality.[108] Previous research has shown that the average 1-year mortality for continuing care facility residents is approximately 28%.[4, 202, 229] Very little exploration has been undertaken into the potentially increased risk of mortality and functional decline

for those who experience a PAH. For pneumonia hospitalizations, mortality rates appear to be higher for those who are hospitalized compared to those who are not.[18, 230] These outcomes require further exploration.

The expert panel identified the emergency department (ED) as an important gatekeeper for acute hospital use in the Canadian health care system. In addition, the panel pointed out that some continuing care facilities transfer residents to ED primarily for diagnostics or acute management when resources are not available in the facility. One opportunity for future work would be to link the DAD and CCRS data to Ontario's ED data, which are held in the National Ambulatory Care Reporting System (NACRS) and are available at ICES. With these additional data, questions could be addressed related to the proportions of residents who visit EDs to access diagnostic facilities or other services but who are not hospitalized. These transfers may also inform the quality of preventive care in continuing care and are missing from the present study. However, at the present time, a simple measure requiring linkage to only one dataset is preferred.

5.3.2 PAH in Policy and Practice

Reporting PAH

There are several options for presenting PAH rates. The option used in this report was to aggregate all 18 PAH conditions to one overall measure of PAH. The advantages of this approach are that it produces a more statistically stable estimate because the events are less rare. Also, it is a simplified measure that does not result in an overload of information for decision-makers. However, aggregate measures may obscure underlying processes whereby improving the quality of preventive care for one condition may mask quality problems in the treatment of other conditions.

An alternate option would be to present each PAH condition individually, which, as the expert panel suggested, would make the indicator more amenable to planning action in individual continuing care facilities. The expert panel suggested that layering the reported measures may be useful. For example, the aggregate PAH measure could be provided for overall summary comparisons between facilities and then the individual PAH rates could be provided at a greater level of detail to individual facilities. If individual conditions were presented separately, there would have to be a decided hierarchy of conditions because all diagnosis fields are used and many hospitalized residents had more than one PAH condition. For example, if a person was hospitalized for a most-responsible diagnosis of CHF, he or she is likely to also have had hypertension listed as a type 1 diagnosis. In this case, the CHF is clearly the salient condition. However, if a person was hospitalized for a most-responsible diagnosis of cancer but also had unmanaged diabetes and hypertension, it is less clear which category he or she would fall into. Decisions about which conditions to report individually should also be guided by their frequency and usefulness. For example, perhaps the dental condition component is too rare to present at a facility level. These diagnoses would remain in the aggregate PAH measure despite being rare.

A third option would be to aggregate the PAH conditions in some other way. For example, McCall and others have suggested using three categories of ACSCs: acute, chronic, and preventable.[153, 231]

The aggregate PAH measure may best be used as an overall indicator of preventive care. For individual facilities, supplementing the overall PAH measure with the rates of hospitalization for individual conditions embedded in the PAH measure is likely to be

more "actionable" for program planning. A benchmarking diagram that compares each facility to overall rates or those for other peer facilities would likely be helpful.

Possible Applications of the PAH Measure

Rates of PAH can be used to examine health system performance, evaluate policy changes, and audit the quality of preventive care.[35] The purpose of the newly developed PAH measure is to flag potential barriers in access to quality preventive care in Canadian continuing care facilities. The measure is best viewed as a screening test with imperfect sensitivity (true positive rate) and specificity (true negative rate). The measure is not designed to capture only true positives. Thus, there will always be a level of PAH that cannot actually be prevented. Observed variation in PAH rates is meant to serve as a trigger to more in-depth investigation.

The expert panel defined the PAH measure to capture hospitalizations that may have been avoided with higher quality of preventive care in the continuing care facility. The PAH measure is not intended to highlight inappropriate hospital days or admissions, as are captured using utilization review measures. An important assumption in developing the PAH measure was that the acute event may have been preventable but the hospitalization itself may have been appropriate given the acuity of the situation.

The overall PAH measure is likely to be most useful for regional planners to determine distribution of resources. Continuing care facilities may have different abilities to treat and manage acute events without hospitalization, limiting the ability of the PAH measure to consistently capture acute exacerbations of existing illness. One role of the PAH indicator could be to identify variation between facilities with different capacities that can be further explored. If PAH variations are found to arise because of different

resources, rather than different preventive practice patterns, this would have implications at a health system policy level and the equitable distribution of resources. It may be that these differences are acceptable, in which case a PAH measure stratified by resource availability would be most informative. The use of the PAH measure would assist to make these decisions explicit and to ensure that the patient populations are suited to the resources available.

One caution when using the PAH rate as an indicator of a facility's preventive care activities is that over-focusing on PAH in isolation may promote underutilization of the hospital when it is necessary and appropriate. Thus, mortality rates and advanced directives are important factors to be taken into consideration in conjunction with a PAH rate. In the current study, death was considered a separate outcome and the presence of advanced directives was controlled for in the analysis of predictors of hospitalization rates.

For this investigation, an episodes of care approach was taken where the CCC and acute care stays were linked together to form one episode. Because few residents were discharged home and then readmitted to the CCC system, the number of episodes was not substantially different from the number of separate admissions. However, this approach ensured that the admission characteristics used in the analysis of predictors of PAH were collected on admission to the CCC setting. Using this approach, the effects of a prior CCC admission were minimized. Examining episodes also takes an intent-to-treat type of approach to examining the effect of facility characteristics and QIs on PAH rates. For example, if poor quality CCC facilities are more likely to directly transfer residents to other CCCs and then these patients are subsequently hospitalized for poor quality of care,

the facility characteristics of the first CCC are correctly associated with the high PAH rate. In contrast, if the stay in the first CCC was short or the poor preventive care occurred in the second CCC, the high PAH rate may be assigned to the incorrect facility. However, inter-CCC transfers within episodes were rare (<1%) and over 93% of the episodes included only one CCC stay. This approach was appropriate for the rigour of a research study. However, further discussion and investigation is needed to determine a suitable approach for addressing inter-facility transfers if the PAH is to be used as a QI at a continuing care facility level. In this case, including all patients regardless of whether they were transferred from another CCC may be more informative for the facility.

The goal of this study was to develop the PAH indicator. The next step is to use the indicator and begin to tease apart the various factors that may contribute to higher or lower rates of PAH. In Switzerland, inappropriate hospital admission, as measured by the AEP, was decreased from 15% to 9% following an intervention designed to determine the causes of inappropriateness and modify the processes.[69] Although the PAH measure provides different information than the AEP, the measures can be used in similar ways: to identify areas for further study and improvement.

5.4 Conclusions

This study contributes the first Canadian data-based definition of PAH from continuing care. The PAH measure is grounded in previous work in other settings as well as the consensus of a panel of experts. The resulting PAH measure can be used to uncover variations in patterns of hospitalization that may be avoidable with an enhanced focus on preventive care in the continuing care setting. This study is the first to examine rates and predictors of PAH and hospitalizations using administrative data from an entire

population of institutionalized older adults in Canada. Previous research has shown inconsistent results with respect to predictors of PAH and this study contributes results for a Canadian sample and CCC setting to the literature in this area. Our results showed that PAH rates varied across facilities and that the measure distinguished between resident groups (e.g., long versus short-stay, cognitively impaired versus intact). Use of the PAH measure in practice and research will further enhance its utility in health care decision-making.

REFERENCES

1. Coburn AF, Keith RG, Bolda EJ. The impact of rural residence on multiple hospitalizations in nursing facility residents. The Gerontologist 2002;42(5):661-6.

2. Castle NG, Mor V. Hospitalization of nursing home residents: A review of the literature, 1980-1995. Medical Care Research and Review 1996;53(2):123-48.

3. Coleman EA, Barbaccia JC, Coughan-Minihane MS. Hospitalization rates in nursing home residents with dementia: A pilot study of the impact of a special care unit. Journal of the American Geriatrics Society 1990;38(2):108-12.

4. Eaton CB, Lapane KL, Murphy JB, Hume AL. Effect of statin (HMG-Co-A-Reductase Inhibitor) use on 1-year mortality and hospitalization rates in older patients with cardiovascular disease living in nursing homes. Journal of the American Geriatrics Society 2002;50:1389-95.

5. Freiman MP, Murtaugh CM. Interactions between hospital and nursing home use. Public Health Reports 1995;110:546-54.

6. Fried TR, Mor V. Frailty and hospitalization of long-term stay nursing home residents. Journal of the American Geriatrics Society 1997;45:265-9.

7. Frijters DH, Mor V, DuPaquier J-N, Berg K, Carpenter GI, Ribbe MW. Transitions across various continuing care settings. Age and Ageing 1997;26-S2:73-6.

8. Hutt E, Ecord M, Eilertsen TB, Fredrickson E, Kramer AM. Precipitants of emergency room visits and acute hospitalization in short-stay medicare nursing home residents. Journal of the American Geriatrics Society 2002;50:223-9.

9. Murtaugh CM, Freiman MP. Nursing home residents at risk of hospitalization and the characteristics of their hospital stays. The Gerontologist 1995;35(1):35-43.

10. Barker WH, Zimmer JG, Hall WJ, Ruff BC, Freundlich CB, Eggert GM. Rates, patterns, causes, and costs of hospitalization of nursing home residents: a population-based study. American Journal of Public Health 1994;84(10):1615-20.

11. Canadian Statistics: Population by sex and age group, by province and territory. Statistics Canada, 2006. (Accessed May 26, 2006, at http://www40.statcan.ca/l01/cst01/demo31a.htm.)

12. Teare GF, Rashkovan N, Cernat G. Hospital Report 2005: Complex Continuing Care. Joint Initiative of the Ontario Hospital Association and the Government of Ontario. Toronto: Hospital Report Research Collaborative; 2005.

13. Complex Continuing Care in Ontario: Resident Demographics and System Characteristics. Ottawa: Canadian Institute for Health Information; 2004.

14. Facility-based Continuing Care in Canada, 2004-2005: An emerging portrait of the continuum. Ottawa: Canadian Institute for Health Information; 2006.

15. Creditor MC. Hazards of hospitalization of the elderly. Annals of Internal Medicine 1993;118:219-23.

16. Olsen CG, Ouslander JG, Singer K, Zimmer JG. Keep nursing home residents out of the hospital. Patient Care 1993;October 15:101-25.

17. National Health Expenditure Trends 1975-2005. Ottawa: Canadian Institute for Health Information; 2005.

18. Muder RR, Brennen C, Swenson DL, Wagener M. Pneumonia in a long-term care facility: A prospective study of outcome. Archives of Internal Medicine 1996;156(20):2365-71.

19. Carter MW. Factors associated with ambulatory care-sensitive hospitalizations among nursing home residents. Journal of Aging & Health 2003;15(2):295-329.

20. Culler SD, Parchman ML, Przybylski M. Factors related to potentially preventable hospitalizations among the elderly. Medical Care 1998;36(6):804-17.

21. Finucane P. Use of in-patient hospital beds by people living in residential care. Gerontology 2000;46:133-8.

22. Hayes CB, Johnson Z, Hynes M. Utilisation of hospital beds by the elderly - A cohort study of admissions to a teaching hospital. Irish Medical Journal 1995;88(4):124-6.

23. Jones JS, Dwyer PR, White LJ, Firman R. Patient transfer from nursing home to emergency department: Outcomes and policy implications. Academic Emergency Medicine 1997;4(9):908-15.

24. Saliba D, Kington R, Buchanan J, et al. Appropriateness of the decision to transfer nursing facility residents to the hospital. Journal of the American Geriatrics Society 2000;48(2):154-63.

25. Tsang P, Severs MP. A study of appropriateness of acute geriatric admissions and an assessment of the Appropriateness Evaluation Protocol. Journal of the Royal College of Physicians of London 1995;29(4):311-4.

26. Wolff JL, Starfield B, Anderson G. Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. Archives of Internal Medicine 2002;162:2269-76.

27. Ingold BB, Yersin B, Wietlisbach V, Burckhardt P, Burnand B, Bula CJ. Characteristics associated with inappropriate hospital use in elderly patients admitted to a general internal medicine service. Aging Clin Exp Res 2000;12(6):430-8.

28. Bergman H, Clarfield AM. Appropriateness of patient transfer from a nursing home to an acute-care hospital: A study of emergency room visits and hospital admissions. Journal of the American Geriatrics Society 1991;39:1164-8.

29. Bellelli G, Frisoni GB, Barbisoni P, Boffelli S, Rozzini R, Trabucchi M. The management of adverse clinical events in nursing homes: A 1-year survey study. Journal of the American Geriatrics Society 2001;49:915-25.

30. O'Brien GM, Shapiro MJ, Woolard RW, O'Sullivan PS, Stein MD. "Inappropriate" emergency department use: A comparison of three methodologies for identification. Academic Emergency Medicine 1996;3(3):252-7.

31. Kalant N, Berlinguet M, Diodati JG, Dragatakis L, Marcotte F. How valid are utilization review tools in assessing appropriate use of acute care beds? Canadian Medical Association Journal 2000;162(13):1809-13.

32. Intrator O, Zinn J, Mor V. Nursing home characteristics and potentially preventable hospitalizations of long-stay residents. Journal of the American Geriatrics Society 2004;52(10):1-7.

33. Weissman JS, Gatsonic C, Eptstien AM. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. Journal of the American Medical Association 1992;268(17):2388-95.

34. Pappas G, Hadden WC. Potentially avoidable hospitalizations: Inequalities in rates between US socioeconomic groups. American Journal of Public Health 1997;87(5):811-6.

35. Brown AD, Goldacre MJ, Hicks N, et al. Hospitalization for ambulatory care-sensitive conditions: A method for comparative access and quality studies using routinely collected statistics. Canadian Journal of Public Health 2001;92(2):155-9.

36. Cornette P, Swine C, Malhomme B, Gillet J-B, Meert P, D'Hoore W. Early evaluation of the risk of functional decline following hospitalization of older patients: development of a predictive tool. European Journal of Public Health 2005;16(2):203-8.

37. Sager MA, Francke T, Inouye SK, et al. Functional outcomes of acute medical illness and hospitalization in older persons. Archives of Internal Medicine 1996;156:645-52.

38. Hansen K, Mahoney J, MPalta. Risk factors for lack of recovery of ADL independence after hospital discharge. Journal of the American Geriatrics Society 1999;47(3):360-5.

39. Hirsch CH, Sommers L, Olsen A, Mullen L, Winograd CH. The natural history of functional morbidity in hospitalized older patients. Journal of the American Geriatrics Society 1990;38(12):1296-303.

40. Covinsky KE, Palmer RM, Fortinsky RH, et al. Loss of independence in activities of daily living in older adults hospitalized with medical illnesses: Increased vulnerability with age. Journal of the American Geriatrics Society 2003;51:451-8.

41. Boyd CM, Xue Q-L, Guralnik JM, Fried LP. Hospitalization and development of dependence in activities of daily living in a cohort of disabled older women: The Women's Health and Aging Study. Journal of Gerontology: Medical Sciences 2005;60A(7):888-93.

42. Pedone C, Ercolani S, Catani M, et al. Elderly patients with cognitive impairment have a high risk for functional decline during hospitalization: The GIFA study. Journal of Gerontology: Medical Sciences 2005;60A(12):1576-80.

43. Mecocci P, Strauss Ev, Cherubini A, et al. Cognitive impairment is the major risk factor for development of geriatric syndromes during hospitalization: results from the GIFA study. Dementia and Geriatric Cognitive Disorders 2005;20:262-9.

44. Tanner CE, Eckstrom E, Desai SS, Joseph CL, Ririe MR, Bowen JL. Uncovering frustrations. A qualitative needs assessment of academic general internists as geriatric care providers and teachers. Journal of General Internal Medicine 2006;21(1):51-5.

45. Lovell M. Caring for the elderly: Changing perceptions and attitudes. Journal of Vascular Nursing 2006;24(1):22-6.

46. Vinsnes AG, Harkless GE, Haltbakk J, Bohm J, Hunskaar S. Healthcare personnel's attitudes towards patients with urinary incontinence. Journal of Clinical Nursing 2001;10(4):455-62.

47. Burke RJ. Hospital restructuring, workload, and nursing staff satisfaction and work experiences. The Health Care Manager 2003;22(2):99-107.

48. Rubin G, George A, Chinn DJ, Richardson C. Errors in general practice: development of an error classification and pilot study of a method for detecting errors. Quality and Safety in Health Care 2003;12:443-7.

49. Schimmel EM. The hazards of hospitalization. Annals of Internal Medicine 1964;60:100-10.

50. Sangha O, Schneeweiss S, Wildner M, et al. Metric properties of the appropriateness evaluation protocol and predictors of inappropriate hospial use in Germany: an approach using longitudinal patient data. International Journal for Quality in Health Care 2002;14(6):483-92.

51. Baker GR, Norton PG, Flintoft V, et al. The Canadian Adverse Events Study: The incidence of adverse events among hospital patients in Canada. Canadian Medical Association Journal 2004;170(11):1678-86.

52. Steel K, Gertman PM, Crescenzi C, Anderson J. Iatrogenic illness on a general medical service at a university hospital. New England Journal of Medicine 1981;304:638-42.

53. Forster AJ, Asmis TR, Clark HD, et al. Ottawa hospital patient safety study: incidence and timing of adverse events in patients admitted to a Canadian teaching hospital. Canadian Medical Association Journal 2004;170(8):1235-40.

54. Field TS, Gurwitz JH, Avorn J, et al. Risk factors for adverse drug events among nursing home residents. Archives of Internal Medicine 2001;161:1629-34.

55. Davis P. Health care as a risk factor. Canadian Medical Association Journal 2004;170(11):1688-9.

56. Sloane PD, Zimmerman S, Brown LC, Ives TJ, Walsh JF. Inappropriate medicaiton prescribing in residential care / assisted living facilities. Journal of the American Geriatrics Society 2002;50:1001-11.

57. Noyes MA, Lucas DS, Stratton MA. Principles of geriatric pharmacotherapy. Journal of Geriatric Drug Therapy 1996;10(3):5-35.

58. Nari RF. Prescribing in the elderly: best practice. Geriatric Medicine 2002;32(3):19-21.

59. Boockvar K, Lachs M. Hospitalization risk following admission to an academic nursing home. Journal of the American Medical Directors Association 2002;3:130-5.

60. Bobb A, Gleason K, Husch M, Feinglass J, Yarnold PR, Noskin GA. The epidemiology of prescribing errors. Archives of Internal Medicine 2004;164:785-92.

61. The Canada Health Act: Overview and Options. Library of Parliament, Parliament of Canada, PRB 94-4E, 2003. (Accessed June 3, 2006, at http://www.parl.gc.ca/information/library/PRBpubs/944-e.htm.)

62. Flintoft VF, Williams JI, Williams RC, Basinski AS, Blackstien-Hirsch P, Naylor CD. The need for acute, subacute and nonacute care at 105 general hospital sites in Ontario. Joint Policy and Planning Committee Non-Acute Hospitalization Project Working Group. Canadian Medical Association Journal 1998;158(10):1289-96.

63. Eriksen BO, Forde OH, Kristiansen IS, et al. Cost savings and health losses from reducing inappropriate admissions to a department of internal medicine. International Journal of Technology Assessment in Health Care 2000;16(4):1147-57.

64. Vetter N. Inappropriately delayed discharge from hospital: What do we know? British Medical Journal 2003;326:927-8.

65. Tu JV. Utilization review: Can it be improved? Canadian Medical Association Journal 2000;162(13):1824-5.

66. Trerise B, Dodek P, Leung A, Spinelli JJ. Underutilization of acute care settings in a tertiary care hospital. International Journal for Quality in Health Care 2001;13(1):27-32.

67. Panis LJGG, Gooskens M, Verheggen FWSM, Pop P, Prins MH. Predictors of inappropriate hospital stay: a clinical case study. International Journal for Quality in Health Care 2003;15(1):57-65.

68. Gertman PM, Restuccia JD. The appropriateness evaluation protocol: a technique for assessing unnecessary days of hospital care. Medical Care 1991;19:855-71.

69. Kossovsky MP, Copart P, Bolla F, et al. Evaluation of quality improvement interventions to reduce inappropriate hospital use. International Journal for Quality in Health Care 2002;14(3):227-32.

70. Panis LJGG, Verheggen FWSM, Pop P. To stay or not to stay. The assessment of appropriate hospital stay: A Dutch report. International Journal for Quality in Health Care 2002;14(1):55-67.

71. Barriers to Community Care. Final Report. Saskatoon (SK): Health Services Utilization and Research Commission; 1994.

72. Wright CJ, Cardiff K. Acute medical beds: How are they used in British Columbia. Report no HPRU 97:7D. Vancouver: Centre for Health Services and Policy Research, University of British Columbia; 1998.

73. Non-acute hospitalization project - final report. Reference document RD6-3. Toronto: Utilization Steering Committee, Joint Policy and Planning Committee. Ontario Ministry of Health; 1997.

74. DeCoster C, Roos NP, Carriere KC, Peterson S. Inappropriate hospital use by patients receiving care for medical conditions: targeting utilization review. Canadian Medical Association Journal 1997;157:889-96.

75. Wright CJ, Cardiff K. The utilization of acute care medical beds in Prince Edward Island. Report no HPRU 98:14D. Vancouver: Centre for Health Services and Policy Research, University of British Columbia; 1998.

76. Coast J, Peters TJ, Inglis A. Factors associated with inappropriate emergency hospital admission in the UK. International Journal for Quality in Health Care 1996;8(1):31-9.

77. Rodriguez-Vera FJ. The AEP in the assessment of appropriate hospital stay. International Journal for Quality in Health Care 2002;14(5):429-30.

78. Halfon P, Eggli Y. Screening inappropriate hospital days on the basis of routinely available data. International Journal for Quality in Health Care 2001;13(4):289-99.

79. Smeets PMJH, Verheggen FWSM, Pop P, Panis LJGG, Carpay JJ. Assessing the necessity of hospital stay by means of the Appropriateness Evaluation Protocol: How strong is the evidence to proceed? International Journal for Quality in Health Care 2000;12(6):483-93.

80. Zimmerman S, Gruber-Baldini AL, Hebel R, Sloane PD, Magaziner J. Nursing home facility risk factors for infection and hospitalization: Importance of registered nurse turnover, administration, and social factors. Journal of the American Geriatrics Society 2002;50:1987-95.

81. Murtaugh CM. Transitions through postacute and long-term care settings: Patterns of use and outcomes for a national cohort of elders. Medical Care 2002;40(3):227-36.

82. Sim I, Cummings SR. A new framework for describing and quantifying the gap between proof and practice. Medical Care 2003;41(8):874-81.

83. Basu J, Friedman B, Burstin H. Primary care, HMO enrollment, and hospitalization for ambulatory care sensitive conditions: A new approach. Medical Care 2002;40(12):1260-9.

84. Laditka JM, Laditka SB, Probst JC. More may be better: Evidence of a negative relationship between physician supply and hospitalization for ambulatory care sensitive conditions. Health Services Research 2005;40(4):1148-66.

85. Korenbrot CC, Ehlers S, Crouch JA. Disparities in hospitalizations of rural American Indians. Medical Care 2003;41(5):626-36.

86. Billings J, Zeitel L, Lukomnik J, Carey TS, Blank AE, Newman L. Impact of socioeconomic status on hospital use in New York City. Health Affairs 1993;12:162-73.

87. Shah BR, Gunraj N, Hux JE. Markers of access to and quality of primary care for aboriginal people in Ontario, Canada. American Journal of Public Health 2003;93(5):798-802.

88. Bindman AB, Grumbach K, Osmond D, et al. Preventable hospitalizations and access to health care. Journal of the American Medical Association 1995;274(4):305-12.

89. Billings J, Anderson GM, Newman LS. Recent findings on preventable hospitalizations. Health Affairs 1996;15(3):239-.

90. Niefeld MR, Braunstein JB, Wu AW, Saudek CD, Weller WE, Anderson GF. Preventable hospitalization among elderly Medicare beneficiaries with type 2 diabetes. Diabetes Care 2003;26(5):1344-9.

91. McCall NT, Brody E, Mobley L, Subramanian S. Investigation of increasing rates of hospitalization for ambulatory care sensitive conditions among Medicare fee-for-service beneficiaries. CMS Contract No. 500-00-0029, Task Order No. 9: RTI International; 2004.

92. Kozak LJ, Hall MJ, Owings MF. Trends in avoidable hospitalizations, 1980-1998. Health Affairs 2001;20(2):225-32.

93. Basu J. Severity of illness, race, and choice of local versus distant hospitals among the elderly. Journal of Health Care for the Poor and Underserved 2005;16:391-405.

94. Guo L, MacDowell M, Levin L, Hornung RW, Linn S. How are age and payors related to avoidable hospitalization conditions? Managed Care Quarterly 2001;9(4):33-42.

95. Kane RL, Homyak P, Bershadsky B, Flood S, Zhang H. Patterns of utilization of rthe Minnesota Senior Health Options Program. Journal of the American Geriatrics Society 2004;52:2039-44.

96. Kane RL, Keckhafer G, Flood S, Bershadsky B, Siadaty MS. The effect of Evercare on hospital use. Journal of the American Geriatrics Society 2003;51:1427-34.

97. Martinen M, Freundl M. Managing congestive heart failure in long-term care: development of an interdisciplinary protocol. Journal of Gerontological Nursing 2004;30(12):5-12.

98. Last JM. A Dictionary of Epidemiology: Fourth Edition. Oxford: Oxford University Press; 2001.

99. Caminal J, Starfield B, Sanchez E, Casanova C, Morales M. The role of primary care in preventing ambulatory care sensitive conditions. European Journal of Public Health 2004;14(3):246-51.

100. Ackermann RJ, Kemle KA, Vogel RL, Jr RCG. Emergency department use by nursing home residents. Annals of Emergency Medicine 1998;31(6):749-57.

101. Beers MH, Ouslander JG, Fingold SF, et al. Inappropriate medication prescribing in skilled-nursing facilities. Annals of Internal Medicine 1992;117:684-9.

102. Lau DT, Kasper JD, Potter DEB, Lyles A. Potentially inappropriate medication prescriptions among elderly nursing home residents: Their scope and associated resident and facility characteristics. Health Services Research 2004;39:1257-76.

103. Lau DT, Kasper JD, Potter DEB, Lyles A, Bennett RG. Hospitalization and death associated with potentially inappropriate medication prescriptions among elderly nursing home residents. Archives of Internal Medicine 2005;165:68-74.

104. Sloane PD, Gruber-Baldini AL, Zimmerman S, et al. Medication undertreatment in assisted living settings. Archives of Internal Medicine 2004;164:2031-7.

105. McGilton K, Irwin-Robinson H, Boscart V, Spanjevic L. Communication enhancement: nurse and patient satisfaction outcomes in a complex continuing care facility. Journal of Advanced Nursing 2006;54(1):35-44

106. Muder RR. Pneumonia in residents of long-term care facilities: epidemiology, etiology, management, and prevention. American Journal of Medicine 1998;105:319-30.

107. Dosa D. Should I hospitalize my resident with nursing home-acquired pneumonia? Journal of the American Medical Directors Association 2006;7:S74-S80.

108. Fried TR, Gillick MR, Lipsitz LA. Short-term functional outcomes of long-term care residents with pneumonia treated with and without hospital transfer. Journal of the American Geriatrics Society 1997;45(3):302-6.

109. Fried TR, Gillick MR, Lipsitz LA. Whether to transfer? Factors associated with hospitalization and outcome of elderly long-term care patients with pneumonia. Journal of General Internal Medicine 1995;10:246-50.

110. Kruse RL, Mehr DR, Boles KE, et al. Does hospitalization impact survival after lower respiratory infection in nursing home residents? Medical Care 2004;42(9):860-70.

111. Kikawada M, Iwamoto T, Takasaki M. Aspiration and infection in the elderly: Epidemiology, diagnosis and management. Drugs and Aging 2005;22(2):115-30.

112. Janssens J-P. Pneumonia in the elderly (geriatric) population. Current Opinion in Pulmonary Medicine 2005;11:226-30.

113. Miller RA. The aging immune system: primer and prospectus. Science 1996;273:70-4.

114. Centres for Disease Control and Prevention. Prevention of pneumococcal disease; recommendation of the Advisory Committee on Immunization Practices (ACIP). MMWR 1997;46(No. RR-8):1-24.

115. Zimmer JG. Needed: Acute care in the nursing home. Patient Care 1993;November 30:59-68.

116. Lloyd-Jones DM, Larson MG, Leip EP, et al. Lifetime risk for developing congestive heart failure: The Framingham Heart Study. Circulation 2002;106:3068-72.

117. Pulignano G, Sindaco DD, Tavazzi L, et al. Clincal features and outcomes of elderly outpatients with heart failure followed up in hospital cardiology units: Data from a large nationwide cardiology database (IN-CHF Registry). American Heart Journal 2002;143:45-55.

118. Rochon PA, Sykora K, Bronskill SE, et al. Use of angiotensin-converting enzyme inhibitor therapy and dose-related outcomes in older adults with new heart failure in the community. Journal of General Internal Medicine 2004;19(6):676-83.

119. ACC/AHA guidelines for the evaluation and management of chronic heart failure in the adult: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Revise the 1995 Guidelines for the Evaluation and Management of Heart Failure). American College of Cardiology, 2001. (Accessed May 26, 2006, at https://www.acc.org/clinical/guidelines/failure/hf_index.htm.)

120. Hutt E, Fredrickson E, Ecord M, Kramer AM. Associations among processes and outcomes of care for Medicare nursing home residents with acute heart failure. Journal of the American Medical Directors Association 2003;4:195-9.

121. Ray JG, Gon Y, Sykora K, Tu JV. Statin use and survival outcomes in elderly patients with heart failure. Archives of Internal Medicine 2005;165:62-7.

122. Smart N, Marwick TH. Exercise training for patients with heart failure: a systematic review of factors that improve mortality and morbidity. American Journal of Medicine 2004;116:693-706.

123. Resnick B. Encouraging exercise in older adults with congestive heart failure. Geriatric Nursing 2004;25(4):204-11.

124. Lacasse Y, Brooks D, Goldstein RS. Trends in the epidemiology of COPD in Canada, 1980 to 1995. Chest - The Cardiopulmonary and Critical Care Journal 1999;116(2):306-13.

125. Tan WC, Xiang Z, Qiu D, Ng TP, Lam SF, Hegele RG. Epidemiology of respiratory viruses in patients hospitalized with near-fatal asthma, acute exacerbations of asthma, or chronic obstructive pulmonary disease. American Journal of Medicine 2003;115:272-7.

126. Barr RG, Somers SC, Speizer FE, Carnargo CA. Patient factors and medication guideline adherence among older women with asthma. Archives of Internal Medicine 2002;162:1761 - 8.

127. Moore J. Hypertension: Catching the silent killer. The Nurse Practitioner 2005;30(10):16-31.

128. Flannery D, Gerstenlauer S. Gerontologic nurse practitioner care guidelines: Hypertension in the elderly person. Geriatric Nursing 2003;24(6):373-5.

129. Leeper SC. Aggressive hypertension management in patients of advancing and advanced age. Southern Medical Journal 2005;98(8):805-8.

130. Ramsay SE, Whincup PH, Lawlor DA, et al. Secondary prevention of coronary heart disease in older patients after the national service framework: population based study. British Medical Journal 2006;332:144-5.

131. Vu MQ, Weintraub N, Rubenstein LZ. Falls in the nursing home: are they preventable. Journal of the American Medical Directors Association 2006;7:S53-S8.

132. DeLucca J, Ingram L, Hecker S. Innovations in clinical practice award winner: An evidence-based fall prevention program. Geriatric Nursing 2004;26(1):47-8.

133. McCarus DC. Fracture prevention in postmenopausal osteoporosis: A review of treatment options. Obstetrical and Gynecological Survey 2005;61(1):39-50.

134. Coleman P. Improving oral health care for the frail elderly: a review of widespread problems and best practices. Geriatric Nursing 2002;23(4):189-99.

135. Katancik JA, Kritchevsky S, Weyant RJ, et al. Periodontitis and airway obstruction. Journal of Periodontology 2005;76(11 Suppl):2161-7.

136. Senpuku H, Sogame A, Inoshita E, Tsuha Y, Miyazaki H, Hanada N. Systemic diseases in association with microbial species in oral biofilm from elderly requiring care. Gerontology 2003;49:301-9.

137. Sheiham A, Steele JG, Marcenes W, et al. The relationship among dental status, nutrient intake, and nutritional status in older people. Journal of Dental Research 2001;80(2):408-13.

138. Momeyer MA, Luggen AS. Geriatric nurse practitioner guideline: Peridontal disease in older adults. Geriatric Nursing 2005;26(3):197-200.

139. Coleman P. Resistive behaviors of elderly nursing home residents during oral care. Geriatric Nursing 2005;26(6):349-50.

140. Hebert C. Clinical intervention project to improve oral care in a long-term care setting. Geriatric Nursing 2005;26(6):351.

141. Ferry M. Strategies for ensuring good hydration in the elderly. Nutrition Reviews 2005;63(6):S22-S9.

142. Zembrzuski CD. A three-dimensional approach to hydration of elders: Administration, clinical staff, and in-service education. Geriatric Nursing 1997;18:20-6.

143. Frerick J. Gerontologic nurse practitioner care guidelines: Urinary tract infection. Geriatric Nursing 2004;25(3):185-7.

144. Madthun S, Paur R, Bruce AW, Midthun P. Urinary tract infections in the elderly: A survey of physicians and nurses. Geriatric Nursing 2005;26:245-51.

145. Andersen RM. Revisiting the behavioral model and access to medical care: Does it matter? Journal of Health and Social Behavior 1995;36:1-10.

146. Bradley EH, McGraw SA, Curry L, et al. Expanding the Andersen Model: The role of psychosocial factors in long-term care use. Health Services Research 2002;37(5):1221-42.

147. Saag KG, Doebbeling BN, Rohrer JE, et al. Variation in teriary prevention and health service utilization among the elderly: the role of urban-rural residence and supplemental insurance. Medical Care 1998;36(7):965-76.

148. Phillips KA, Morrison KR, Andersen R, Aday LA. Understanding the context of healthcare utilization: assessing environmental and provider-related variables in the behavioral model of utilization. Health Services Research 1998;33(3):571-94.

149. Alessi CA, O HJ. A prospective study of acute illness in the nursing home. Aging Clin Exp Res 1998;10(6):479-89.

150. Ackermann RJ, Kemle KA. The effect of a physician assistant on the hospitalization of nursing home residents. Journal of the American Geriatrics Society 1998;46:610-4.

151. Mor V, Intrator O, Fries BE, et al. Changes in hospitalization associated with introducing the Resident Assessment Intstrument. Journal of the American Geriatrics Society 1997;45(8):1002-10.

152. Intrator O, Castle NG, Mor V. Facility characteristics associated with hospitalization of nursing home residents: Results of a national study. Medical Care 1999;37(3):228-37.

153. McCall N, Harlow J, Dayhoff D. Rates of hospitalization for ambulatory care sensitive conditions in the Medicare+Choice population. Health Care Financing Review 2001;22(3):127-45.

154. Happ MB, Capezuti E, Strumpf NE, et al. Advance care planning and eld-of-life care for hospitalized nursing home residents. Journal of the American Geriatrics Society 2002;50:829-35.

155. Burton LC, German PS, Gruber-Baldini AL, Hebel R, Zimmerman S, Magaziner J. Medical care for nursing home residents: Differences by dementia status. Journal of the American Geriatrics Society 2001;49:142-7.

156. Health care renewal in Canada: Clearing the road to quality. Health Council of Canada, 2006. (Accessed May 31, 2006, at http://www.healthcouncilcanada.ca/en/index.php?option=com_content&task=view&id=85&Itemid=86.)

157. Morris J, Moore T, Jones R, et al. Validation of long-term and post-acute care quality indicators: Abt Associates Inc, Brown University, and HRCA; 2002.

158. Fisher ES, Wennberg JE. Health care quality, geographic variations, and the challenge of supply-sensitive care. Perspectives in Biology and Medicine 2003;46(1):69-80.

159. Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas F, Pinder EL. The implications of regional variations in Medicare spending. Part 1: the content, quality, and accessibility of care. Annals of Internal Medicine 2003;138:273-87.

160. Fisher ES, Wennberg JE, Stukel TA, et al. Associations among hospital capacity, utilization, and mortality of US Medicare beneficiaries, controlling for sociodemographic factors. Health Services Research 2000;34(6):1351-.

161. Wennberg JE, Fisher ES, Stukel TA, Skinner JS, Sharp SM, Bronner KK. Use of hospitals, physician visits, and hospice care during last six months of life among cohorts loyal to highly respected hospitals in the United States. British Medical Journal 2004;328:607-10.

162. Pilote L, Merrett P, Karp I, et al. Cardiac procedures after an acute myocardial infarction across nine Canadian provinces. Canadian Journal of Cardiology 2004;20(5):491-500.

163. Chan B, Harju M, eds. Supply and utilization of health care services for diabetes: In Hux J, Booth G, Slaughter P, Laupacis A. Diabetes in Ontario: an ICES practice atlas: Institute for Clinical Evaluative Sciences; 2003.

164. Coyte P, Young W. Regional variations in the use of home care services in Ontario, 1993/94. Canadian Medical Association Journal 1999;161(4):376-80.

165. Goel V, Williams J, Anderson G, Blackstien-Hirsch P, Fooks C, Naylor D. Patterns of health care in Ontario, 2nd edition: an ICES practice atlas. Toronto: Institute for Clinical Evaluative Sciences; 1996.

166. Carter MW, Datti B, Winters JM. ED visits by older adults for ambulatory care-sensitive and supply-sensitive conditions. American Journal of Emergency Medicine 2006;24:428-34.

167. Bravo G, Dubois M-F, DeWals P, Hebert R, Messier L. Relationship between regulatory status, quality of care, and three-year mortality in Canadian residential care facilities: A longitudinal study. Health Services Research 2002;37(5):1181-96.

168. Teare GF, Daniel I, Markel F, et al. Hospital Report 2003: Complex Continuing Care. Joint Initiative of the Ontario Hospital Association and the Government of Ontario. Toronto: Hospital Report Reserach Collaborative, University of Toronto; 2004.

169. Diagnosis Typing: Current Canadian and International Practices. Canadian Institute for Health Information., September 2004. (Accessed May 31, 2006, at http://secure.cihi.ca/cihiweb/en/downloads/Diagnosis_Typing_Background_v1.pdf.)

170. Cavoukian A. Review of the Institute for Clinical Evaluative Sciences: A prescribed entity under the Personal Health Information Protection Act: Information and Privacy Commissioner/Ontario; 2005.

171. Privacy Code: Protecting personal health information at ICES. Institute for Clinical Evaluative Sciences, October 2005. (Accessed May 29, 2006, at http://www.ices.on.ca/file/ACF20B%2Epdf.)

172. The Hospital Report Research Collaborative. Hospital Report 2001: Complex Continuing Care. Toronto: University of Toronto; 2001 December 2001.

173. Instruments: Long Term Care Facility. interRAI, 2006. (Accessed May 29, 2006, at http://www.interrai.org/section/view/?fnode=17.)

174. Morris JN, Hawes C, Fries BE, et al. Designing the national resident assessment instrument for nursing homes. Gerontologist 1990;30(3):293-307.

175. CIHI Continuing Care: Frequently Asked Questions. Canadian Institute for Health Information,
April 2006. (Accessed May 29, 2006, at
http://secure.cihi.ca/cihiweb/en/downloads/CCRS_FAQ_2006-04-24.pdf.)

176. Richards J, Brown A, Homan C. The data quality study of the Canadian Discharge Abstract Database. Proceedings of Statistics Canada Symposium 2001.

177. Online Resource Manual for Physicians. Ontario Ministry of Health and Long-Term Care, January 2005. (Accessed May 29, 2006, at
http://www.health.gov.on.ca/english/providers/pub/ohip/physmanual/physmanual_mn.html.)

178. Teare GF, Weiler L. Hosptial Report 2003: Complex Continuing Care System Integration and Change Technical Report. Toronto: Hospital Report Research Collaborative, University of Toronto; 2004.

179. Schlesselman JJ. Case-control studies: Design, conduct, analysis. New York: Oxford University Press; 1982.

180. Dixon WJ. Introduction to statistical analysis 4ed. London: McGraw-Hill; 1983.

181. Mor V, Angelelli J, Jones R, Roy J, Moore T, Morris J. Inter-rater reliability of nursing home quality indicators in the U.S. BMC Health Services Research 2003;3(20):http://www.biomedcentral.com/1472-6963/3/20.

182. Milnes K. Ontario Hospital Cost Distribution Methodology by Patient Activity. Toronto: Ontario Joint Policy and Planning Committee. Ref Doc #9-11; 2001.

183. Poisson and Negative Bimonial Regressions. Social Sciences Teaching and Research Statistics, University of Kentucky. (Accessed May 31, 2006, at http://www.uky.edu/ComputingCenter/SSTARS/.)

184. SAS Help and Documentations: The GENMOD Procedure - Generalized Linear Models Theory. Cary, NC: SAS Version 8.

185. Byers AL, Allore H, Gill TM, Peduzzi PN. Application of negative binomial modeling for discrete outcomes: a case study in aging research. Journal of Clinical Epidemiology 2003;56(6):559-64.

186. Hirdes J, Frijters DH, Teare GF. The MDS-CHESS Scale: A new measure to predict mortality in institutionalized older people. Journal of the American Geriatrics Society 2003;51:96-100.

187. Teare GF. Personal Communication: Description of Palliative Admission Identification Methodology. In; November 7, 2005.

188. Bjorkgren MA, Hakkinen U, Finne-Soveri UH, Fries BE. Validity and reliability of Resource Utilization Groups (RUG-III) in Finnish long-term care facilities. Scandinavian Journal of Public Health 1999;27(3):228-34.

189. Fries BE, Schneider DP, Foley WJ, Gavazzi M, Burke R, Cornelius E. Refining a case-mix measure for nursing homes: Resource Utilization Groups (RUG-III). Medical Care 1994;32(7):668-85.

190. Hirdes JP, Botz CA, Kozak J, Lepp V. Identifying an appropriate case mix measure for chronic care: evidence from an Ontario pilot study. Healthcare Management Forum 1996;9(1):40-6.

191. Topinkova E, Neuwirth J, Mellanova A, Stankova M, Haas T. Case-mix classification in post-acute and long-term care. Validation of Resource Utilization Groups III (RUG-III) in the Czech Republic. Cas Lek Cesk 2000;139(2):42-8.

192. Carptenter GI, Ikegami N, Ljunggren G, Carrillo E, Fries BE. RUG-III and resource allocation: comparing the relationship of direct care time with patient characteristics in five countries. Age and Ageing 1997;26 Suppl 2:61-5.

193. Morris J, Fries BE, Mehr D. MDS cognitive performance scale. Journals of Gerontology Volume A: Biological Science and Medical Science 1994;49:M174-82.

194. Hartmaier S, Sloane P, Guess H, Kock G, Mitchell C, Phillips C. Validation of the Minimum Data Set cognitive performance scale: agreement with the Mini-Mental State examination. Journals of Gerontology Volume A: Biological Science and Medical Science 1995;50A:M128-33.

195. Morris J, Fries B, Morris S. Scaling ADLs within the MDS. Journal of Gerontology: Medical Sciences 1999;54A(11):M546-M53.

196. Burrows A, Morris J, Simon S, Hirdes J, Phillips C. Development of a minimum data set-based depression rating scale for use in nursing homes. Age Ageing 2000;29(2):165-72.

197. Morris J, Murphy KM, Nonemaker S. Minimum Data Set 2.0: Long term care facility resident assessment instrument (RAI) user's manual: Briggs Health Care Products; 1995.

198. Acute Care Grouping Methodologies: From Diagnosis Related Groups to Case Mix Groups Redevelopment. Ottawa: Canadian Institute for Health Information; February 2004.

199. Case Mix Groups with Complexity Overlay and Age Adjustment. Canadian Institute for Health Information, 2004. (Accessed May 29, 2006, at http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=casemix_cmgplx_e.)

200. Geographic Units: Urban Area. Statistics Canada, 2006. (Accessed May 29, 2006, at http://www12.statcan.ca/english/census01/products/reference/dict/geo049.htm.)

201. Rosner B. Fundamentals of Biostatistics. 5 ed. Pacific Grove: Brooks/Cole; 2000.

202. Keily DK, Flacker JM. Common and gender specific factors associated with one-year mortality in nursing home residents. Journal of the American Medical Directors Association 2002;3:302-9.

203. Raudenbush SW, Bryk AS. Hierarchical Linear Models, 2nd edition. Thousand Oaks: Sage Publications; 2002.

204. Patetta M, Marovich P, Lucas B, et al. Longitudinal Data Analysis with Discrete and Continuous Responses Course Notes. In. Cary, NC: SAS Institute Inc.; 2002.

205. Pope C, Mays N, eds. Qualitative Research in Health Care. Second Edition. 2 ed. London: BMJ Books; 1999.

206. Fitch K, Dernstein SJ, Aguilar MD, et al. The RAND/UCLA Appropriateness Method User's Manual. Santa Monica: RAND; 2001.

207. U.S. Federal Government's Department of Health and Human Services. ICD-9-CM Official Guidelines for Coding and Reporting. 2005. (Accessed May 31, 2006, at http://www.cdc.gov/nchs/datawh/ftpserv/ftpicd9/icdguide05.pdf.)

208. Ontario's complex continuing care population: five-year trends in selected clinical characteristics 1999-2000 to 2003-2004. Canadian Institute for Health Information, 2005. (Accessed May 31, 2006, at http://secure.cihi.ca/cihiweb/en/downloads/CCRS_Analysis_in_Brief_2005-05-31.pdf.)

209. Menendez R, Ferrando D, Valles JM, Martinez E, Perpina M. Initial risk class and length of hospital stay in community-acquired pneumonia. European Respiratory Journal 2001;18:151-6.

210. Report on Seniors' Falls in Canada. Ottawa: Department of Aging and Seniors, Public Health Agency of Canada; 2005.

211. Clancy CM. The persistent challenge of avoidable hospitalizations. Health Services Research 2005;40(4):953-6.

212. Scott V, Pearce M, Pengelly C. Technical report: Hospitalizations due to falls among Canadians age 65 and over living in residential care facilities. . Ottawa: Public Health Agency of Canada; 2005.

213. Scott JR, Gibran NS, engrav LH, Mack CD, Rivaraq FP. Incidence and characteristics of hospitalized patients with pressure ulcers: State of Washington, 1987 to 2000. Plastic and Reconstructive Surgery 2006;117:630-4.

214. Berlowitz DR, Brand H, Perkins C. Geriatric syndromes as outcome measures of hospital care: can administrative data be used? Journal of the American Geriatrics Society 1999;47(6):692-6.

215. Davies HD, O'Hara R, Mumenthaler MS, et al. Underreporting of behavioral problems in older hospitalized patients. Gerontologist 2005;45(4):535-8.

216. Coding Variations in the Discharge Abstract Database (DAD) Data. Ottawa: Canadian Institute for Health Information; 2003.

217. Last JM. A Dictionary of Epidemiology. 2 ed. New York: Oxford University Press; 2001.

218. Berta W, Valdmanis ALV. Observations on institutional long-term care in Ontario: 1996-2002. Canadian Journal on Aging 2005;24(1):71-84.

219. Building on values: The future of health care in Canada - final report. Commission on the Future of Health Care in Canada., 2002. (Accessed June 3, 2006, at http://www.hc-sc.gc.ca/english/care/romanow/index1.html.)

220. Hebert R. Research on aging: Providing evidence for rescuing the Canadian health care system. Submission to the Romanow Commission.; 2002.

221. Porell F, Caro FG, Silva A, Monane M. A longitudinal analysis of nursing home outcomes. Health Services Research 1998;33(4):835-66.

222. Vik SA, Hogan DB, Patten SB, Johnson JA, Romonko-Slack L, Maxwell CJ. Medication nonadherence and subsequent risk of hospitalization and mortality in older adults. Drugs and Aging 2006;in press.

223. Lyness JM, Cox C, Curry J, Conwell Y, King DA, Caine ED. Older age and the underreporting of depressive symptoms. Journal of the American Geriatrics Society 1995;43(3):216-21.

224. Close JCT. Prevention of falls in older people. Disability and Rehabilitation 2005;27(18-19):1061-71.

225. Krauss MJ, Evanoff B, Hitcho E, et al. A case-control study of patient, medication, and care-related risk factors for inpatient falls. Journal of General Internal Medicine 2005;20:116-22.

226. Raz R, Ben-Israel Y, Gronich D, Granot E, Colodner R, Visotzky I. Usefulness of blood cultures in the management of febrile patients in long-term care facilities. European Journal of Clinical Microbiology and Infectious Disease 2005;24:745-8.

227. Loeb M, Carusone SC, Goeree R, et al. Effect of a clinical pathway to reduce hospitalizations in nursing home residents with pneumonia: A randomized controlled trial. Journal of the American Medical Association 2006;21:2503-10.

228. Black SA, Rush RD. Cognitive and functional decline in adults aged 75 and older. Journal of the American Geriatrics Society 2002;50(12):1978-86.

229. Dale MC, Burns A, Panter L, Morris J. Factors affecting survival of elderly nursing home residents. International Journal of Geriatric Pshychiatry 2001;16:70-6.

230. Thompson RS, Hall NK, Szpiech M. Hospitalization and mortality rates for nursing home-acquired pneumonia. Journal of Family Practice 1999;48(4):291-3.

231. McCall NT, Harlow J, Dayhoff D. Rates of hospitalization for ambulatory care sensitive conditions in the Medicare+Choice population. Health Care Financing Review 2001;22(3):127-45.

APPENDIX A: Ethics Approval from the Conjoint Health Research Ethics Board

FACULTY OF MEDICINE | UNIVERSITY OF CALGARY

OFFICE OF MEDICAL BIOETHICS
Room 93, Heritage Medical Research Bldg
3330 Hospital Drive NW
Calgary, AB, Canada T2N 4N1
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2005-05-02

Dr. C.J. Maxwell
Department of Community Health Sciences
HMRB
University of Calgary
Calgary, Alberta

Dear Dr. Maxwell:

RE: Potentially Avoidable Hospitalization of Institutionalized Older Persons

Grant ID: 18438

The above-named research project including the Clinical Research Protocol (Version dated September 2004), and Expert Panel Consent Form (Version dated April 24, 2005) have been granted ethical approval by the Conjoint Health Research Ethics Board of the Faculties of Medicine, Nursing and Kinesiology, University of Calgary, and the Affiliated Teaching Institutions. The Board conforms to the Tri-Council Guidelines, ICH Guidelines and amendments to regulations of the Food and Drug Act re clinical trials, including membership and requirements for a quorum.

You and your co-investigators are not members of the CHREB and did not participate in review or voting on this study.

Please note that this approval is subject to the following conditions:

(1) access to personal identifiable health information was not requested in this submission
(2) a copy of the informed consent form must have been given to each research subject, if required for this study;
(3) a Progress Report must be submitted by 2006-05-02, containing the following information:
  i) the number of subjects recruited;
  ii) a description of any protocol modification;
  iii) any unusual and/or severe complications, adverse events or unanticipated problems involving risks to subjects or others, withdrawal of subjects from the research, or complaints about the research;
  iv) a summary of any recent literature, finding, or other relevant information, especially information about risks associated with the research;
  v) a copy of the current informed consent form;
  vi) the expected date of termination of this project.
(4) a Final Report must be submitted at the termination of the project.

Please note that you have been named as a principal collaborator on this study because students are not permitted to serve as principal investigators. Please accept the Board's best wishes for success in your research.
Yours sincerely,

Christopher J. Doig, MD, MSc, FRCPC

Chair, Conjoint Health Research Ethics Board

CJD/km
c.c. Adult Research Committee Dr. M. Verhoef (information) Research Services Ms. J. Walker (PhD Student)
Office of Information & Privacy Commissioner

APPENDIX B: Ambulatory Care Sensitive Conditions (ICD-9-CM Codes with Short Descriptions)

Angina Pectoris

411.1	INTERMED CORONARY SYND
411.8	ACUTE COR OCCLSN W/O MI AC ISCHEMIC HRT DIS NEC
413	ANGINA DECUBITUS PRINZMETAL ANGINA ANGINA PECTORIS NEC/NOS

Asthma

493	EXTRINSIC ASTHMA NOS EXT ASTHMA W STATUS ASTH EXT ASTHMA W(ACUTE) EXAC INTRINSIC ASTHMA NOS INT ASTHMA W STATUS ASTH INT ASTHMA W (AC) EXAC CHRONIC OBST ASTHMA NOS CH OB ASTHMA W STAT ASTH CH OBST ASTH W (AC) EXAC EXERCSE IND BRONCHOSPASM COUGH VARIANT ASTHMA ASTHMA NOS ASTHMA W STATUS ASTHMAT ASTHMA NOS W (AC) EXAC

Bacterial Pneumonia

486	PNEUMONIA, ORGANISM NOS
481	PNEUMOCOCCAL PNEUMONIA
482.2	H.INFLUENZAE PNEUMONIA
482.3	STREPTOCOCCAL PNEUMN NOS PNEUMONIA STRPTOCOCCUS A PNEUMONIA STRPTOCOCCUS B PNEUMONIA OTH STREP
482.9	BACTERIAL PNEUMONIA NOS
483	PNEUMONIA D/T CHLAMYDIA PNEU MYCPLSM PNEUMONIAE PNEUMON OTH SPEC ORGNSM

Cellulitis

681	CELLULITIS, FINGER NOS FELON ONYCHIA OF FINGER CELLULITIS, TOE NOS ONYCHIA OF TOE CELLULITIS OF DIGIT NOS
682	CELLULITIS OF FACE CELLULITIS OF NECK CELLULITIS OF TRUNK CELLULITIS OF ARM

	CELLULITIS OF HAND CELLULITIS OF BUTTOCK CELLULITIS OF LEG CELLULITIS OF FOOT CELLULITIS, SITE NEC CELLULITIS NOS
683	ACUTE LYMPHADENITIS
686	PYODERMA NOS PYODERMA GANGRENOSUM PYODERMA NEC PYOGENIC GRANULOMA LOCAL SKIN INFECTION NEC LOCAL SKIN INFECTION NOS

Chronic obstructive pulmonary disease

466	ACUTE BRONCHITIS ACU BRONCHOLITIS D/T RSV ACU BRNCHLTS D/T OTH ORG
491	SIMPLE CHR BRONCHITIS MUCOPURUL CHR BRONCHITIS OBST CHR BRONC W/O EXAC OBS CHR BRONC W(AC) EXAC CHRONIC BRONCHITIS NEC CHRONIC BRONCHITIS NOS
492	EMPHYSEMATOUS BLEB EMPHYSEMA NEC
494	BRONCHIECTAS W/O AC EXAC BRONCHIECTASIS W AC EXAC
496	CHR AIRWAY OBSTRUCT NEC

Congestive Heart Failure

428	CHF NOS LEFT HEART FAILURE SYSTOLIC HRT FAILURE NOS AC SYSTOLIC HRT FAILURE CHR SYSTOLIC HRT FAILURE AC ON CHR SYST HRT FAIL DIASTOLC HRT FAILURE NOS AC DIASTOLIC HRT FAILURE CHR DIASTOLIC HRT FAIL AC ON CHR DIAST HRT FAIL SYST/DIAST HRT FAIL NOS AC SYST/DIASTOL HRT FAIL CHR SYST/DIASTL HRT FAIL AC/CHR SYST/DIA HRT FAIL HEART FAILURE NOS
518.4	ACUTE LUNG EDEMA NOS

Dehydration

276.5	HYPOVOLEMIA

Dental Conditions

521	DENTAL CARIES NOS DENTAL CARIES - ENAMEL DENTAL CARIES - DENTINE DENTAL CARIES - PULP DENTAL CARIES - ARRESTED ODONTOCLASIA DENTAL CARIES NEC EXCESS ATTRITION-TEETH ABRASION OF TEETH EROSION OF TEETH RESORPTION OF TEETH HYPERCEMENTOSIS ANKYLOSIS OF TEETH POSTERUPT COLOR CHANGE HARD TISS DIS TEETH NEC HARD TISS DIS TEETH NOS
522	PULPITIS NECROSIS OF TOOTH PULP TOOTH PULP DEGENERATION ABN HARD TISS-TOOTH PULP AC APICAL PERIODONTITIS PERIAPICAL ABSCESS CHR APICAL PERIODONTITIS PERIAPICAL ABSC W SINUS RADICULAR CYST PULP/PERIAPICAL DIS NEC
523	ACUTE GINGIVITIS CHRONIC GINGIVITIS GINGIVAL RECESSION ACUTE PERIODONTITIS CHRONIC PERIODONTITIS PERIODONTOSIS ACCRETIONS ON TEETH PERIODONTAL DISEASE NEC GINGIV/PERIODONT DIS NOS
525	EXFOLIATION OF TEETH ACQ ABSENCE OF TEETH NOS LOSS OF TEETH D/T TRAUMA LOSS TEETH D/T PERI DIS LOSS OF TEETH D/T CARIES LOSS OF TEETH NEC ATROPHY ALVEOLAR RIDGE RETAINED DENTAL ROOT DENTAL DISORDER NEC DENTAL DISORDER NOS
528	STOMATITIS CANCRUM ORIS ORAL APHTHAE CELLULITIS/ABSCESS MOUTH ORAL SOFT TISSUE CYST DISEASES OF LIPS LEUKOPLAKIA ORAL MUCOSA ORAL EPITHELIUM DIS NEC

	ORAL SUBMUCOSAL FIBROSIS ORAL SOFT TISSUE DIS NEC

Diabetes with ketoacidosis or hypersmolar coma

250.1	DMII KETO NT ST UNCNTRLD DMI KETO NT ST UNCNTRLD DMII KETOACD UNCONTROLD DMI KETOACD UNCONTROLD
250.2	DMII HPRSM NT ST UNCNTRL DMI HPRSM NT ST UNCNTRLD DMII HPROSMLR UNCONTROLD DMI HPROSMLR UNCONTROLD
250.3	DMII O CM NT ST UNCNTRLD DMI O CM NT ST UNCNTRLD DMII OTH COMA UNCONTROLD DMI OTH COMA UNCONTROLD

Diabetes with specified manifestations

250.8	DMII OTH NT ST UNCNTRLD DMI OTH NT ST UNCNTRLD DMII OTH UNCNTRLD DMI OTH UNCNTRLD
250.9	DMII UNSPF NT ST UNCNTRL DMI UNSPF NT ST UNCNTRLD DMII UNSPF UNCNTRLD DMI UNSPF UNCNTRLD

Diabetes without specified manifestations

250.0	DMII WO CMP NT ST UNCNTR DMI WO CMP NT ST UNCNTRL DMII WO CMP UNCNTRLD DMI WO CMP UNCNTRLD

Gastroenteritis

558.9	NONINF GASTROENTERIT NEC

Grand Mal seizure disorders

345	GEN NONCV EP W/O INTR EP GEN NONCONV EP W INTR EP GEN CNV EPIL W/O INTR EP GEN CNV EPIL W INTR EPIL PETIT MAL STATUS GRAND MAL STATUS PSYMOTR EPIL W/O INT EPI PSYMOTR EPIL W INTR EPIL PART EPIL W/O INTR EPIL PART EPIL W INTR EPIL INF SPASM W/O INTR EPIL INF SPASM W INTRACT EPIL EPIL PAR CONT W/O INT EP EPIL PAR CONT W INTR EPI EPILEP NEC W/O INTR EPIL

	EPILEPSY NEC W INTR EPIL EPILEP NOS W/O INTR EPIL EPILEPSY NOS W INTR EPIL
780.3	FEBRILE CONVULSIONS CONVULSIONS NEC

Hypertension

401.0	4010 MALIGNANT HYPERTENSION
401.9	4019 HYPERTENSION NOS
402.0	40200 MAL HYP HT DIS W/O HF 40201 MAL HYPERT HRT DIS W HF
402.1	40210 BENIGN HYP HT DIS W/O HF 40211 BENIGN HYP HT DIS W HF
402.9	40290 HYP HRT DIS NOS W/O HF 40291 HYP HT DIS NOS W HT FAIL

Hypoglycemia

251.2	HYPOGLYCEMIA NOS

Immunization-preventable conditions

003	SALMONELLA ENTERITIS SALMONELLA SEPTICEMIA LOCAL SALMONELLA INF NOS SALMONELLA MENINGITIS SALMONELLA PNEUMONIA SALMONELLA ARTHRITIS SALMONELLA OSTEOMYELITIS LOCAL SALMONELLA INF NEC SALMONELLA INFECTION NEC SALMONELLA INFECTION NOS
037	TETANUS
390	RHEUM FEV W/O HRT INVOLV
391	ACUTE RHEUMATIC PERICARD ACUTE RHEUMATIC ENDOCARD AC RHEUMATIC MYOCARDITIS AC RHEUMAT HRT DIS NEC RHEUMAT HRT DIS NOS
320.0	3920 RHEUM CHOREA W HRT INVOL

Iron deficiency anemia

280.1	IRON DEF ANEMIA DIETARY
280.8	IRON DEFIC ANEMIA NEC
280.9	IRON DEFIC ANEMIA NOS

Kidney / Urinary tract infection

590	UNILATERAL SMALL KIDNEY
599.0	URIN TRACT INFECTION NOS
599.9	URINARY TRACT DIS NOS

Nutritional deficiency

260	KWASHIORKOR
261	NUTRITIONAL MARASMUS

262	OTH SEVERE MALNUTRITION
268.0	RICKETS, ACTIVE
268.1	RICKETS, LATE EFFECT

Pelvic inflammatory disease

614	AC SALPINGO-OOPHORITIS CHR SALPINGO-OOPHORITIS SALPINGO-OOPHORITIS NOS ACUTE PARAMETRITIS CHRONIC PARAMETRITIS AC PELV PERITONITIS-FEM FEM PELVIC PERITON ADHES CHR PELV PERITON NEC-FEM FEM PELV INFLAM DIS NEC FEM PELV INFLAM DIS NOS

Severe ear, nose, and throat infection

382	AC SUPP OTITIS MEDIA NOS AC SUPP OM W DRUM RUPT AC SUPP OM IN OTH DIS CHR TUBOTYMPAN SUPPUR OM CHR ATTICOANTRAL SUP OM CHR SUP OTITIS MEDIA NOS SUPPUR OTITIS MEDIA NOS OTITIS MEDIA NOS
462	ACUTE PHARYNGITIS
463	ACUTE TONSILLITIS
465	ACUTE LARYNGOPHARYNGITIS ACUTE URI MULT SITES NEC ACUTE URI NOS
472.1	CHRONIC PHARYNGITIS

Tuberculosis

011	TB LUNG INFILTR-UNSPEC TB LUNG INFILTR-NO EXAM TB LUNG INFILTR-EXM UNKN TB LUNG INFILTR-MICRO DX TB LUNG INFILTR-CULT DX TB LUNG INFILTR-HISTO DX TB LUNG INFILTR-OTH TEST TB LUNG NODULAR-UNSPEC TB LUNG NODULAR-NO EXAM TB LUNG NODUL-EXAM UNKN TB LUNG NODULAR-MICRO DX TB LUNG NODULAR-CULT DX TB LUNG NODULAR-HISTO DX TB LUNG NODULAR-OTH TEST TB LUNG W CAVITY-UNSPEC TB LUNG W CAVITY-NO EXAM TB LUNG CAVITY-EXAM UNKN TB LUNG W CAVIT-MICRO DX TB LUNG W CAVITY-CULT DX

	TB LUNG W CAVIT-HISTO DX TB LUNG W CAVIT-OTH TEST TB OF BRONCHUS-UNSPEC TB OF BRONCHUS-NO EXAM TB OF BRONCHUS-EXAM UNKN TB OF BRONCHUS-MICRO DX TB OF BRONCHUS-CULT DX TB OF BRONCHUS-HISTO DX TB OF BRONCHUS-OTH TEST TB LUNG FIBROSIS-UNSPEC TB LUNG FIBROSIS-NO EXAM TB LUNG FIBROS-EXAM UNKN TB LUNG FIBROS-MICRO DX TB LUNG FIBROSIS-CULT DX TB LUNG FIBROS-HISTO DX TB LUNG FIBROS-OTH TEST TB BRONCHIECTASIS-UNSPEC TB BRONCHIECT-NO EXAM TB BRONCHIECT-EXAM UNKN TB BRONCHIECT-MICRO DX TB BRONCHIECT-CULT DX TB BRONCHIECT-HISTO DX TB BRONCHIECT-OTH TEST TB PNEUMONIA-UNSPEC TB PNEUMONIA-NO EXAM TB PNEUMONIA-EXAM UNKN TB PNEUMONIA-MICRO DX TB PNEUMONIA-CULT DX TB PNEUMONIA-HISTO DX TB PNEUMONIA-OTH TEST TB PNEUMOTHORAX-UNSPEC TB PNEUMOTHORAX-NO EXAM TB PNEUMOTHORX-EXAM UNKN TB PNEUMOTHORAX-MICRO DX TB PNEUMOTHORAX-CULT DX TB PNEUMOTHORAX-HISTO DX TB PNEUMOTHORAX-OTH TEST PULMONARY TB NEC-UNSPEC PULMONARY TB NEC-NO EXAM PULMON TB NEC-EXAM UNKN PULMON TB NEC-MICRO DX PULMON TB NEC-CULT DX PULMON TB NEC-HISTO DX PULMON TB NEC-OTH TEST PULMONARY TB NOS-UNSPEC PULMONARY TB NOS-NO EXAM PULMON TB NOS-EXAM UNKN PULMON TB NOS-MICRO DX PULMON TB NOS-CULT DX PULMON TB NOS-HISTO DX PULMON TB NOS-OTH TEST
012	TB PLEURISY-UNSPEC TB PLEURISY-NO EXAM TB PLEURISY-EXAM UNKN

	TB PLEURISY-MICRO DX TB PLEURISY-CULT DX TB PLEURISY-HISTOLOG DX TB PLEURISY-OTH TEST TB THORACIC NODES-UNSPEC TB THORAX NODE-NO EXAM TB THORAX NODE-EXAM UNKN TB THORAX NODE-MICRO DX TB THORAX NODE-CULT DX TB THORAX NODE-HISTO DX TB THORAX NODE-OTH TEST ISOL TRACHEAL TB-UNSPEC ISOL TRACHEAL TB-NO EXAM ISOL TRACH TB-EXAM UNKN ISOLAT TRACH TB-MICRO DX ISOL TRACHEAL TB-CULT DX ISOLAT TRACH TB-HISTO DX ISOLAT TRACH TB-OTH TEST TB LARYNGITIS-UNSPEC TB LARYNGITIS-NO EXAM TB LARYNGITIS-EXAM UNKN TB LARYNGITIS-MICRO DX TB LARYNGITIS-CULT DX TB LARYNGITIS-HISTO DX TB LARYNGITIS-OTH TEST RESP TB NEC-UNSPEC RESP TB NEC-NO EXAM RESP TB NEC-EXAM UNKN RESP TB NEC-MICRO DX RESP TB NEC-CULT DX RESP TB NEC-HISTO DX RESP TB NEC-OTH TEST
013	TB MENINGITIS-UNSPEC TB MENINGITIS-NO EXAM TB MENINGITIS-EXAM UNKN TB MENINGITIS-MICRO DX TB MENINGITIS-CULT DX TB MENINGITIS-HISTO DX TB MENINGITIS-OTH TEST TUBRCLMA MENINGES-UNSPEC TUBRCLMA MENING-NO EXAM TUBRCLMA MENIN-EXAM UNKN TUBRCLMA MENING-MICRO DX TUBRCLMA MENING-CULT DX TUBRCLMA MENING-HISTO DX TUBRCLMA MENING-OTH TEST TUBERCULOMA BRAIN-UNSPEC TUBRCLOMA BRAIN-NO EXAM TUBRCLMA BRAIN-EXAM UNKN TUBRCLOMA BRAIN-MICRO DX TUBRCLOMA BRAIN-CULT DX TUBRCLOMA BRAIN-HISTO DX TUBRCLOMA BRAIN-OTH TEST TB BRAIN ABSCESS-UNSPEC

	TB BRAIN ABSCESS-NO EXAM TB BRAIN ABSC-EXAM UNKN TB BRAIN ABSC-MICRO DX TB BRAIN ABSCESS-CULT DX TB BRAIN ABSC-HISTO DX TB BRAIN ABSC-OTH TEST TUBRCLMA SP CORD-UNSPEC TUBRCLMA SP CORD-NO EXAM TUBRCLMA SP CD-EXAM UNKN TUBRCLMA SP CRD-MICRO DX TUBRCLMA SP CORD-CULT DX TUBRCLMA SP CRD-HISTO DX TUBRCLMA SP CRD-OTH TEST TB SP CRD ABSCESS-UNSPEC TB SP CRD ABSC-NO EXAM TB SP CRD ABSC-EXAM UNKN TB SP CRD ABSC-MICRO DX TB SP CRD ABSC-CULT DX TB SP CRD ABSC-HISTO DX TB SP CRD ABSC-OTH TEST TB ENCEPHALITIS-UNSPEC TB ENCEPHALITIS-NO EXAM TB ENCEPHALIT-EXAM UNKN TB ENCEPHALITIS-MICRO DX TB ENCEPHALITIS-CULT DX TB ENCEPHALITIS-HISTO DX TB ENCEPHALITIS-OTH TEST CNS TB NEC-UNSPEC CNS TB NEC-NO EXAM CNS TB NEC-EXAM UNKN CNS TB NEC-MICRO DX CNS TB NEC-CULT DX CNS TB NEC-HISTO DX CNS TB NEC-OTH TEST CNS TB NOS-UNSPEC CNS TB NOS-NO EXAM CNS TB NOS-EXAM UNKN CNS TB NOS-MICRO DX CNS TB NOS-CULT DX CNS TB NOS-HISTO DX CNS TB NOS-OTH TEST
014	TB PERITONITIS-UNSPEC TB PERITONITIS-NO EXAM TB PERITONITIS-EXAM UNKN TB PERITONITIS-MICRO DX TB PERITONITIS-CULT DX TB PERITONITIS-HISTO DX TB PERITONITIS-OTH TEST INTESTINAL TB NEC-UNSPEC INTESTIN TB NEC-NO EXAM INTEST TB NEC-EXAM UNKN INTESTIN TB NEC-MICRO DX INTESTIN TB NEC-CULT DX

	INTESTIN TB NEC-HISTO DX INTESTIN TB NEC-OTH TEST
015	TB OF VERTEBRA-UNSPEC TB OF VERTEBRA-NO EXAM TB OF VERTEBRA-EXAM UNKN TB OF VERTEBRA-MICRO DX TB OF VERTEBRA-CULT DX TB OF VERTEBRA-HISTO DX TB OF VERTEBRA-OTH TEST TB OF HIP-UNSPEC TB OF HIP-NO EXAM TB OF HIP-EXAM UNKN TB OF HIP-MICRO DX TB OF HIP-CULT DX TB OF HIP-HISTO DX TB OF HIP-OTH TEST TB OF KNEE-UNSPEC TB OF KNEE-NO EXAM TB OF KNEE-EXAM UNKN TB OF KNEE-MICRO DX TB OF KNEE-CULT DX TB OF KNEE-HISTO DX TB OF KNEE-OTH TEST TB OF LIMB BONES-UNSPEC TB LIMB BONES-NO EXAM TB LIMB BONES-EXAM UNKN TB LIMB BONES-MICRO DX TB LIMB BONES-CULT DX TB LIMB BONES-HISTO DX TB LIMB BONES-OTH TEST TB OF MASTOID-UNSPEC TB OF MASTOID-NO EXAM TB OF MASTOID-EXAM UNKN TB OF MASTOID-MICRO DX TB OF MASTOID-CULT DX TB OF MASTOID-HISTO DX TB OF MASTOID-OTH TEST TB OF BONE NEC-UNSPEC TB OF BONE NEC-NO EXAM TB OF BONE NEC-EXAM UNKN TB OF BONE NEC-MICRO DX TB OF BONE NEC-CULT DX TB OF BONE NEC-HISTO DX TB OF BONE NEC-OTH TEST TB OF JOINT NEC-UNSPEC TB OF JOINT NEC-NO EXAM TB JOINT NEC-EXAM UNKN TB OF JOINT NEC-MICRO DX TB OF JOINT NEC-CULT DX TB OF JOINT NEC-HISTO DX TB OF JOINT NEC-OTH TEST TB BONE/JOINT NOS-UNSPEC TB BONE/JT NOS-NO EXAM TB BONE/JT NOS-EXAM UNKN

	TB BONE/JT NOS-MICRO DX TB BONE/JT NOS-CULT DX TB BONE/JT NOS-HISTO DX TB BONE/JT NOS-OTH TEST
016	TB OF KIDNEY-UNSPEC TB OF KIDNEY-NO EXAM TB OF KIDNEY-EXAM UNKN TB OF KIDNEY-MICRO DX TB OF KIDNEY-CULT DX TB OF KIDNEY-HISTO DX TB OF KIDNEY-OTH TEST TB OF BLADDER-UNSPEC TB OF BLADDER-NO EXAM TB OF BLADDER-EXAM UNKN TB OF BLADDER-MICRO DX TB OF BLADDER-CULT DX TB OF BLADDER-HISTO DX TB OF BLADDER-OTH TEST TB OF URETER-UNSPEC TB OF URETER-NO EXAM TB OF URETER-EXAM UNKN TB OF URETER-MICRO DX TB OF URETER-CULT DX TB OF URETER-HISTO DX TB OF URETER-OTH TEST TB URINARY NEC-UNSPEC TB URINARY NEC-NO EXAM TB URINARY NEC-EXAM UNKN TB URINARY NEC-MICRO DX TB URINARY NEC-CULT DX TB URINARY NEC-HISTO DX TB URINARY NEC-OTH TEST TB EPIDIDYMIS-UNSPEC TB EPIDIDYMIS-NO EXAM TB EPIDIDYMIS-EXAM UNKN TB EPIDIDYMIS-MICRO DX TB EPIDIDYMIS-CULT DX TB EPIDIDYMIS-HISTO DX TB EPIDIDYMIS-OTH TEST TB MALE GENIT NEC-UNSPEC TB MALE GEN NEC-NO EXAM TB MALE GEN NEC-EX UNKN TB MALE GEN NEC-MICRO DX TB MALE GEN NEC-CULT DX TB MALE GEN NEC-HISTO DX TB MALE GEN NEC-OTH TEST TB OVARY & TUBE-UNSPEC TB OVARY & TUBE-NO EXAM TB OVARY/TUBE-EXAM UNKN TB OVARY & TUBE-MICRO DX TB OVARY & TUBE-CULT DX TB OVARY & TUBE-HISTO DX TB OVARY & TUBE-OTH TEST TB FEMALE GEN NEC-UNSPEC

	TB FEM GEN NEC-NO EXAM TB FEM GEN NEC-EXAM UNKN TB FEM GEN NEC-MICRO DX TB FEM GEN NEC-CULT DX TB FEM GEN NEC-HISTO DX TB FEM GEN NEC-OTH TEST GU TB NOS-UNSPEC GU TB NOS-NO EXAM GU TB NOS-EXAM UNKN GU TB NOS-MICRO DX GU TB NOS-CULT DX GU TB NOS-HISTO DX GU TB NOS-OTH TEST
017	TB SKIN/SUBCUTAN-UNSPEC TB SKIN/SUBCUT-NO EXAM TB SKIN/SUBCUT-EXAM UNKN TB SKIN/SUBCUT-MICRO DX TB SKIN/SUBCUT-CULT DX TB SKIN/SUBCUT-HISTO DX TB SKIN/SUBCUT-OTH TEST ERYTHEMA NODOS TB-UNSPEC ERYTHEM NODOS TB-NO EXAM ERYTHEM NOD TB-EXAM UNKN ERYTHEM NOD TB-MICRO DX ERYTHEM NODOS TB-CULT DX ERYTHEM NOD TB-HISTO DX ERYTHEM NOD TB-OTH TEST TB PERIPH LYMPH-UNSPEC TB PERIPH LYMPH-NO EXAM TB PERIPH LYMPH-EXAM UNK TB PERIPH LYMPH-MICRO DX TB PERIPH LYMPH-CULT DX TB PERIPH LYMPH-HISTO DX TB PERIPH LYMPH-OTH TEST TB OF EYE-UNSPEC TB OF EYE-NO EXAM TB OF EYE-EXAM UNKN TB OF EYE-MICRO DX TB OF EYE-CULT DX TB OF EYE-HISTO DX TB OF EYE-OTH TEST TB OF EAR-UNSPEC TB OF EAR-NO EXAM TB OF EAR-EXAM UNKN TB OF EAR-MICRO DX TB OF EAR-CULT DX TB OF EAR-HISTO DX TB OF EAR-OTH TEST TB OF THYROID-UNSPEC TB OF THYROID-NO EXAM TB OF THYROID-EXAM UNKN TB OF THYROID-MICRO DX TB OF THYROID-CULT DX TB OF THYROID-HISTO DX

	TB OF THYROID-OTH TEST TB OF ADRENAL-UNSPEC TB OF ADRENAL-NO EXAM TB OF ADRENAL-EXAM UNKN TB OF ADRENAL-MICRO DX TB OF ADRENAL-CULT DX TB OF ADRENAL-HISTO DX TB OF ADRENAL-OTH TEST TB OF SPLEEN-UNSPEC TB OF SPLEEN-NO EXAM TB OF SPLEEN-EXAM UNKN TB OF SPLEEN-MICRO DX TB OF SPLEEN-CULT DX TB OF SPLEEN-HISTO DX TB OF SPLEEN-OTH TEST TB ESOPHAGUS-UNSPEC TB ESOPHAGUS-NO EXAM TB ESOPHAGUS-EXAM UNKN TB ESOPHAGUS-MICRO DX TB ESOPHAGUS-CULT DX TB ESOPHAGUS-HISTO DX TB ESOPHAGUS-OTH TEST TB OF ORGAN NEC-UNSPEC TB OF ORGAN NEC-NO EXAM TB ORGAN NEC-EXAM UNKN TB OF ORGAN NEC-MICRO DX TB OF ORGAN NEC-CULT DX TB OF ORGAN NEC-HISTO DX TB OF ORGAN NEC-OTH TEST
018	ACUTE MILIARY TB-UNSPEC ACUTE MILIARY TB-NO EXAM AC MILIARY TB-EXAM UNKN AC MILIARY TB-MICRO DX ACUTE MILIARY TB-CULT DX AC MILIARY TB-HISTO DX AC MILIARY TB-OTH TEST MILIARY TB NEC-UNSPEC MILIARY TB NEC-NO EXAM MILIARY TB NEC-EXAM UNKN MILIARY TB NEC-MICRO DX MILIARY TB NEC-CULT DX MILIARY TB NEC-HISTO DX MILIARY TB NEC-OTH TEST MILIARY TB NOS-UNSPEC MILIARY TB NOS-NO EXAM MILIARY TB NOS-EXAM UNKN MILIARY TB NOS-MICRO DX MILIARY TB NOS-CULT DX MILIARY TB NOS-HISTO DX MILIARY TB NOS-OTH TEST

APPENDIX C: MDS 2.0 Quarterly and Full Assessments

MINIMUM DATA SET (MDS) VERSION 2.0

Modified for Ontario Chronic Care Institutions

Addressograph

QUARTERLY ASSESSMENT

SECTION A: IDENTIFICATION AND BACKGROUND INFORMATION

1	RESIDENT NAME	a. First b. Middle Initial c. Last d. Jr/Sr
2	ROOM NUMBER	
3	ASSESSMENT REFERENCE DATE	Last day of MDS observation period Year - Month - Day

SECTION B: COGNITIVE PATTERNS

1	COMATOSE	*(Persistent vegetative state or no discernible consciousness)* 0. No 1. Yes (Skip to item G1)	
2	MEMORY	*(Recall of what was learned or known)* a. Short-term memory OK—seems or appears to recall after 5 minutes 0. Memory OK 1. Memory problem b. Long-term memory OK—seems or appears to recall long past 0. Memory OK 1. Memory problem	
3	MEMORY/ RECALL ABILITY	*(Check all that resident was normally able to recall during the last 7 days.)* a. Current season [a] b. Location of own room [b] c. Staff names and faces [c] d. That he/she is in a facility [d] e. *NONE OF ABOVE* are recalled [e]	
4	COGNITIVE SKILLS FOR DAILY DECISION MAKING	*(Made decisions regarding tasks of daily life.)* 0. INDEPENDENT–decisions consistent and reasonable 1. MODIFIED INDEPENDENCE–some difficulty in new situations only 2. MODERATELY IMPAIRED—decisions poor; cues or supervision required 3. SEVERELY IMPAIRED—never/rarely made decisions	

SECTION B: COGNITIVE PATTERNS (cont'd)

5	INDICATORS OF DELIRIUM-PERIODIC DISORDERED THINKING/ AWARENESS	*(Code for behaviour in last 7 days.) Accurate assessment requires conversations with staff and family who have direct knowledge of resident's behaviour over this time.* 0. Behaviour not present 1. Behaviour present, not of recent onset 2. Behaviour present, over last 7 days appears different from resident's usual functioning (e.g. new onset or worsening)	
		a. EASILY DISTRACTED (e.g. difficulty paying attention, gets sidetracked)	
		b. PERIODS OF ALTERED PERCEPTION OR AWARE-NESS OF SURROUNDINGS (e.g. moves lips or talks to someone not present; believes he or she is somewhere else; confuses night and day)	
		c. EPISODES OF DISORGANIZED SPEECH (e.g. speech is incoherent, nonsensical, irrelevant, or rambling from subject to subject; loses train of thought)	
		d. PERIODS OF RESTLESSNESS (e.g. fidgeting or picking at skin, clothing, napkins, etc.; frequent position changes; repetitive physical movements or calling out)	
		e. PERIODS OF LETHARGY (e.g. sluggishness; staring into space; difficult to arouse; little bodily movement)	
		f. MENTAL FUNCTION VARIES OVER THE COURSE OF THE DAY (e.g. sometimes better, sometimes worse; behaviours sometimes present, sometimes not)	

SECTION C: COMMUNICATION/HEARING PATTERNS

4	MAKING SELF UNDERSTOOD	*(Expressing information content—however able)* 0. UNDERSTOOD 1. USUALLY UNDERSTOOD—difficulty finding words or finishing thoughts 2. SOMETIMES UNDERSTOOD—ability is limited to making concrete requests 3. RARELY OR NEVER UNDERSTOOD	
6	ABILITY TO UNDERSTAND OTHERS	*(Understanding verbal information content—however able)* 0. UNDERSTANDS 1. USUALLY UNDERSTANDS—may miss some part or intent of message 2. SOMETIMES UNDERSTANDS—responds adequately to simple, direct communication 3. RARELY OR NEVER UNDERSTANDS 9. UNKNOWN (for cognitively impaired only)	

SECTION E: MOOD AND BEHAVIOUR PATTERNS

1	INDICATORS OF DEPRESSION, ANXIETY, SAD MOOD	*(Code for indicators observed in LAST 30 DAYS, irrespective of the assumed cause.)* 0. Indicator not exhibited in last 30 days 1. Indicator of this type exhibited up to 5 days a week 2. Indicator of this type exhibited daily or almost daily (6, 7 days)
		VERBAL EXPRESSIONS OF DISTRESS
		a. Resident made negative statements (e.g. "Nothing matters; Would rather be dead; What's the use; Regrets having lived so long; Let me die.")
		b. Repetitive questions ("Where do I go? What do I do?")
		c. Repetitive verbalizations (e.g. Calling out for help "God help me.")
		d. Persistent anger with self or others (e.g. easily annoyed, anger at placement in facility; anger at care received)
		e. Self deprecation (e.g. "I am nothing, of no use to anyone.")
		f. Expressions of what appear to be unrealistic fears (e.g. fear of being abandoned, left alone, being with others)
		g. Recurrent statements that something terrible is about to happen (e.g. believes is about to die, have a heart attack)
		h. Repetitive health complaints (e.g. persistently seeks medical attention, obsessive concern with body functions)
		i. Repetitive anxious complaints or concerns—non-health (e.g. persistently seeks attention or reassurance regarding schedules, meals, laundry or clothing, relationship issues)
		SLEEP-CYCLE ISSUES
		j. Unpleasant mood in morning
		k. Insomnia or change in usual sleep pattern
		SAD, APATHETIC, ANXIOUS APPEARANCE
		l. Sad, pained, worried facial expressions (e.g. furrowed brows)
		m. Crying, tearfulness
		n. Repetitive physical movements (e.g. pacing, hand wringing, restlessness, fidgeting, picking)
		LOSS OF INTEREST
		o. Withdrawal from activities of interest (e.g. no interest in longstanding activities or being with family, friends)
		p. Reduced social interaction
2	MOOD PERSISTENCE	One or more indicators of depressed, sad or anxious mood were not easily altered by attempts to "cheer up", console, or reassure the resident in last 7 days. 1. USUALLY UNDERSTOOD—difficulty finding 0. No mood indicators 1. Indicators present, easily altered 2. Indicators present, not easily altered
4	BEHAVIOURAL SYMPTOMS	*(Code for behaviour in last 7 days.)* A. Behavioural symptom frequently in last 7 days 0. Behaviour not exhibited in last 7 days 1. Behaviour of this type occurred on 1 to 3 days in last 7 days 2. Behaviour of this type occurred 4 to 6 days, but less than daily 3. Behaviour of this type occurred daily B. Behavioural symptom alterability in last 7 days 0. Behaviour not present —OR—behaviour was easily altered 1. Behaviour was not easily altered (cont'd)

SECTION E: MOOD AND BEHAVIOUR PATTERNS (cont'd)

			A	B
4	BEHAVIOURAL SYMPTOMS (cont'd)	a. **WANDERING** (moved with no rational purpose, seemingly oblivious to needs or safety)		
		b. **VERBALLY ABUSIVE** behavioural symptoms (others were threatened, screamed at, cursed at)		
		c. **PHYSICALLY ABUSIVE** behavioural symptoms (others were hit, shoved, scratched, sexually abused)		
		d. **SOCIALLY INAPPROPRIATE or DISRUPTIVE** behavioural symptoms (made disruptive sounds, noisiness, screaming, self-abusive acts, sexual behaviour or disrobing in public, smeared or threw food or feces, hoarding, rummaged in others' belongings)		
		e. **RESISTS CARE** (resisted taking meds or injections, ADL assistance, or eating)		

SECTION G: PHYSICAL FUNCTIONING AND STRUCTURAL PROBLEMS

1	A. ADL SELF-PERFORMANCE *(Code for resident's **PERFORMANCE OVER ALL SHIFTS** during last 7 days, not including setup.)* 0. **INDEPENDENT**. No help or oversight–OR–help/oversight provided only 1 or 2 times during last 7 days. 1. **SUPERVISION.** Oversight, encouragement or cueing provided 3 or more times during last 7 days–OR–Supervision plus physical assistance provided only 1 or 2 times during last 7 days. 2. **LIMITED ASSISTANCE**. Resident highly involved in activity; received physical help in guided maneuvering of limbs, or other nonweight-bearing assistance 3 or more times–OR–More help provided only 1 or 2 times during last 7 days. 3. **EXTENSIVE ASSISTANCE**. Although resident performed part of activity, over last 7-day period, help of the following type(s) was provided 3 or more times: • weight-bearing support • full staff performance during part (but not all) of last 7 days. 4. **TOTAL DEPENDENCE**. Full staff performance of activity during entire 7 days. 8. **ACTIVITY DID NOT OCCUR** during entire 7 days.			
	B. ADL SUPPORT PROVIDED (*Code for **MOST SUPPORT PROVIDED OVER ALL SHIFTS** during last 7 days; code regardless of resident's self-performance classification.*) 0. No setup or physical help from staff 1. Setup help only 2. One-person physical assist 3. Two+ persons physical assist 8. ADL activity did not occur during entire 7 days		A SELF-PERFORMANCE	B SUPPORT
a	**BED MOBILITY**	How resident moves to and from lying position, turns from side to side, and positions body while in bed		
b	**TRANSFER**	How resident moves between surfaces–to and from: bed, chair, wheelchair, standing position (EXCLUDE to and from bath and toilet)		
c	**WALK IN ROOM**	How resident walks between locations in own room		
d	**WALK IN CORRIDOR**	How resident walks in corridor on unit		
e	**LOCOMOTION ON UNIT**	How resident moves between locations in own room and adjacent corridor on same floor. If in wheelchair, self-sufficiency once in chair		
f	**LOCOMOTION OFF UNIT**	How resident moves to and returns from off-unit locations (e.g. areas set aside for dining, activities or treatments). If facility has only one floor, how resident moves to and from distant areas on the floor. If in wheelchair, self-sufficiency once in chair		
g	**DRESSNG**	How resident puts on, fastens, and takes off all items of street clothing, including donning and removing prosthesis		
h	**EATING**	How resident eats and drinks (regardless of skill). Includes intake of nourishment by other means (e.g. tube feeding, total parenteral nutrition)		
i	**TOILET USE**	How resident uses the toilet room (or commode, bedpan, urinal); transfers on/off toilet, cleanses, changes pad, manages ostomy or catheter, adjusts clothes		
j	**PERSONAL HYGIENE**	How resident maintains personal hygiene, including combing hair; brushing teeth; shaving; applying makeup; washing and drying face, hands, and perineum (EXCLUDE baths and showers)		

SECTION G: PHYSICAL FUNCTIONING AND STRUCTURAL PROBLEMS (cont'd)

2 BATHING

How resident takes full-body bath or shower, sponge bath, and transfers in and out of tub or shower (EXCLUDE washing of back and hair).

(Code for most dependent in self-performance and support.)

Bathing self-performance codes are:
0. Independent–No help provided
1. Supervision–Oversight help only
2. Physical help limited to transfer only
3. Physical help in part of bathing activity
4. Total dependence
8. Bathing did not occur during the entire 7 days

A (SELF-PERFORMANCE)

3 TEST FOR BALANCE

(Code for ability during test in the last 7 days.)
0. Maintained position as required in test
1. Unsteady, but able to rebalance self without physical support
2. Partial physical support during test or doesn't follow directions
3. Not able to attempt test without physical help

a. Balance while standing
b. Balance while sitting–position, trunk control

4 FUNCTIONAL LIMITATION IN RANGE OF MOTION

(Code for limitations during last 7 days that interfered with daily functions or put resident at risk of injury.)

A. RANGE OF MOTION: 0. No limitation; 1. Limitation on 1 side; 2. Limitation on both sides
B. VOLUNTARY MOVEMENT: 0. No loss; 1. Partial loss; 2. Full loss

	A	B
a. Neck		
b. Arm—including shoulder or elbow		
c. Hand—including wrist or fingers		
d. Leg—including hip or knee		
e. Foot—including ankle or toes		
f. Other limitation or loss		

6 MODES OF TRANSFER

(Check all that apply during last 7 days.)
a. Bedfast all or most of the time
b. Bed rails used for bed mobility or transfer
f. *NONE OF ABOVE*

7 TASK SEGMENTATION

Some or all of ADL activities were broken into sub-tasks during last 7 days so that resident could perform them.
0. No 1. Yes

SECTION H: CONTINENCE IN LAST 14 DAYS

1 CONTINENCE SELF-CONTROL CATEGORIES *(Code for performance over all shifts.)*
0. CONTINENT–Complete control
1. USUALLY CONTINENT–BLADDER, incontinent episodes once a week or less; BOWEL, less than weekly
2. OCCASIONALLY INCONTINENT– BLADDER, 2+ times a week but not daily; BOWEL, once a week
3. FREQUENTLY INCONTINENT–BLADDER, tended to be incontinent daily, but some control present (e.g. on day shift); BOWEL, 2 or 3 times a week
4. INCONTINENT–Had inadequate control. BLADDER, multiple daily episodes; BOWEL, all (or almost all) of the time

a BOWEL CONTINENCE — Control of bowel movement, with appliance or bowel continence programs, if used

b BLADDER CONTINENCE — Control of urinary bladder function (if dribbles, volume insufficient to soak through underpants), with appliances (e.g. foley) or continence programs, if used

2 BOWEL ELIMINATION PATTERN *(Check all that apply in LAST 14 DAYS.)*
c. Diarrhea
d. Fecal impaction
e. *NONE OF ABOVE*

3 APPLIANCES AND PROGRAMS *(Check all that apply in LAST 14 DAYS.)*
a. Any scheduled toileting plan
b. Bladder retraining program
c. External (condom) catheter
d. Indwelling catheter
i. Ostomy present
j. *NONE OF ABOVE*

SECTION I: DISEASE DIAGNOSES

(Check only those diseases that have a relationship to current ADL status, cognitive status, mood and behaviour status, medical treatments, nurse monitoring, or risk of death. Do not list inactive diagnoses.)

1 DISEASES *(If none of I1a–I1ff apply, CHECK item I1rr, NONE OF ABOVE.)*

ENDOCRINE/METABOLIC/NUTRITIONAL
a. Diabetes mellitus

MUSCULOSKELETAL
m. Hip fracture

NEUROLOGICAL
r. Aphasia
s. Cerebral palsy
t. Cerebrovascular accident (stroke)
v. Hemiplegia/hemiparesis
w. Multiple sclerosis
z. Quadriplegia

PSYCHIATRIC/MOOD
ee. Depression
ff. Manic depressive (bipolar disease)
rr. *NONE OF ABOVE*

2 INFECTIONS *(If none apply, CHECK the NONE OF ABOVE box.)*
a. Antibiotic resistant infection (e.g. Methicillin resistant staph)
b. Clostridium difficile
c. Conjunctivitis
d. HIV infection
e. Pneumonia
f. Respiratory infection
g. Septicemia
h. Sexually transmitted diseases
i. Tuberculosis (active)
j. Urinary tract infection in LAST 30 DAYS
k. Viral hepatitis
l. Wound infection
m. *NONE OF ABOVE*

SECTION J: HEALTH CONDITIONS

1 PROBLEM CONDITIONS *(Check all problems present in last 7 days UNLESS OTHER TIME FRAME IS INDICATED.)*

INDICATORS OF FLUID STATUS
a. Weight gain or loss of 1.5 or more kilograms in last 7 days (3 lbs.)
b. Inability to lie flat due to shortness of breath
c. Dehydrated; output exceeds intake
d. Insufficient fluid; did NOT consume all or almost all liquids provided during LAST 3 DAYS

OTHER
e. Delusions
g. Edema
h. Fever
i. Hallucinations
j. Internal bleeding
k. Recurrent lung aspirations in LAST 90 DAYS
l. Shortness of breath
n. Unsteady gait
o. Vomiting
p. *NONE OF ABOVE*

2 PAIN SYMPTOMS *(Code for the highest level of pain present in last 7 days.)*

a. FREQUENCY with which resident complains or shows evidence of pain:
0. No pain *(Skip to J4)*
1. Pain less than daily
2. Pain daily

b. INTENSITY of pain:
1. Mild pain
2. Moderate pain
3. Times when pain is horrible or excruciating

4 ACCIDENTS *(Identify all that apply.)*
a. Fell in PAST 30 DAYS
b. Fell in PAST 31 to 180 DAYS
c. Hip fracture in LAST 180 DAYS
d. Other fracture in LAST 180 DAYS
e. *NONE OF ABOVE*

SECTION J: HEALTH CONDITIONS (cont'd)

5	STABILITY OF CONDITIONS	*(Check all that apply.)* a. Conditions or diseases make resident's cognitive, ADL, mood, or behaviour patterns unstable (fluctuating, precarious, or deteriorating) b. Resident experiencing an acute episode or a flare-up of a recurrent or chronic problem c. End-stage disease; 6 months or less to live d. *NONE OF ABOVE*	a b c d

SECTION K: ORAL/NUTRITIONAL STATUS

1	ORAL PROBLEMS	*(Check all that apply in last 7 days.)* a. Chewing problem [a] b. Swallowing problem [b] d. *NONE OF ABOVE*	d
2	HEIGHT AND WEIGHT	*(a. Record height in centimetres)* a. HEIGHT (cm.) *(b. Record weight in kilograms)* b. WEIGHT (kg.) Base weight on most recent measure in LAST 30 DAYS; measure weight consistently in accord with standard facility practice (e.g. in AM after voiding, before meal, with shoes off, and in nightclothes).	
3	WEIGHT CHANGE	**a. Weight loss**—5% or more in LAST 30 DAYS or 10% or more in LAST 180 DAYS. 0. No 1. Yes 9. Unknown **b. Weight gain**—5% or more in LAST 30 DAYS or 10% or more in LAST 180 DAYS 0. No 1. Yes 9. Unknown	
5	NUTRITIONAL APPROACHES	*(Check all that apply in last 7 days.)* a. Parenteral/IV [a] b. Feeding tube [b] f. Dietary supplement between meals [f] g. Plate guard, stabilized built-up utensil, etc. h. On a planned weight change program i. NONE OF ABOVE	g h i
6	PARENTERAL OR ENTERAL INTAKE	*(Skip to Section M if neither 5a nor 5b is checked.)* a. Code the proportion of total calories the resident received through parenteral or tube feedings in the last 7 days 0. None 2. 26% to 50% 4. 76% to 100% 1. 1% to 25% 3. 51% to 75% b. Code the average fluid intake per day by IV or tube in the last 7 days 0. None 3. 1001 to 1500 cc/day 1. 1 to 500 cc/day 4. 1501 to 2000 cc/day 2. 501 to 1000 cc/day 5. 2001 or more cc/day	

SECTION M: SKIN CONDITION

1	ULCERS (due to any cause)	*(Record the **number** of ulcers at each ulcer stage—regardless of cause. If none present at a stage, record "0" (zero). Code all that apply in last 7 days. Code 9 = 9 or more.)* **Requires a full body exam.** a. **Stage 1**–A persistent area of skin redness (without a break in the skin) that does not disappear when pressure is relieved b. **Stage 2**–A partial thickness loss of skin layers that presents clinically as an abrasion, blister or shallow crater c. **Stage 3**–A full thickness of skin is lost, exposing the subcutaneous tissues—presents as a deep crater with or without undermining adjacent tissue d. **Stage 4**–A full thickness of skin and subcutaneous tissue is lost, exposing muscle or bone	
2	TYPE OF ULCER	*(For each type of ulcer, code for the **highest stage** in last 7 days using scale in item M1—i.e., 0 = none; stages 1, 2, 3, 4.)* a. Pressure ulcer—any lesion caused by pressure resulting in damage of underlying tissue b. Stasis ulcer—open lesion caused by poor circulation in the lower extremities	

SECTION M: SKIN CONDITION (cont'd)

4	OTHER SKIN PROBLEMS OR LESIONS PRESENT	*(Check all that apply during last 7 days.)* a. Abrasions, bruises b. Burns (second or third degree) c. Open lesions other than ulcers, rashes or cuts (e.g. cancer lesions) d. Rashes (e.g. intertrigo, eczema, drug/heat rash, herpes) e. Skin desensitized to pain or pressure f. Skin tears or cuts (other than surgery) g. Surgical wounds h. *NONE OF ABOVE*	a b c d E f g h
5	SKIN TREATMENTS	*(Check all that apply during last 7 days.)* a. Pressure relieving device(s) for chair b. Pressure relieving device(s) for bed c. Turning or repositioning program d. Nutrition or hydration intervention to manage skin problems e. Ulcer care f. Surgical wound care g. Application of dressings (with or without topical medications) other than to feet h. Application of ointments or medications (except to feet) i. Other preventative or protective skin care (except to feet) j. *NONE OF ABOVE*	a b c d e f g h i j
6	FOOT PROBLEMS AND CARE	*(Check all that apply during last 7 days.)* a. Resident has one or more foot problems (e.g. corns, callouses, bunions, hammer toes, overlapping toes, pain, structural problems) b. Infection of the foot (e.g. cellulitis, purulent drainage) c. Open lesions on the foot d. Nails or callouses trimmed during LAST 90 DAYS e. Received preventative or protective foot care (e.g. used special shoes, inserts, pads, toe separators) f. Application of dressings (with or without topical meds) g. *NONE OF ABOVE*	a b c d e f g

SECTION N: ACTIVITY PURSUIT PATTERNS

1	TIME AWAKE	*(Check appropriate time periods over last 7 days.)* Resident awake all or most of the time (i.e. naps no more than 1 hour per time period) in the: a. Morning [a] c. Evening b. Afternoon [b] d. *NONE OF ABOVE*	c d
		(If resident is comatose, skip to Section O.)	
2	AVERAGE TIME INVOLVED IN ACTIVITIES	*(When awake and not getting treatment or ADL care)* 0. Most—more than 2/3 of time 1. Some—from 1/3 to 2/3 of time 2. Little—less than 1/3 of time	

SECTION O: MEDICATIONS

1	NUMBER OF MEDICATIONS	*(Record the NUMBER of different MEDICATIONS used in the last 7 days. Enter "0" if none used.)*	
3	INJECTIONS	*(Record the NUMBER OF DAYS injections of any type were received during the last 7 days. Enter "0" if none used.)*	
4	DAYS RECEIVED THE FOLLOWING MEDICATION	*(Record the NUMBER OF DAYS during last 7 days; enter "0" if not used. N.B. Enter "1" for long-acting meds used less than weekly.)* a. Antipsychotic [ ] c. Antidepressant b. Antianxiety drug [ ] d. Hypnotic e. Diuretic	

[ ] = when box blank, must enter number or letter.
[a] = when box holds a letter, check if condition applies.

SECTION P: SPECIAL TREATMENTS AND PROCEDURES

1 — SPECIAL TREATMENTS, PROCEDURES, AND PROGRAMS

a. SPECIAL CARE—(Check treatments or programs received in LAST 14 DAYS.)

TREATMENTS		PROGRAMS	
A. Chemotherapy	A	M. Alcohol or drug treatment program	M
B. Dialysis	B	N. Alzheimer's or dementia special care unit	N
C. IV medication	C	O. Hospice care	O
D. Intake/output	D	P. Pediatric care	P
E. Monitoring acute medical condition	E	Q. Respite care	Q
F. Ostomy care	F	R. Training in skills to return to the community (e.g. taking medications, house-work, shopping, transportation, ADLs)	R
G. Oxygen therapy	G		
H. Radiation	H		
I. Suctioning	I		
J. Trach. Care	J		
K. Transfusions	K		
L. Ventilator or respirator	L	S. *NONE OF ABOVE*	S

b. THERAPIES—*(Record the number of days and total minutes each of the following therapies was administered (for at least 15 minutes a day) in the last 7 days. Enter "0" if none or less than 15 minutes daily.) Note: Count only post-admission therapies.*

Box **A** = **# of days** administered for 15 minutes or more
Box **B** = **total # of minutes** provided in last 7 days

	A	B
a. Speech—language pathology, audiology service		
b. Occupational therapy		
c. Physical therapy		
d. Respiratory therapy		
e. Psychological therapy (by any licensed mental health professional)		

SECTION P: SPECIAL TREATMENTS AND PROCEDURES (cont'd)

3 — NURSING REHABILITATION/ RESTORATIVE CARE

(Record the NUMBER OF DAYS each of the following rehabilitation or restorative techniques or practices was provided to the resident for more than or equal to 15 minutes per day in the last 7 days. Enter "0" if none or less than 15 minutes daily.)

a. Range of motion (passive)		f. Walking	
b. Range of motion (active)		g. Dressing or grooming	
c. Splint or brace assistance		h. Eating or swallowing	
Training and skill practice in:		i. Amputation or prosthesis care	
d. Bed mobility		j. Communication	
e. Transfer		k. Other	

4 — DEVICES AND RESTRAINTS

(Use the following codes for the last 7 days.)
0. Not used 1. Used less than daily 2. Used daily

Bed Rails		c. Trunk restraint	
a. Full bed rails on all open sides of bed		d. Limb restraint	
b. Other types of side rails used (e.g. half rail, 1 side)		e. Chair prevents rising	

7 — PHYSICIAN VISITS

In the LAST 14 DAYS (or since admission, if less than 14 days in facility), how many days has the physician (or authorized assistant or practitioner) examined the resident? *(Enter "0" if none.)*

8 — PHYSICIAN ORDERS

In the LAST 14 DAYS (or since admission, if less than 14 days in facility), on how many days has the physician (or authorized assistant or practitioner) changed the resident's orders? *Do not include order renewals without change. (Enter "0" if none.)*

SECTION Q: DISCHARGE POTENTIAL AND OVERALL STATUS

2 — OVERALL CHANGE IN CARE NEEDS

Resident's overall level of self-sufficiency has changed significantly as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days ago).

0. No change
1. Improved—receives fewer supports, needs less restrictive level of care
2. Deteriorated—receives more support

2. SIGNATURES OF THOSE COMPLETING THE ASSESSMENT

a. Signature of RN Assessment Coordinator (sign on above line) — Provider Type — Assessor ID #

b. Date RN Assessment Coordinator signed as complete

Year - Month - Day

Other Signatures	Title	Sections	Date	Provider Type	Assessor ID #
*c.					
d.					
e.					
f.					
g.					

* most responsible physician

= when box blank, must enter number or letter.
a = when box holds a letter, check if condition applies.

MINIMUM DATA SET (MDS) VERSION 2.0

Modified for Ontario Chronic Care Institutions

Addressograph

FULL ASSESSMENT

SECTION A: IDENTIFICATION AND BACKGROUND INFORMATION

1	RESIDENT NAME	a. First b. Middle Initial c. Last d. Jr/Sr	
2	ROOM NUMBER		
3	ASSESSMENT REFERENCE DATE	Last day of MDS observation period Year - Month - Day	
5	MARITAL STATUS	1. Never married 3. Widowed 5. Divorced 2. Married 4. Separated 9. Unknown	
6a	CHART NUMBER		
6b	REGISTER NUMBER		
7	RESPONSIBILITY FOR PAYMENT	*(Check all that apply in LAST 30 DAYS.)* a. Resident of Canada (covered by OHIP or other provincial funding) b. Workers' Compensation Board (Workplace Safety and Insurance Board) c. Non-resident of Ontario, resident of Canada d. Self-pay e. Federal government (RCMP, Canadian Armed Forces, inmate of federal penitentiary, veteran, refugee) f. Other	a b c d e f
9	RESPONSIBILITY/ LEGAL GUARDIAN	*(Check all that apply. Use '9' if unknown.)* a. Legal guardian b. Durable power of attorney/financial c. Other legal oversight d. Family member responsible e. Durable power of attorney/health care f. Patient responsible for self g. *NONE OF ABOVE*	a b c d e f g
10	ADVANCED DIRECTIVES	*(For those items with supporting documentation in the medical record, check all that apply. Use '9' if unknown.)* a. Living will [a] b. Do not resuscitate [b] c. Do not hospitalize [c] d. Organ donation [d] e. Autopsy request [e] f. Feeding restrictions g. Medication restrictions h. Other treatment restrictions i. *NONE OF ABOVE*	f g h i

SECTION B: COGNITIVE PATTERNS

1	COMATOSE	*(Persistent vegetative state or no discernible consciousness)* 0. No 1. Yes (Skip to item G1)	

SECTION B: COGNITIVE PATTERNS (cont'd)

2	MEMORY	*(Recall of what was learned or known)* a. Short-term memory OK—seems or appears to recall after 5 minutes 0. Memory OK 1. Memory problem b. Long-term memory OK—seems or appears to recall long past 0. Memory OK 1. Memory problem	
3	MEMORY/ RECALL ABILITY	*(Check all that resident was normally able to recall during the last 7 days.)* a. Current season [a] b. Location of own room [b] c. Staff names and faces [c] d. That he/she is in a facility e. *NONE OF ABOVE* are recalled	d e
4	COGNITIVE SKILLS FOR DAILY DECISION MAKING	*(Made decisions regarding tasks of daily life.)* 0. INDEPENDENT–decisions consistent and reasonable 1. MODIFIED INDEPENDENCE–some difficulty in new situations only 2. MODERATELY IMPAIRED—decisions poor; cues or supervision required 3. SEVERELY IMPAIRED—never/rarely made decisions	
5	INDICATORS OF DELIRIUM-PERIODIC DISORDERED THINKING/ AWARENESS	*(Code for behaviour in last 7 days.) Accurate assessment requires conversations with staff and family who have direct knowledge of resident's behaviour over this time.* 0. Behaviour not present 1. Behaviour present, not of recent onset 2. Behaviour present, over last 7 days appears different from resident's usual functioning (e.g. new onset or worsening) a. EASILY DISTRACTED (e.g. difficulty paying attention, gets sidetracked) b. PERIODS OF ALTERED PERCEPTION OR AWARENESS OF SURROUNDINGS (e.g. moves lips or talks to someone not present; believes he or she is somewhere else; confuses night and day) c. EPISODES OF DISORGANIZED SPEECH (e.g. speech is incoherent, nonsensical, irrelevant, or rambling from subject to subject; loses train of thought) d. PERIODS OF RESTLESSNESS (e.g. fidgeting or picking at skin, clothing, napkins, etc.; frequent position changes; repetitive physical movements or calling out) e. PERIODS OF LETHARGY (e.g. sluggishness; staring into space; difficult to arouse; little bodily movement) f. MENTAL FUNCTION VARIES OVER THE COURSE OF THE DAY (e.g. sometimes better, sometimes worse; behaviours sometimes present, sometimes not)	
6	CHANGE IN COGNITIVE STATUS	Resident's cognitive status, skills or abilities have changed as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days). 0. No change 1. Improved 2. Deteriorated	

SECTION C: COMMUNICATION/HEARING PATTERNS

1	HEARING	*(With hearing appliance, if used)* 0. HEARS ADEQUATELY—normal talk, TV, phone 1. MINIMAL DIFFICULTY—when not in quiet setting 2. HEARS IN SPECIAL SITUATION ONLY—speaker has to adjust tonal quality and speak distinctly 3. HIGHLY IMPAIRED or absence of useful hearing 9. UNKNOWN (for cognitively impaired only)	
2	COMMUNICATION DEVICES/ TECHNIQUES	*(Check all that apply during last 7 days.)* a. Hearing aid, present and used — a b. Hearing aid, present and not used regularly — b c. Other receptive communication techniques used (e.g. lip reading) — c d. *NONE OF ABOVE* — d	
3	MODES OF EXPRESSION	*(Check all used by resident to make needs known.)* a. Speech — a b. Writing messages to express or clarify needs — b c. American sign language or Braille — c d. Signs or gestures or sounds — d e. Communication board — e f. Other — f g. *NONE OF ABOVE* — g	
4	MAKING SELF UNDERSTOOD	*(Expressing information content—however able)* 0. UNDERSTOOD 1. USUALLY UNDERSTOOD—difficulty finding words or finishing thoughts 2. SOMETIMES UNDERSTOOD—ability is limited to making concrete requests 3. RARELY OR NEVER UNDERSTOOD	
5	SPEECH CLARITY	*(Code for speech in last 7 days.)* 0. CLEAR SPEECH—distinct, intelligible words 1. UNCLEAR SPEECH—slurred, mumbled words 2. NO SPEECH—absence of spoken words	
6	ABILITY TO UNDERSTAND OTHERS	*(Understanding verbal information content—however able)* 0. UNDERSTANDS 1. USUALLY UNDERSTANDS—may miss some part or intent of message 2. SOMETIMES UNDERSTANDS—responds adequately to simple, direct communication 3. RARELY OR NEVER UNDERSTANDS 9. UNKNOWN (for cognitively impaired only)	
7	CHANGE IN COMMUNICATION/ HEARING	Resident's ability to express, understand, or hear information has changed as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days). 0. No Change 1. Improved 2. Deteriorated	

SECTION D: VISION PATTERNS

1	VISION	*(Able to see in adequate light and with glasses, if used)* 0. ADEQUATE—sees fine detail, including regular print in newspapers or books 1. IMPAIRED—sees large print, but not regular print in newspapers or books 2. MODERATELY IMPAIRED—limited vision; not able to see newspaper headlines, but can identify objects 3. HIGHLY IMPAIRED—object identification in question, but eyes appear to follow objects 4. SEVERELY IMPAIRED—no vision or sees only light, colours or shapes; eyes do not appear to follow objects 9. UNKNOWN (for cognitively impaired only)	

SECTION D: VISION PATTERNS (cont'd)

2	VISUAL LIMITATIONS/ DIFFICULTIES	a. Side vision problems—decreased peripheral vision (e.g. leaves food on one side of tray, difficulty travelling, bumps into people and objects, misjudges placement of chair when seating self) 0. No 1. Yes 9. Unknown (for cognitively impaired only) b. Experiences any of the following: sees halos or rings around lights, sees flashes of light, sees "curtains" over eyes 0. No 1. Yes 9. Unknown (for cognitively impaired only) c. *NONE OF ABOVE*	
3	VISUAL APPLIANCES	Glasses; contact lenses; magnifying glass 0. No 1. Yes	

SECTION E: MOOD AND BEHAVIOUR PATTERNS

1	INDICATORS OF DEPRESSION, ANXIETY, SAD MOOD	*(Code for indicators observed in LAST 30 DAYS, irrespective of the assumed cause.)* 0. Indicator not exhibited in last 30 days 1. Indicator of this type exhibited up to 5 days a week 2. Indicator of this type exhibited daily or almost daily (6, 7 days) **VERBAL EXPRESSIONS OF DISTRESS** a. Resident made negative statements (e.g. "Nothing matters; Would rather be dead; What's the use; Regrets having lived so long; Let me die.") b. Repetitive questions: (e.g. "Where do I go? What do I do?" c. Repetitive verbalizations (e.g. Calling out for help; "God help me.") d. Persistent anger with self or others (e.g. easily annoyed, anger at placement in facility; anger at care received) e. Self deprecation (e.g. "I am nothing, of no use to anyone.") f. Expressions of what appear to be unrealistic fears (e.g. fear of being abandoned, left alone, being with others) g. Recurrent statements that something terrible is about to happen (e.g. believes is about to die, have a heart attack) h. Repetitive health complaints (e.g. persistently seeks medical attention, obsessive concern with body functions) i. Repetitive anxious complaints or concerns—non-health (e.g. persistently seeks attention or reassurance regarding schedules, meals, laundry or clothing, relationship issues) **SLEEP-CYCLE ISSUES** j. Unpleasant mood in morning k. Insomnia or change in usual sleep pattern **SAD, APATHETIC, ANXIOUS APPEARANCE** l. Sad, pained, worried facial expressions (e.g. furrowed brows) m. Crying, tearfulness n. Repetitive physical movements (e.g. pacing, hand wringing, restlessness, fidgeting, picking) **LOSS OF INTEREST** o. Withdrawal from activities of interest (e.g. no interest in longstanding activities or being with family, friends) p. Reduced social interaction	
2	MOOD PERSISTENCE	One or more indicators of depressed, sad or anxious mood were not easily altered by attempts to "cheer up", console, or reassure the resident in last 7 days. 0. No mood indicators 1. Indicators present, easily altered 2. Indicators present, not easily altered	
3	CHANGE IN MOOD	Resident's mood status has changed as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days). 0. No change 1. Improved 2. Deteriorated	

SECTION E: MOOD AND BEHAVIOUR PATTERNS (cont'd)

4	BEHAVIOURAL SYMPTOMS	*(Code for behaviour in last 7 days.)* A. Behavioural symptom frequently in last 7 days 0. Behaviour not exhibited in last 7 days 1. Behaviour of this type occurred on 1 to 3 days in last 7 days 2. Behaviour of this type occurred 4 to 6 days, but less than daily 3. Behaviour of this type occurred daily B. Behavioural symptom alterability in last 7 days 0. Behaviour not present —OR— behaviour was easily altered 1. Behaviour was not easily altered	A	B
		a. **WANDERING** (moved with no rational purpose, seemingly oblivious to needs or safety)		
		b. **VERBALLY ABUSIVE** behavioural symptoms (others were threatened, screamed at, cursed at)		
		c. **PHYSICALLY ABUSIVE** behavioural symptoms (others were hit, shoved, scratched, sexually abused)		
		d. **SOCIALLY INAPPROPRIATE or DISRUPTIVE** behavioural symptoms (made disruptive sounds, noisiness, screaming, self-abusive acts, sexual behaviour or disrobing in public, smeared or threw food or feces, hoarding, rummaged in others' belongings)		
		e. **RESISTS CARE** (resisted taking meds or injections, ADL assistance, or eating)		
5	CHANGE IN BEHAVIOURAL SYMPTOMS	Resident's behavioural status has changed as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days). 0. No change 1. Improved 2. Deteriorated		

SECTION F: PSYCHOSOCIAL WELL-BEING

1	SENSE OF INITIATIVE/ INVOLVEMENT	a. At ease interacting with others	a
		b. At ease doing planned or structured activities	b
		c. At ease doing self-initiated activities	c
		d. Establishes own goals	d
		e. Pursues involvement in life of facility (e.g. makes and keeps friends; involved in group activities; responds positively to new activities; assists at religious services)	e
		f. Accepts invitations into most group activities	f
		g. *NONE OF ABOVE*	g
2	UNSETTLED RELATIONSHIPS	a. Covert/open conflict with or repeated criticism of staff	a
		b. Unhappy with roommate	b
		c. Unhappy with residents other than roommate	c
		d. Openly expresses conflict/anger with family/friends	d
		e. Absence of personal contact with family or friends	e
		f. Recent loss of close family member or friend	f
		g. Does not adjust easily to change in routines	g
		h. *NONE OF ABOVE*	h
3	PAST ROLES	a. Strong identification with past roles and life status 0. No 1. Yes 9. Unknown (for cognitively impaired only)	
		b. Expresses sadness, anger or empty feeling over lost roles or status 0. No 1. Yes 9. Unknown (for cognitively impaired only)	
		c. Resident perceives that daily life (customary routine, activities) is very different from prior pattern in the community 0. No 1. Yes 9. Unknown (for cognitively impaired only)	

SECTION G: PHYSICAL FUNCTIONING AND STRUCTURAL PROBLEMS

1 A. ADL SELF-PERFORMANCE *(Code for resident's **PERFORMANCE OVER ALL SHIFTS** during last 7 days, not including setup)*

0. **INDEPENDENT**. No help or oversight–OR–help/oversight provided only 1 or 2 times during last 7 days.
1. **SUPERVISION.** Oversight, encouragement or cueing provided 3 or more times during last 7 days–OR–Supervision plus physical assistance provided only 1 or 2 times during last 7 days.
2. **LIMITED ASSISTANCE**. Resident highly involved in activity; received physical help in guided maneuvering of limbs, or other nonweight-bearing assistance 3 or more times–OR–More help provided only 1 or 2 times during last 7 days.
3. **EXTENSIVE ASSISTANCE**. Although resident performed part of activity, over last 7-day period, help of the following type(s) was provided 3 or more times:
   - weight-bearing support
   - full staff performance during part (but not all) of last 7 days.
4. **TOTAL DEPENDENCE**. Full staff performance of activity during entire 7 days.
8. **ACTIVITY DID NOT OCCUR** during entire 7 days.

B. ADL SUPPORT PROVIDED *(Code for **MOST SUPPORT PROVIDED OVER ALL SHIFTS** during last 7 days; code regardless of resident's self-performance classification.)*

0. No setup or physical help from staff
1. Setup help only
2. One-person physical assist
3. Two+ persons physical assist
8. ADL activity did not occur during entire 7 days

			A SELF-PERFORMANCE	B SUPPORT
a	BED MOBILITY	How resident moves to and from lying position, turns from side to side, and positions body while in bed		
b	TRANSFER	How resident moves between surfaces–to and from: bed, chair, wheelchair, standing position (EXCLUDE to and from bath and toilet)		
c	WALK IN ROOM	How resident walks between locations in own room		
d	WALK IN CORRIDOR	How resident walks in corridor on unit		
e	LOCOMOTION ON UNIT	How resident moves between locations in own room and adjacent corridor on same floor. If in wheelchair, self-sufficiency once in chair		
f	LOCOMOTION OFF UNIT	How resident moves to and returns from off-unit locations (e.g. areas set aside for dining, activities or treatments). If facility has only one floor, how resident moves to and from distant areas on the floor. If in wheelchair, self-sufficiency once in chair		
g	DRESSNG	How resident puts on, fastens, and takes off all items of street clothing, including donning and removing prosthesis		
h	EATING	How resident eats and drinks (regardless of skill). Includes intake of nourishment by other means (e.g. tube feeding, total parenteral nutrition)		
i	TOILET USE	How resident uses the toilet room (or commode, bedpan, urinal); transfers on/off toilet, cleanses, changes pad, manages ostomy or catheter, adjusts clothes		
j	PERSONAL HYGIENE	How resident maintains personal hygiene, including combing hair; brushing teeth; shaving; applying makeup; washing and drying face, hands, and perineum (EXCLUDE baths and showers)		

SECTION G: PHYSICAL FUNCTIONING AND STRUCTURAL PROBLEMS (cont'd)

2 BATHING

How resident takes full-body bath or shower, sponge bath, and transfers in and out of tub or shower (EXCLUDE washing of back and hair). (*Code for most dependent in self-performance and support.*)

Bathing self-performance codes are:

0. Independent–No help provided
1. Supervision–Oversight help only
2. Physical help limited to transfer only
3. Physical help in part of bathing activity
4. Total dependence
8. Bathing did not occur during the entire 7 days

(Bathing support codes are as defined in item 1B above)

	A (SELF-PERFORMANCE)	B (SUPPORT)

3 TEST FOR BALANCE

(Code for ability during test in the last 7 days.)

0. Maintained position as required in test
1. Unsteady, but able to rebalance self without physical support
2. Partial physical support during test or doesn't follow directions
3. Not able to attempt test without physical help

a. Balance while standing	
b. Balance while sitting–position, trunk control	

4 FUNCTIONAL LIMITATION IN RANGE OF MOTION

(Code for limitations during last 7 days that interfered with daily functions or put resident at risk of injury.)

A. RANGE OF MOTION: 0. No limitation; 1. Limitation on 1 side; 2. Limitation on both sides

B. VOLUNTARY MOVEMENT: 0. No loss; 1. Partial loss; 2. Full loss

	A	B
a. Neck		
b. Arm—including shoulder or elbow		
c. Hand—including wrist or fingers		
d. Leg—including hip or knee		
e. Foot—including ankle or toes		
f. Other limitation or loss		

5 MODES OF LOCOMOTION

(Check all that apply during last 7 days.)

- a. Cane, walker, or crutch — a
- b. Wheeled self — b
- c. Other person wheeled — c
- d. Wheelchair primary mode of locomotion — d
- e. *NONE OF ABOVE* — e

6 MODES OF TRANSFER

(Check all that apply during last 7 days.)

- a. Bedfast all or most of the time — a
- b. Bed rails used for bed mobility or transfer — b
- c. Lifted manually — c
- d. Lifted mechanically — d
- e. Transfer aid (e.g. slide board, trapeze, cane, walker, brace) — e
- f. *NONE OF ABOVE* — f

7 TASK SEGMENTATION

Some or all of ADL activities were broken into sub-tasks during last 7 days so that resident could perform them.

0. No 1. Yes

8 ADL FUNCTIONAL REHAB. POTENTIAL

(Check all that apply during last 7 days.)

- a. Resident believes self to be capable of increased independence in at least some ADLs — a
- b. Direct care staff believe resident is capable of increased independence in at least some ADLs — b
- c. Resident able to perform tasks/activity but is very slow — c
- d. Difference in ADL self-performance or ADL support, comparing mornings to evenings — d
- e. *NONE OF ABOVE* — e

9 CHANGE IN ADL FUNCTION

Resident's ADL Self-Performance status has changed as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days).

0. No change 1. Improved 2. Deteriorated

SECTION H: CONTINENCE IN LAST 14 DAYS

1 CONTINENCE SELF-CONTROL CATEGORIES *(Code for performance over all shifts.)*

0. CONTINENT–Complete control
1. USUALLY CONTINENT–BLADDER, incontinent episodes once a week or less; BOWEL, less than weekly
2. OCCASIONALLY INCONTINENT– BLADDER, 2+ times a week but not daily; BOWEL, once a week
3. FREQUENTLY INCONTINENT–BLADDER, tended to be incontinent daily, but some control present (e.g. on day shift); BOWEL, 2 or 3 times a week
4. INCONTINENT–Had inadequate control. BLADDER, multiple daily episodes; BOWEL, all (or almost all) of the time

a BOWEL CONTINENCE — Control of bowel movement, with appliance or bowel continence programs, if used

b BLADDER CONTINENCE — Control of urinary bladder function (if dribbles, volume insufficient to soak through underpants), with appliances (e.g. foley) or continence programs, if used

2 BOWEL ELIMINATION PATTERN

(Check all that apply in LAST 14 DAYS.)

- a. Bowel elimination pattern regular—at least 1 movement every 3 days — a
- b. Constipation — b
- c. Diarrhea — c
- d. Fecal impaction — d
- e. *NONE OF ABOVE* — e

3 APPLIANCES AND PROGRAMS

(Check all that apply in LAST 14 DAYS.)

- a. Any scheduled toileting plan — a
- b. Bladder retraining program — b
- c. External (condom) catheter — c
- d. Indwelling catheter — d
- e. Intermittent catheter — e
- f. Did not use toilet room, commode, urinal — f
- g. Pads or briefs used — g
- h. Enemas, irrigation — h
- i. Ostomy present — i
- j. *NONE OF ABOVE* — j

4 CHANGE IN URINARY CONTINENCE

Resident's urinary continence has changed as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days).

0. No change 1. Improved 2. Deteriorated

SECTION I: DISEASE DIAGNOSES

(Check only those diseases that have a relationship to current ADL status, cognitive status, mood and behaviour status, medical treatments, nurse monitoring, or risk of death. Do not list inactive diagnoses.)

1 DISEASES *(If none of I1a–I1qq apply, CHECK item I1rr, NONE OF ABOVE.)*

ENDOCRINE/METABOLIC/NUTRITIONAL

- a. Diabetes mellitus — a
- b. Hyperthyroidism — b
- c. Hypothyroidism — c

HEART/CIRCULATION

- d. Arteriosclerotic heart disease (ASHD) — d
- e. Cardiac dysrhythmia — e
- f. Congestive heart failure — f
- g. Deep vein thrombosis — g
- h. Hypertension — h
- i. Hypotension — i
- j. Peripheral vascular disease — j
- k. Other cardiovascular disease — k

MUSCULOSKELETAL

- l. Arthritis — l
- m. Hip fracture — m
- n. Missing limb (e.g. amputation) — n
- o. Osteoporosis — o
- p. Pathological bone fracture — p

NEUROLOGICAL

- q. Alzheimer's disease — q
- r. Aphasia — r
- s. Cerebral palsy — s
- t. Cerebrovascular accident (stroke) — t
- u. Dementia other than Alzheimer's disease — u
- v. Hemiplegia/hemiparesis — v
- w. Multiple sclerosis — w
- x. Paraplegia — x
- y. Parkinson's disease — y
- z. Quadriplegia — z
- aa. Seizure disorder — aa
- bb. Transient ischemic attack (TIA) — bb
- cc. Traumatic brain injury — cc

(cont'd over)

SECTION I: DISEASE DIAGNOSES (cont'd)

(Check only those diseases that have a relationship to current ADL status, cognitive status, mood and behaviour status, medical treatments, nurse monitoring, or risk of death. Do not list inactive diagnoses.)

1 DISEASES (cont'd) — *(If none of I1a–I1qq apply, CHECK item I1rr, NONE OF ABOVE.)*

PSYCHIATRIC/MOOD

- dd. Anxiety disorder [dd]
- ee. Depression [ee]
- ff. Manic depressive (bipolar disease) [ff]
- gg. Schizophrenia [gg]

PULMONARY

- hh. Asthma [hh]
- ii. Emphysema/COPD [ii]

SENSORY

- jj. Cataracts [jj]
- kk. Diabetic retinopathy [kk]
- ll. Glaucoma [ll]
- mm. Macular degeneration [mm]

OTHER

- nn. Allergies [nn]
- oo. Anemia [oo]
- pp. Cancer [pp]
- qq. Renal failure [qq]
- rr. *NONE OF ABOVE* [rr]

2 INFECTIONS — *(If none apply, CHECK the NONE OF ABOVE box.)*

- a. Antibiotic resistant infection (e.g. Methicillin resistant staph) [a]
- b. Clostridium difficile [b]
- c. Conjunctivitis [c]
- d. HIV infection [d]
- e. Pneumonia [e]
- f. Respiratory infection [f]
- g. Septicemia [g]
- h. Sexually transmitted diseases [h]
- i. Tuberculosis (active) [i]
- j. Urinary tract infection in LAST 30 DAYS [j]
- k. Viral hepatitis [k]
- l. Wound infection [l]
- m. *NONE OF ABOVE* [m]

SECTION J: HEALTH CONDITIONS

1 PROBLEM CONDITIONS — *(Check all problems present in last 7 days UNLESS OTHER TIME FRAME IS INDICATED.)*

INDICATORS OF FLUID STATUS

- a. Weight gain or loss of 1.5 or more kilograms in last 7 days (3 lbs.) [a]
- b. Inability to lie flat due to shortness of breath [b]
- c. Dehydrated; output exceeds intake [c]
- d. Insufficient fluid; did NOT consume all or almost all liquids provided during LAST 3 DAYS [d]

OTHER

- e. Delusions [e]
- f. Dizziness/vertigo [f]
- g. Edema [g]
- h. Fever [h]
- i. Hallucinations [i]
- j. Internal bleeding [j]
- k. Recurrent lung aspirations in LAST 90 DAYS [k]
- l. Shortness of breath [l]
- m. Syncope (fainting) [m]
- n. Unsteady gait [n]
- o. Vomiting [o]
- p. *NONE OF ABOVE* [p]

2 PAIN SYMPTOMS — *(Code for the highest level of pain present in last 7 days.)*

a. FREQUENCY with which resident complains or shows evidence of pain:
0. No pain *(Skip to J4)*
1. Pain less than daily
2. Pain daily

b. INTENSITY of pain:
1. Mild pain
2. Moderate pain
3. Times when pain is horrible or excruciating

3 PAIN SITE — *(Check all sites where pain was present in last 7 days.)*

- a. Back pain [a]
- b. Bone pain [b]
- c. Chest pain during usual activities [c]
- d. Headache [d]
- e. Hip pain [e]
- f. Incisional pain [f]
- g. Joint pain (other than hip) [g]
- h. Soft tissue pain (e.g. lesion, muscle) [h]
- i. Stomach pain [i]
- j. Other [j]

SECTION J: HEALTH CONDITIONS (cont'd)

4 ACCIDENTS — *(Identify all that apply.)*

- a. Fell in PAST 30 DAYS [a]
- b. Fell in PAST 31 to 180 DAYS [b]
- c. Hip fracture in LAST 180 DAYS [c]
- d. Other fracture in LAST 180 DAYS [d]
- e. *NONE OF ABOVE* [e]

5 STABILITY OF CONDITIONS — *(Check all that apply.)*

- a. Conditions or diseases make resident's cognitive, ADL, mood, or behaviour patterns unstable (fluctuating, precarious, or deteriorating) [a]
- b. Resident experiencing an acute episode or a flare-up of a recurrent or chronic problem [b]
- c. End-stage disease; 6 months or less to live [c]
- d. *NONE OF ABOVE* [d]

SECTION K: ORAL/NUTRITIONAL STATUS

1 ORAL PROBLEMS — *(Check all that apply in last 7 days.)*

- a. Chewing problem [a]
- b. Swallowing problem [b]
- c. Mouth pain [c]
- d. *NONE OF ABOVE* [d]

2 HEIGHT AND WEIGHT

a. (Record height in centimetres) a. HEIGHT (cm.)

b. (Record weight in kilograms) b. WEIGHT (kg.)

Base weight on most recent measure in LAST 30 DAYS; measure weight consistently in accord with standard facility practice (e.g. in AM after voiding, before meal, with shoes off, and in nightclothes).

3 WEIGHT CHANGE

a. Weight loss—5% or more in LAST 30 DAYS or 10% or more in LAST 180 DAYS.
0. No 1. Yes 9. Unknown

b. Weight gain—5% or more in LAST 30 DAYS or 10% or more in LAST 180 DAYS
0. No 1. Yes 9. Unknown

4 NUTRITIONAL PROBLEMS — *(Check all that apply in last 7 days.)*

- a. Complains about the taste of many foods [a]
- b. Regular or repetitive complaints of hunger [b]
- c. Leaves 25% or more of food uneaten at most meals [c]
- d. *NONE OF ABOVE* [d]

5 NUTRITIONAL APPROACHES — *(Check all that apply in last 7 days.)*

- a. Parenteral/IV [a]
- b. Feeding tube [b]
- c. Mechanically altered diet [c]
- d. Syringe (oral feeding) [d]
- e. Therapeutic diet [e]
- f. Dietary supplement between meals [f]
- g. Plate guard, stabilized built-up utensil, etc. [g]
- h. On a planned weight change program [h]
- i. NONE OF ABOVE [i]

6 PARENTERAL OR ENTERAL INTAKE — *(Skip to Section L if neither 5a nor 5b is checked.)*

a. Code the proportion of total calories the resident received through parenteral or tube feedings in the last 7 days
0. None 2. 26% to 50% 4. 76% to 100%
1. 1% to 25% 3. 51% to 75%

b. Code the average fluid intake per day by IV or tube in the last 7 days
0. None 3. 1001 to 1500 cc/day
1. 1 to 500 cc/day 4. 1501 to 2000 cc/day
2. 501 to 1000 cc/day 5. 2001 or more cc/day

SECTION L: ORAL/DENTAL STATUS

1 ORAL STATUS AND DISEASE PREVENTION — *(Check all that apply in last 7 days.)*

- a. Debris (soft, easily removable substances) present in mouth prior to going to bed at night [a]
- b. Has dentures and/or removable bridge [b]
- c. Some or all natural teeth lost—does not have or does not use dentures (or partial plates) [c]
- d. Broken, loose, or carious teeth [d]
- e. Inflamed gums (gingiva); swollen or bleeding gums; oral abscesses, ulcers, or rashes [e]
- f. Daily cleaning of teeth or dentures, or daily mouth care—by resident or staff [f]
- g. *NONE OF ABOVE* [g]

SECTION M: SKIN CONDITION

1	ULCERS (due to any cause)	*(Record the **number** of ulcers at each ulcer stage—regardless of cause. If none present at a stage, record "0" (zero). Code all that apply in last 7 days. Code 9 = 9 or more.)* **Requires a full body exam.** a. **Stage 1**–A persistent area of skin redness (without a break in the skin) that does not disappear when pressure is relieved b. **Stage 2**–A partial thickness loss of skin layers that presents clinically as an abrasion, blister or shallow crater c. **Stage 3**–A full thickness of skin is lost, exposing the subcutaneous tissues—presents as a deep crater with or without undermining adjacent tissue d. **Stage 4**–A full thickness of skin and subcutaneous tissue is lost, exposing muscle or bone	
2	TYPE OF ULCER	*(For each type of ulcer, code for the **highest stage** in last 7 days using scale in item M1—i.e., 0 = none; stages 1, 2, 3, 4.)* a. Pressure ulcer—any lesion caused by pressure resulting in damage of underlying tissue b. Stasis ulcer—open lesion caused by poor circulation in the lower extremities	
3	HISTORY OF RESOLVED ULCERS	Resident has had a pressure ulcer that was resolved or cured in LAST 90 DAYS. 0. No 1. Yes	
4	OTHER SKIN PROBLEMS OR LESIONS PRESENT	*(Check all that apply during last 7 days.)* a. Abrasions, bruises b. Burns (second or third degree) c. Open lesions other than ulcers, rashes or cuts (e.g. cancer lesions) d. Rashes (e.g. intertrigo, eczema, drug/heat rash, herpes) e. Skin desensitized to pain or pressure f. Skin tears or cuts (other than surgery) g. Surgical wounds h. *NONE OF ABOVE*	a b c d e f g h
5	SKIN TREATMENTS	*(Check all that apply during last 7 days.)* a. Pressure relieving device(s) for chair b. Pressure relieving device(s) for bed c. Turning or repositioning program d. Nutrition or hydration intervention to manage skin problems e. Ulcer care f. Surgical wound care g. Application of dressings (with or without topical medications) other than to feet h. Application of ointments or medications (except to feet) i. Other preventative or protective skin care (except to feet) j. *NONE OF ABOVE*	a b c d e f g h i j
6	FOOT PROBLEMS AND CARE	*(Check all that apply during last 7 days.)* a. Resident has one or more foot problems (e.g. corns, callouses, bunions, hammer toes, overlapping toes, pain, structural problems) b. Infection of the foot (e.g. cellulitis, purulent drainage) c. Open lesions on the foot d. Nails or callouses trimmed during LAST 90 DAYS e. Received preventative or protective foot care (e.g. used special shoes, inserts, pads, toe separators) f. Application of dressings (with or without topical meds) g. *NONE OF ABOVE*	a b c d e f g

SECTION N: ACTIVITY PURSUIT PATTERNS

1	TIME AWAKE	*(Check appropriate time periods over last 7 days.)* Resident awake all or most of the time (i.e. naps no more than 1 hour per time period) in the: a. Morning [a] c. Evening b. Afternoon [b] d. *NONE OF ABOVE*	c d
		(If resident is comatose, skip to Section O.)	

SECTION N: ACTIVITY PURSUIT PATTERNS (cont'd)

2	AVERAGE TIME INVOLVED IN ACTIVITIES	*(When awake and not getting treatment or ADL care)* 0. Most—more than 2/3 of time 1. Some—from 1/3 to 2/3 of time 2. Little—less than 1/3 of time	
3	PREFERRED ACTIVITY SETTINGS	*(Check all settings in which activities are preferred.)* a. Own room [a] d. Outside facility b. Day or activity room [b] e. *NONE OF ABOVE* c. Inside facility/off unit [c]	d e
4	GENERAL ACTIVITY PREFERENCES (adapted to resident's current abilities)	*(Check all PREFERENCES whether or not activity is currently available to resident.)* a. Cards, other games [a] g. Trips or shopping b. Crafts or arts [b] h. Walk/wheeling outdoors c. Exercise or sports [c] i. Watching TV d. Music [d] j. Gardening or plants e. Reading, writing [e] k. Talking or conversing f. Spiritual or religious activities [f] l. Helping others m. *NONE OF ABOVE*	g h i j k l m
5	PREFERS CHANGE IN DAILY ROUTINE	*(Code for resident preferences in daily routine.)* 0. No change 1. Slight change 2. Major change a. Type of activities in which resident is currently involved b. Extent of resident involvement in activities	

SECTION O: MEDICATIONS

1	NUMBER OF MEDICATIONS	*(Record the NUMBER of different MEDICATIONS used in the last 7 days. Enter "0" if none used.)*	
2	NEW MEDICATIONS	Resident currently receiving medications that were initiated during the LAST 90 DAYS. 0. No 1. Yes 9. Unknown (admission only)	
3	INJECTIONS	*(Record the NUMBER OF DAYS injections of any type were received during the last 7 days. Enter "0" if none used.)*	
4	DAYS RECEIVED THE FOLLOWING MEDICATION	*(Record the NUMBER OF DAYS during last 7 days; enter "0" if not used. N.B. Enter "1" for long-acting meds used less than weekly.)* c. Antidepressant a. Antipsychotic d. Hypnotic b. Antianxiety drug e. Diuretic	

SECTION P: SPECIAL TREATMENTS AND PROCEDURES

1	SPECIAL TREATMENTS, PROCEDURES, AND PROGRAMS	***a. SPECIAL CARE**—(Check treatments or programs received in LAST 14 DAYS.)* **TREATMENTS** A. Chemotherapy [A] B. Dialysis [B] C. IV medication [C] D. Intake/output [D] E. Monitoring acute medical condition [E] F. Ostomy care [F] G. Oxygen therapy [G] H. Radiation [H] I. Suctioning [I] J. Trach. Care [J] K. Transfusions [K] L. Ventilator or respirator [L] **PROGRAMS** M. Alcohol or drug treatment program N. Alzheimer's or dementia special care unit O. Hospice care P. Pediatric care Q. Respite care R. Training in skills to return to the community (e.g. taking medications, housework, shopping, transportation, ADLs) S. *NONE OF ABOVE*	M N O P Q R S
		***b. THERAPIES**—(Record the number of days and total minutes each of the following therapies was administered (for at least 15 minutes a day) in the last 7 days. Enter "0" if none or less than 15 minutes daily.) Note: Count only post-admission therapies.* Box **A** = **# of days** administered for 15 minutes or more Box **B** = **total # of minutes** provided in last 7 days a. Speech—language pathology, audiology service [A] [B] b. Occupational therapy c. Physical therapy d. Respiratory therapy e. Psychological therapy (by any licensed mental health professional)	

[ ] = when box blank, must enter number or letter.
[a] = when box holds a letter, check if condition applies.

SECTION P: SPECIAL TREATMENTS AND PROCEDURES (cont'd)

2	INTERVENTION PROGRAMS FOR MOOD, BEHAVIOUR, COGNITIVE LOSS	*(Check all interventions or strategies used in the last 7 days, no matter where received.)*	
		a. Special behaviour symptom evaluation program	a
		b. Evaluation by a licensed mental health specialist in LAST 90 DAYS	b
		c. Group therapy	c
		d. Resident-specific deliberate changes in the environment to address mood or behaviour patterns (e.g. providing bureau in which to rummage)	d
		e. Reorientation (e.g. cueing)	e
		f. *NONE OF ABOVE*	f
3	NURSING REHABILITATION/ RESTORATIVE CARE	*(Record the NUMBER OF DAYS each of the following rehabilitation or restorative techniques or practices was provided to the resident for more than or equal to 15 minutes per day in the last 7 days. Enter "0" if none or less than 15 minutes daily.)*	
		a. Range of motion (passive)	
		b. Range of motion (active)	
		c. Splint or brace assistance	
		Training and skill practice in:	
		d. Bed mobility	
		e. Transfer	
		f. Walking	
		g. Dressing or grooming	
		h. Eating or swallowing	
		i. Amputation or prosthesis care	
		j. Communication	
		k. Other	
4	DEVICES AND RESTRAINTS	*(Use the following codes for the last 7 days:)* 0. Not used 1. Used less than daily 2. Used daily	
		Bed Rails	
		a. Full bed rails on all open sides of bed	
		b. Other types of side rails used (e.g. half rail, 1 side)	
		c. Trunk restraint	
		d. Limb restraint	
		e. Chair prevents rising	
5	HOSPITAL STAY(s)	*(Record number of times resident was admitted to hospital in the LAST 90 DAYS [or since last assessment if less than 90 days]. Enter "0" if no admission.)*	
6	EMERGENCY ROOM (ER) VISIT(s)	*(Record number of times resident visited ER in the LAST 90 DAYS [or since last assessment if less than 90 days]. Enter "0" if no ER visits.)*	

SECTION P: SPECIAL TREATMENTS AND PROCEDURES (cont'd)

7	PHYSICIAN VISITS	In the LAST 14 DAYS (or since admission, if less than 14 days in facility), how many days has the physician (or authorized assistant or practitioner) examined the resident? *(Enter "0" if none.)*	
8	PHYSICIAN ORDERS	In the LAST 14 DAYS (or since admission, if less than 14 days in facility), on how many days has the physician (or authorized assistant or practitioner) changed the resident's orders? *Do not include order renewals without change. (Enter "0" if none.)*	
9	ABNORMAL LAB VALUES	Has the resident had any abnormal lab values during the LAST 90 DAYS (or since admission)? 0. No 1. Yes	

SECTION Q: DISCHARGE POTENTIAL AND OVERALL STATUS

1	DISCHARGE POTENTIAL	a. Resident expresses or indicates preference to return to the community. 0. No 1. Yes	
		b. Resident has a support person who is positive towards discharge. 0. No 1. Yes	
		c. Stay projected to be of a short duration—Discharge projected WITHIN 90 DAYS. *(Do not include expected discharge due to death.)* 0. No 2. Within 31–90 days 1. Within 30 days 3. Discharge status uncertain	
2	OVERALL CHANGE IN CARE NEEDS	Resident's overall level of self-sufficiency has changed significantly as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days). 0. No change 1. Improved—receives fewer supports, needs less restrictive level of care 2. Deteriorated—receives more support	

SECTION R: ASSESSMENT INFORMATION

1	PARTICIPATION IN ASSESSMENT	a. Resident: 0. No 1. Yes	
		b. Family: 0. No 1. Yes 2. No family	
		c. Significant other: 0. No. 1. Yes 2. None	

2. SIGNATURES OF THOSE COMPLETING THE ASSESSMENT

Provider Type | Assessor ID #

a. Signature of RN Assessment Coordinator (sign on above line)

b. Date RN Assessment Coordinator signed as complete

Year - Month - Day

Other Signatures	Title	Sections	Date	Provider Type	Assessor ID #
*c.					
d.					
e.					
f.					
g.					
h.					
i.					

* most responsible physician

APPENDIX D: System Integration and Change Survey 2003 (Evidence-Based Practice)

SECTION 1
EVIDENCE-BASED PRACTICE

Hospital Name: _____

Site: _____ City/Town: _____

Your name (CCC): _____ Title: _____

Your name (Rehab): _____ Title: _____

Incorporating Evidence-based Practice into *Complex Continuing Care* Services

1. Which of the following strategies were implemented to make evidence-based practice knowledge available to staff within your **Complex Continuing Care** Services between April 1, 2001 and March 31, 2002 (check all that apply)?

- ❑ a) No strategies in place
- ❑ b) Reference texts available to staff (e.g. text books, access to online resources)
- ❑ c) Practice guidelines (see definition below) with specific care recommendations available to staff
- ❑ d) Practice protocols (see definition below) available to staff
- ❑ e) Inservices regarding practice protocols/practice guidelines presented to staff
- ❑ f) Other (Specify)

_____
_____
_____

Practice Protocols in *Complex Continuing Care* Services

Practice Guidelines are documented statements (recommendations) designed to assist practitioner and patient decisions about appropriate health care for specific clinical issues.

Practice Protocols state a best practice process (usually based on guideline recommendations) with regard to a specific clinical issue. They are developed in consultation with staff and are sometimes outlined for staff using process algorithms or flow charts. Practice protocols are more prescriptive than guidelines in that they lay out the normally expected course of action for assessment and/or treatment. However, they do not exclude exceptions due to clinical judgment. Practice protocols always have related documentation processes or expectations.

2. For each of the following clinical issues or conditions, please indicate if you provided staff with practice guidelines and/or practice protocols within your **Complex Continuing Care** Services between April 1, 2001 and March 31, 2002 (check **one** per row). Please indicate the date of most recent review/revision of each practice protocol/practice guideline.

		Check one per row						
		N/A Clinical issue not present in our CCC Services	Clinical issue present but no practice guideline or protocol existed for this clinical issue between Apr 1, 2001 and Mar 31, 2002	*Practice guideline* was available for this clinical issue to assist decision-making between Apr 1, 2001 and Mar 31, 2002	*Practice protocol* for this clinical issue was in development between Apr 1, 2001 and Mar 31, 2002	*Practice protocol* was applied to decision-making in the care of *some* (1-74%) eligible* patients between Apr 1, 2001 and Mar 31, 2002	*Practice protocol* was applied to decision-making in the care of *most* (75%+) eligible patients between Apr 1, 2001 and Mar 31, 2002	Date of most recent review/revision of practice protocol or guideline
a.	Use of physical restraints	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
b.	Use of anti-psychotic drugs	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
c.	Wound or ulcer care/preventative skin care	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
d.	Management of behaviours	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
e.	Management of pneumonia	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
f.	Management of pain	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
g.	Prevention and management of falls	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
h.	Management of incontinence	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
i.	Management of urinary tract infection	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
j.	Detection and management of delirium	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
k.	Management of sleep problems	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
l.	Management of diabetes	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
m.	Management of dysphagia (including decision to use/remove feeding tube)	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown
n.	Other (Specify) _____	❑1	❑2	❑3	❑4	❑5	❑6	___/___/___ (DD/MM/YYYY) ❑7 Unknown

***Eligible patients are all patients with the specific clinical condition referred to in the table.** We assume that (1) seeking patient consent concerning treatments/tests/decisions recommended in the protocol and (2) consideration of contraindication(s) or reasons not to apply the practice protocol in specific cases are basic elements in application of a protocol.

Practice Protocols in *Rehabilitation* Services

Practice Protocols state a best practice process (usually based on guideline recommendations) with regard to a specific clinical issue. They are developed in consultation with staff and are sometimes outlined for staff using process algorithms or flow charts. Practice protocols are more prescriptive than guidelines in that they lay out the normally expected course of action for assessment and/or treatment. However, they do not exclude exceptions due to clinical judgment. Practice protocols always have related documentation processes or expectations.

3. Did your **Rehabilitation** (Rehab) Services have any practice protocols developed or in the development phase between April 1, 2001 and March 31, 2002?

- ❑ 1 No (proceed to *Question 8*)
- ❑ 2 Yes

If you have indicated that your hospital does **NOT** have **PRACTICE PROTOCOLS** for any of the clinical issues listed in *Question 2* (CCC) or *Question 3* (Rehab), please proceed to *Question 8*.

4. We are interested in knowing which practice protocols have been developed or were in the development phase within your **Rehabilitation** Services, between April 1, 2001 and March 31, 2002. Please **list** them and for each listed protocol, indicate the following:
In *Part I:* The name of the clinical issue with protocol;
In *Part II:* The patient group for whom the protocol has been developed or was in the development process; &
In *Part III:* The extent of use for each listed protocol (check **one** per row).

	Part I	***Part II***	***Part III* (Check one per row)**				
	Name of clinical issue with protocol (e.g. Fall Prevention)	Patient Group (e.g. General Rehab)	This practice protocol was...				
			In the early stage of development between Apr 1, 2001 and Mar 31, 2002	Developed since Mar 31, 2002 and has been implemented	Developed by Mar 31, 2002 and *no* eligible patients were cared for using this protocol	Developed by Mar 31, 2002 and *some* (1-74%) eligible patients were cared for using this protocol	Developed by Mar 31, 2002 and *most* (75%+) eligible patients were cared for using this protocol
a.			❑1	❑2	❑3	❑4	❑5
b.			❑1	❑2	❑3	❑4	❑5
c.			❑1	❑2	❑3	❑4	❑5
d.			❑1	❑2	❑3	❑4	❑5
e.			❑1	❑2	❑3	❑4	❑5
f.			❑1	❑2	❑3	❑4	❑5
g.			❑1	❑2	❑3	❑4	❑5
h.			❑1	❑2	❑3	❑4	❑5
i.			❑1	❑2	❑3	❑4	❑5

Monitoring and Feedback Regarding Protocol Use in *Complex Continuing Care and Rehabilitation* Services

Rehabilitation Services:
If your Rehab Services had one or more clinical issues with practice protocols as indicated in *Question 4*, please select **one** of these protocols about which to answer *Questions* ***5a to 7***. Respond to *Questions* ***5a to 7*** about the same protocol.

Complex Continuing Care Services:
If your CCC Services had **applied a practice protocol** for one or more clinical issues, as indicated in *Question 2*, please select one of these protocols about which to answer *Questions* ***5a to 6***. Respond to *Questions* ***5a to 6*** about the same protocol.

CCC	Rehab
Selected Clinical Issue with Protocol: Please print: _____ (from *Question 2*) Month & year protocol first implemented: _____ (Month, Year)	Selected Clinical Issue with Protocol: Please print: _____ (from *Question 4*) Month & year protocol first implemented: _____ (Month, Year)

5a. Were clinical staff in your **Complex Continuing Care and/or Rehabilitation** Services required to record *adherence or exception* to practice from those recommended in your practice protocol(s) between April 1, 2001 and March 31, 2002, e.g. can exceptions to protocol be audited?

		CCC	Rehab
a.	No (proceed to *Question 7*)	❑₁	❑₁
b.	Yes (proceed to *Question 5b*)	❑₂	❑₂

5b. If yes, *how* was adherence or exception to the protocol recorded by clinical staff (check all that apply)?

		CCC	Rehab
a.	On paper, in the progress notes	❑	❑
b.	On paper, in the patients' permanent care plan document (e.g. not Kardex) or on a special protocol-related form	❑	❑
c.	Electronically (e.g. on a special on-line protocol-related form or part of on-line care plan documentation)	❑	❑

6. How *often* was information about adherence and exception to the practice protocol reported back to **Complex Continuing Care and/or Rehabilitation** clinical staff between April 1, 2001 and March 31, 2002 (check only **one** option for CCC and check only **one** option for Rehab)?

		CCC	Rehab
a.	Protocol adherence or exceptions *were not* reported back to clinical staff between April 1, 2001 and March 31, 2002	❑₁	❑₁
b.	Protocol adherence or exceptions were reported back to clinical staff *once* between April 1, 2001 and March 31, 2002	❑₂	❑₂
c.	Protocol adherence or exceptions were reported back to clinical staff at least twice ((for different time periods) between April 1, 2001 and March 31, 2002	❑₃	❑₃

Integration of Protocols Across Levels of Care

Complex Continuing Care Services:
If your CCC Services had **applied a protocol** for one or more clinical issues as indicated in *Question 2,* please select one of these protocols about which to answer *Question* **7**.

This protocol may be different from the protocol selected for *Questions* ***5a to 6.***

Selected Clinical Issue with Protocol:

Please print: _____ (from *Question 2*)

7. Practice protocols for some clinical issues may be designed to span practice in more than one level of care. Please indicate if the selected protocol was developed jointly and included aspects of care with other levels of care between April 1, 2001 and March 31, 2002 (check all that apply).

		Check all that apply	
Levels of Care		CCC	Rehab
Acute Care			
a.	Within your organization	❑	❑
b.	External to your organization	❑	❑
Complex Continuing Care			
c.	Within	❑	❑
d.	External	❑	❑
Rehabilitation			
e.	Within	❑	❑
f.	External	❑	❑
CCAC or Ambulatory Care Providers			
g.	Within	❑	❑
h.	External	❑	❑
Long-Term Care			
i.	Within	❑	❑
j.	External	❑	❑
k.	**Other (Specify)** _____		

***To answer in the affirmative**, the external group must have participated in the committee that developed the protocol, and/or formally adopted the protocol.

Statement of Accuracy:

These statements pertaining to **evidence-based practice** at our organization are accurate and reflect the normal operating circumstances between April 1, 2001 and March 31, 2002. I am authorized to make these statements on behalf of our organization.

Hospital Name: _____ Site: _____

Your name (CCC): _____ Signature: _____

Title: _____ Phone number: _____

Date: _____

Hospital Name: _____ Site: _____

Your name (**Rehab**): _____ Signature: _____

Title: _____ Phone number: _____

Date: _____

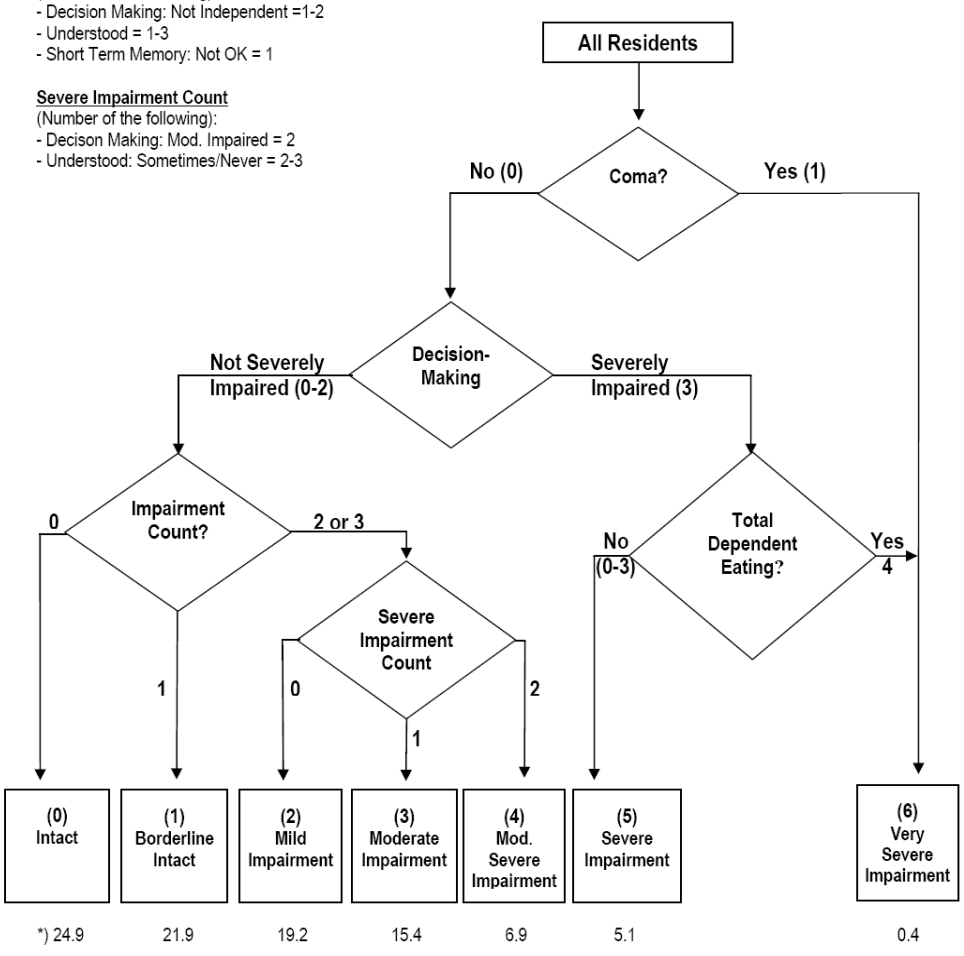
APPENDIX E: MDS 2.0-based Cognitive Performance Scale

interRAI

CPS – Scoring Rules

Impairment Count
(Number of the following):
- Decision Making: Not Independent =1-2
- Understood = 1-3
- Short Term Memory: Not OK = 1

Severe Impairment Count
(Number of the following):
- Decison Making: Mod. Impaired = 2
- Understood: Sometimes/Never = 2-3



*) Average Mini Mental Score in field trial where 30 is best and 0 is worst.

Source: Morris JN, Fries BE, Mehr DR et al. MDS Cognitive Performance Scale. Journal of Gerontology 1994; 49(3): M174-182.

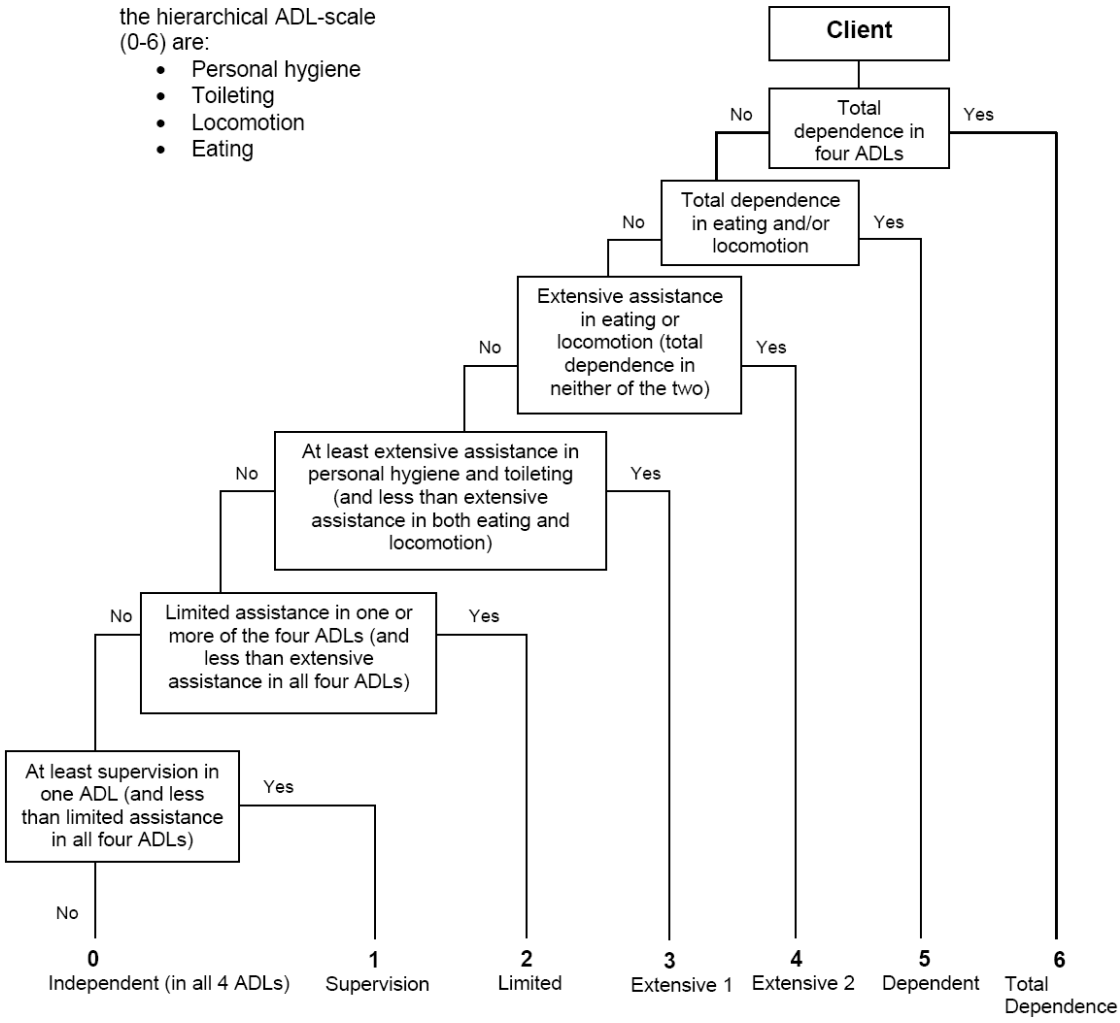
APPENDIX F: MDS 2.0-based Activities of Daily Living Hierarchy

interRAI

ADL Hierarchy Scale

The four items used to score the hierarchical ADL-scale (0-6) are:

- Personal hygiene
- Toileting
- Locomotion
- Eating



Source: Morris JN, Fries BE, Morris SA. Scaling ADLs within the MDS. Journal of Gerontology: Medical Sciences 1999, Vol. 54A, No. 11, M546-M553.

APPENDIX G: Introductory Letter to Expert Panel Members

FACULTY OF MEDICINE
Department of Community Health Sciences
Heritage Medical Research Building, Rm G237
Colleen J. Maxwell PhD
Associate Professor
Telephone: (403) 220-6557
Fax: (403) 270-7307
Email: maxwell@ucalgary.ca

April 8, 2005

Dear [Invitee]:

As part of an ongoing CIHR-funded study of potentially avoidable acute care hospitalizations among residents of long-term care facilities, we are in the process of setting up an **Expert Panel** to address key clinical and methodological issues relevant to this area. Given your expertise and experience in health services research we would like to invite you to participate as a member of this Expert Panel. The commitment is short-term – we are asking you to attend one meeting where you will share your perspective with other respected individuals.

The study is being led by Dr. Colleen Maxwell (University of Calgary) and Dr. Gary Teare (University of Toronto / Institute for Clinical Evaluative Sciences and Health Quality Council of SK). The University of Calgary team includes Dr. David Hogan, Ms. Jennifer Walker and Mr. Steven Lewis. Our specific goal with the Expert Panel is to solicit feedback on the development of an indicator of potentially avoidable hospitalization (PAH) of long-term care residents that will be relevant to the Canadian context. Your valuable input with respect to the clinical, environmental and systemic factors contributing to PAH and other hospitalizations among older, vulnerable persons will assist us in selecting the data items that best define a PAH indicator that could then be used to compare hospitalization rates across facilities, jurisdictions in Canada and nations.

The Expert Panel will consist of nine to twelve individuals with experience in continuing/long-term care and/or acute care, including representatives from geriatric and emergency medicine, nursing and health system administration as well as U.S. researchers working in the field. The meeting will take place over 1.5 days in Calgary. Your travel and meeting expenses will be covered by the study grant. Written notes will be taken during the discussion and the meeting will also be audio taped for our records, with your consent. We will send you a summary of the discussions and decisions made at the meeting and will ask for your written consent to list you as a contributing member of the Expert Panel. Your contribution to this work will only be identified if we have your written consent to do so.

Please let us know if you would like to participate in this exciting and important project. If you do, we would like to determine your availability and preference for a meeting date. Please respond to the questions on the attached form and send it to Jennifer Walker either at jwalk@ucalgary.ca or by fax to **(403) 270-7307**. On behalf of the study team, we wish to thank you in advance for your consideration of our request.

Sincerely,

Colleen Maxwell, PhD
Associate Professor
Analysis
AHFMR Population Health Investigator
CIHR New Investigator

Gary F. Teare Ph.D.
Director, Quality Measurement &

Health Quality Council, Saskatchewan

RESPONSE FORM

Please send to Jennifer Walker either at jwalk@ucalgary.ca or by fax to **(403) 270-7307**

Please indicate (e.g., circle selection) your response.

1. Are you able to participate as a member of the Expert Panel?

   Yes (If yes, please answer questions 2 & 3) No (If no, please go to question 4)

2. Do you prefer a Thursday/Friday meeting or a Saturday/Sunday meeting?

   Thursday/Friday Saturday/Sunday

3. Please indicate your availability for the following meeting dates (times 9:00am-4:30pm first day, 9:00am-12:00pm second day):

a.	May 26 - 27	Available	Not available
b.	May 28 - 29	Available	Not available
c.	June 2 - 3	Available	Not available
d.	June 4 - 5	Available	Not available
e.	June 9 - 10	Available	Not available
f.	June 11 -12	Available	Not available
g.	June 16 - 17	Available	Not available
h.	June 18 - 19	Available	Not available
i.	June 23 - 24	Available	Not available
j.	June 25 -26	Available	Not available

4. If you are not available to participate, we would be most grateful if you could assist us by recommending an alternate participant with relevant clinical and/or health system expertise in continuing care or acute care for older persons.

   Name and contact of alternate participant:

   Name: _____

   Email: _____

   Telephone: _____

   Fax: _____

APPENDIX H: Consent Form for Expert Panel Participants

EXPERT PANEL CONSENT FORM

Research Project Title: Hospitalizations among continuing care residents: Implications for quality of care of older persons

Investigators: Colleen J Maxwell PhD, Gary Teare PhD, David B Hogan MD, Steven Lewis MA, Jennifer D Walker BSc

Sponsor: University of Calgary

This consent form, a copy of which has been given to you, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The goal of this investigation is to solicit expert feedback on the development of an indicator of potentially avoidable hospitalization of chronic or long-term care residents for use in Canada.

You have been chosen as a potential participant because you have extensive expertise in continuing/acute care for older populations and/or because you have specific experience in measuring PAH. Your valuable input with respect to the clinical factors contributing to a PAH as well as the data items that are necessary in defining PAH will contribute to the development of a data-based indicator of PAH that can be used to compare hospitalization rates across facilities and jurisdictions in Canada and elsewhere.

The meeting of the expert panel will take place over 1.5 days and will follow a modified Nominal Group Technique. Written notes will be made during the discussion and the meeting will also be audio taped for our records, with your consent.

We will send you a summary of the discussions and decisions made at the meeting and will ask for your written consent to list you as a contributing member of the Expert Panel. Your contribution to this work will only be identified if we have your written consent to do so. The opinions of individuals will not be identified. If at any time you do not want to continue to participate, please inform the panel facilitator and you may remove yourself from the study immediately.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You

are free to withdraw from the study at any time without jeopardizing your health care. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

If you have further questions concerning matters related to this research, please contact:

Colleen J. Maxwell 220-6557

If you have any questions concerning your rights as a possible participant in this research, please contact Pat Evans, Associate Director, Internal Awards, Research Services, University of Calgary, at 220-3782.

Participant's Signature	Date
Investigator and/ or Delegate's Signature	Date
Witness' Signature	Date

A copy of this consent form has been given to you to keep for your records and reference.

APPENDIX I: Agenda and Background Material for Expert Panel Meeting

Potentially Avoidable Hospitalization (PAH)
Expert Panel Meeting
The Westin Calgary - Brownlee Room

Saturday, June 18, 2005

8:00-9:00 Breakfast served

9:00-9:30 Welcome and introductions

9:30-10:30 Introduction to Ambulatory Care Sensitive Conditions (ACSC) methodology and application to Ontario's Complex Continuing Care population

10:30-10:45 Break – snack served

10:45-12:00 Reflections on ACSC definition of PAH - Key Questions:

1. Can preventable hospitalizations from long-term/chronic care be approximated by admission diagnoses to hospital?
2. Can hospitalizations for the diagnoses included in the current ACSC definition(s) be prevented with adequate preventive care in older institutionalized people?

12:00-1:00 Lunch served

1:00-2:00 Further reflections on ACSC definition of PAH - Key Questions:

3. Are there other diagnoses, not in the current ACSC definition(s), that would indicate a potentially avoidable hospitalization for this population?
4. What considerations/limitations/caveats are important to use of the ACSC approach to identify PAH in the following applications?
    a. Research (e.g. for identifying factors associated with PAH);
    b. Quality Improvement (e.g., as screening indicator to identify potential area of concern/need for improvement);
    c. Accountability measure (e.g., use in public reports or as accountability measure with funders)

2:00-3:30 Defining PAH

1. What are the key aspects of care that a PAH indicator needs to reflect?
2. Are there system/operating environment factors that need to be considered?

3:30-3:45 Break – snack served

3:45-4:15 Overview of data elements available in MDS and DAD databases (for possible use in development of refined PAH indicator based on available data)

4:15-5:00 Defining PAH using administrative data – Key Questions:
Would use of some of the other available health data refine the PAH definition? If so, which elements?

5:00 Break for the evening

7:00 Dinner at the River Café

Sunday, June 19, 2005

7:30-8:30	Breakfast served
8:30-8:45	Overview of process
8:45-10:00	Generating and ranking items for refinement of PAH definition
10:00-10:15	Break – snack served
10:15-11:00	Rating the necessity of the items
11:00-11:30	Wrap-up/summary
11:30	Close – restaurant lunch for those who have time

Potentially Avoidable Hospitalization (PAH)
Expert Panel Meeting:
Background Information

The purpose of this expert panel meeting is to refine the existing methodology used to measure potentially avoidable hospitalizations (PAH). PAHs represent hospitalizations that could be prevented with timely health and support services that prevent or manage conditions or complications of existing illness to keep them from reaching a stage where hospitalization becomes necessary. Thus, PAH rates may be markers for the quality of preventive/primary care provided to individuals outside of the acute hospital setting.

Background

One approach to identifying PAHs is to select conditions for which hospitalizations are generally considered preventable. One widely used application is the Ambulatory Care Sensitive Condition (ACSC) methodology. An ACSC is a condition for which hospitalizations can be avoided either by preventing the condition or by preventing complications of the condition. Initial lists of ACSCs were developed and used on a population level to monitor disparities in access to primary care.

Applications to Long Term Care

While the ACSC methodology has been extensively applied in the general population and frequently used for community-dwelling seniors, it has only recently been extended to residents of LTC facilities in the U.S. To date, there have been no investigations in a Canadian context to explore the rates and correlates of ACSC hospitalization from chronic/long-term care. Though it is hypothesized that hospitalizations for ACSCs may reflect the quality of preventive care in institutional settings, this is yet to be validated.

ACSC List

The diagnoses and specific diagnostic codes used to define ACS conditions vary slightly across studies. The table below outlines the list of conditions that we have considered, based on the previous work of Culler and colleagues (1998) and Carter (2003).

Medical Condition	ICD-9-CM Codes
Angina pectoris	411.1, 411.8, 413
Asthma	493
Cellulitis	681, 682, 683, 686
Chronic obstructive pulmonary disease	466, 491, 492, 494, 496
Congestive heart failure	428, 518.4
Dehydration	276.5
Dental conditions	521-523, 525, 528
Diabetes with ketoacidosis or hypersmolar coma	250.1-250.3

Medical Condition	ICD-9-CM Codes
Diabetes with specified manifestations	250.8, 250.9
Diabetes without specified complications	250.0
Gastroenteritis	588.8
Grand mal seizure disorders	345, 780.3
Hypertension	401.0, 401.9, 402.0, 402.1, 402.9
Hypoglycemia	251.2
Immunization-preventable conditions	003, 037, 390, 391, 320.0
Kidney/urinary tract infection	590, 599.0, 599.9
Nutritional deficiency	260-262, 268.0, 268.1
Pneumonia	486, 481, 482.2, 482.3, 482.9, 483
Severe ear, nose, and throat infections	382, 462, 463, 465, 472.1

Selected References on ACSC

Bindman AB, Grumbach K, Osmond D, et al. Preventable hospitalizations and access to health care. Journal of the American Medical Association 1995; 274:305-312.

Carter MW. Factors associated with ambulatory care-sensitive hospitalizations among nursing home residents. Journal of Aging & Health. 2003; 15:295-329.

Culler SD, Parchman ML, Przybylski M. Factors related to potentially preventable hospitalizations among the elderly. Medical Care 1998; 36:804-817.

Guo L, MacDowell M, Levin L, Hornung RW, Linn S. How are age and payors related to avoidable hospitalization conditions? Managed Care Quarterly 2001; 9:33-42.

Intrator O, Zinn J, Mor V. Nursing home characteristics and potentially preventable hospitalizations of long-stay residents. Journal of the American Geriatrics Society 2004 in press; 52:1-7.

Kane RL, Homyak P, Bershadsky B, Flood S, Zhang H. Patterns of utilization for the Minnesota Senior Health Options program. J Am Geriatr Soc 2004; 52:2039-2044.

Kane RL, Keckhafer G, Flood S, Bershadsky B, Siadaty MS. The effect of Evercare on hospital use. J Am Geriatr Soc 2003; 51:1427-1434.

McCall NT, Brody E, Mobley L, Subramanian S. Investigation of increasing rates of hospitalization for ambulatory care sensitive conditions among medicare fee-for-service beneficiaries: Final report. June 2004. RTI International (RTI Project Number 08686.001.002): www.cms.hhs.gov/researchers/reports/2004/McCall.pdf.

Pappas G, Hadden WC. Potentially avoidable hospitalizations: Inequalities in rates between US socioeconomic groups. American Journal of Public Health 1997; 87:811-816.

Weissman JS, Gatsonic C, Eptstien AM. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. Journal of the American Medical Association 1992; 268:2388-2395.

APPENDIX J: Summary of Expert Panel Meeting
(Sent Out to Participants and Non-Attendees)

Summary of Expert Panel Meeting on
Potentially Avoidable Hospitalizations from Continuing Care
June 18-19, 2005
The Westin Hotel, Calgary Alberta Canada

A panel of experts with methodological, policy, and/or clinical expertise related to hospitalizations of continuing care facility residents was convened to provide guidance on the development of an indicator for Potentially Avoidable Hospitalizations, or PAH.

The early parts of the meeting were spent establishing a common understanding of what is meant by PAH, the context of the current study (Complex Continuing Care (CCC) in Ontario), and the data available. The research team presented the preliminary methods and findings from the first phase of the study which used linked CCC assessment and acute care inpatient data. Past research was also discussed.

Throughout the rest of the meeting, participants were invited to discuss PAH in the context of continuing care and to comment on using Ambulatory Care-Sensitive Conditions (ACSC), a diagnosis-based approach, to define PAH. Participants were invited to suggest other items that should be included in a PAH measure beyond hospital diagnoses. From the discussions, the following main points emerged:

- Hospitalizations can be avoided in three ways:
    - Prevention of the condition,
    - Effective management of chronic conditions, and
    - Early intervention for emerging acute conditions.
- Assessing PAH for individual residents is highly complex.
- PAH should be used to look for variation in rates at a facility or system level, not at the level of the individual.
- PAH rates are a function of facility capacity, quality, policies, and resident characteristics.
- PAH cannot be measured by hospital diagnosis alone but diagnoses, combined with appropriate procedure codes, are a good start to tease out reasons for disparities between facilities or over time and to investigate resource allocation.
- The question of risk-adjustment raises controversy because it may hide quality issues but on the other hand, not risk-adjusting may unfairly penalize facilities that treat sicker residents. There may be a middle ground using a combination of stratification and risk-adjustment approaches.
- If the diagnoses are grouped, the utility of the PAH measure may suffer because it would be more difficult to uncover reasons for differences and take action.

- The CCC environment differs in many ways from other forms of long-term care in Canada. There are also important differences between the long-stay and the short-stay residents that must be considered in analyses.

On the first day, participants were asked to discuss each of the ACSC diagnoses and comment on the necessity of each to a definition of PAH. Consensus on including the condition in a PAH definition was reached where possible. Additionally, the participants were asked which diagnosis types should be included of the following:

- Most-responsible – the condition that accounts for the greatest portion of the length of hospital stay[b]
- Type 1 – a pre-admission condition that contributed to the length of stay

The following morning, participants were reminded of their group recommendations and then were asked to individually rate each of the existing ACSC diagnosis as well as others that arose during the previous day's discussions. The rating scale was 1 to 9 where 1 = "Unsuitable for PAH definition" and 9 = "Essential for PAH definition".

[b] Note that if the most-responsible diagnosis arose after admission to the hospital it is recorded again as a Type 2. These conditions will be excluded because they did not occur before admission to hospital.

Summary of PAH Expert Panel Recommendations

Condition	Comments	Decision - discussion*	Median Rating Score	Decision - rating**
Angina	Exclude surgical interventions.	Keep	7	Yes
Asthma	Combine with COPD?		6	Yes (consider combining)
Cellulitis		No decision	5	Yes
COPD	Most-responsible diagnosis only.	Keep	8	Yes
Congestive Heart Failure	Most-responsible diagnosis only. Add ICD-9 codes 402 and 404.	Keep	8	Yes
Dehydration	Distinct from gastroenteritis and septicemia?	No consensus	8.5	Yes (need coding advice)
Dental Conditions	Most-responsible diagnosis only.	Keep	6	Yes
Diabetes	Most-responsible diagnosis only (coding advice). Limit to those with known condition.	Keep	8	Yes
Gastroenteritis	Most-responsible diagnosis only.	Keep	8	Yes
Grand mal seizure disorders	Refine to relevant diagnoses. Limit to those with known condition.	Keep	4	Yes
Hypertension	Most-responsible diagnosis only.	Keep	6	Yes
Hypoglycemia	Distinct from diabetes?	No consensus	7	Yes (need coding advice)
Immunization-preventable conditions		Drop	1	No
Urinary tract infection	Consider replacing UTI with Septicemia.	No consensus	8	Yes (need coding advice)

Nutritional deficiency		Drop	3	No
Pneumonia	Type 1 and most-resp. diagnoses.	Keep	9	Yes
Severe ear, nose, and throat infections		Drop	1	No
Tuberculosis		Drop	1	No
Fractures	Most-responsible diagnosis only.	Add	8	Yes
Decubitus ulcers		Do not add	3	No
Behaviour / Mental Health		Do not add	2	No
Septicemia		Add	8	Yes
Cardiovascular accidents		Do not add	3	No

*from discussions on Day One
** using a cut-off of a median rating of 3 or lower (cut off used for lowest category in RAND Appropriateness Methodology)

The decisions made during the first day's discussions were validated by the individual ratings, which resulted in similar conclusions. However, additional information related to the importance of various items to the concept of PAH can be gleaned from the median ratings. For example, during the discussions there was consensus that Grand Mal Seizure Disorders should be included. However, it was rated to be borderline necessary to the definition of PAH.

Disagreement occurs when at least three panellists give an item a score in the 1-3 range and at least three panellists rate in the 7-9 range (RAND Appropriateness Method User's Manual). This occurred for only one condition: hypoglycemia. This likely arose because there were questions about whether it was distinct from diabetes or not. This will be discussed with a coding specialist.

PAH Conditions Included in Revised Definition

Medical Condition	Diagnosis Type	ICD-9-CM Codes
Angina pectoris	Most-responsible (ex. post-admit)	411.1, 411.8, 413 (exclude cases with surgical procedures)
Asthma	Most-responsible (ex. post-admit)	493
Cellulitis	Most-responsible (ex. post-admit)	681, 682, 683, 686
Chronic obstructive pulmonary disease	Most-responsible (ex. post-admit)	466, 491, 492, 494, 496
Congestive heart failure	Most-responsible (ex. post-admit)	402, 404, 428, 518.4
Dehydration	Most-responsible (ex. post-admit)	276.5
Dental conditions	Most-responsible (ex. post-admit)	521-523, 525, 528
Diabetes with ketoacidosis or hypersmolar coma	Most-responsible (ex. post-admit), Type 1?	250.1-250.3
Diabetes with specified manifestations	Most-responsible (ex. post-admit), Type 1?	250.8, 250.9
Diabetes without specified complications	Most-responsible (ex. post-admit), Type 1	250.0
Gastroenteritis	Most-responsible (ex. post-admit)	558.9
Grand mal seizure disorders	Most-responsible (ex. post-admit)	345, 780.3
Hypertension	Most-responsible (ex. post-admit)	401.0, 401.9, 402.0, 402.1, 402.9
Hypoglycemia	Most-responsible (ex. post-admit)	251.2
Kidney/urinary tract infection	Most-responsible (ex. post-admit)	590, 599.0, 599.9
Pneumonia	Most-responsible (ex. post-admit), Type 1	486, 481, 482.2, 482.3, 482.9, 483
Injuries from falls	Most-responsible (ex. post-admit), Type 1	E880-E888
Septicemia	Most-responsible (ex. post-admit), Type 1?	0031, 0223, 038, 0545

Detailed list of additional ICD-9CM Codes

Congestive Heart Failure

402	MAL HYPERT HRT DIS W HF BENIGN HYP HT DIS W/O HF BENIGN HYP HT DIS W HF HYP HRT DIS NOS W/P HF HYP HT DIS NOS W HT FAIL
404	MAL HY HT/REN W/O HF/RF MAL HYPER HRT/REN W HF MAL HY HT/REN W REN FAIL MAL HYP HRT/REN W HF&RF BEN HY HT/REN W/O HF/RF BEN HYPER HRT/REN W HF BEN HY HT/REN W REN FAIL BEN HYP HRT/REN W HF&RF HY HT/REN NOS W/O HF/RF HYPER HRT/REN NOS W HF HY HT/REN NOS W REN FAIL HYP HRT/REN NOS W HF&RF

Septicemia

0031	SALMONELLA SEPTICEMIA
0223	ANTHRAX SEPTICEMIA
038	STREPTOCOCCAL SEPTICEMIA STAPHYLCOCC SEPTICEM NOS STAPH AUREUS SEPTICEMIA STAPHYLOCC SETICEM NEC PNEUMOCOCCAL SEPTICEMIA ANAEROBIC SEPTICEMIA GRAM-NEG SEPTICEMIA NOS H. INFLUENAE SEPTICEMIA E COLI SEPTICEMIA PSEUDOMONAS SEPTICEMIA SERRATIA SEPTICEMIA GRAM-NEG SEPTICEMIA NEC SEPTICEMIA NEC SEPTICEMIA NOS
0545	HERPETIC SEPTICEMIA

APPENDIX K: Potentially Avoidable Hospitalizations (Revised list of ICD-9-CM Codes and Short Descriptions)

Angina Pectoris

411.1	Intermediate coronary syndrome
411.8	Acute coronary occlusion without myocardial infarction Acute ischemic heart disease not elsewhere classified
413	Angina decubitus Prinzmetal angina Angina Pectoris not elsewhere classified / unspecified

Asthma

493	Extrinsic Asthma Intrinsic Asthma Chronic Obstructive Asthma Exersise Induced Bronchospasm Cough Variant Asthma Asthma, unspecified

Bacterial Pneumonia

486	Pneumonia, Organism unspecified
481	Pneumococcal Pneumonia
482.2	H. Influenzae Pneumonia
482.3	Streptococcal Pneumonia
482.9	Bacterial Pneumonia, unspecified
483	Pneumonia, D/T Chlamydia Pneumonia, Mycpsm Pneumoniae Pneumonia, Other Specified Organism

Cellulitis

681	Cellulitis of Finger and Toe
682	Cellulitis of Face Cellulitis of Neck Cellulitis of Trunk Cellulitis of Arm Cellulitis of Hand Cellulitis of Buttock Cellulitis of Leg Cellulitis of Foot Cellulitis, site not elsewhere classified Cellulitis, site unspecified
683	Acute Lymphadenitis
686	Pyoderma Pyogenic Granuloma Local Skin Infection

Chronic obstructive pulmonary disease

466	Acute Bronchitis and Bronchiolitis
491	Chronic Bronchitis
492	Emphysema
494	Bronchiectas
496	Chronic Airway Obstruction, not elsewhere classified

Congestive Heart Failure

428	Congestive Heart Failure Left Heart Failure Heart Failure, unspecified
518.4	Acute Lung Edema, unspecified
402	Malignant Hypertensive Heart Disease with Heart Failure Benign Hypertensive Heart Disease without Heart Failure Benign Hypertensive Heart Disease with Heart Failure Hypertensive Heart Diesease, unspecified, without Heart Failure Hypertensive Heart Diesease, unspecified, with Heart Failure
404	Malignant Hypertensive Heart and Renal Disease without Heart/Renal Failure Malignant Hypertensive Heart and Renal Disease with Heart Failure Malignant Hypertensive Heart and Renal Disease with Renal Failure Malignant Hypertensive Heart and Renal Disease with Heart and Renal Failure Benign Hypertensive Heart and Renal Disease without Heart/Renal Failure Benign Hypertensive Heart and Renal Disease with Heart Failure Benign Hypertensive Heart and Renal Disease with Renal Failure Benign Hypertensive Heart and Renal Disease with Heart and Renal Failure Unspecified Hypertensive Heart and Renal Disease without Heart/Renal Failure? EXC Unspecified Hypertensive Heart and Renal Disease with Heart Failure Unspecified Hypertensive Heart and Renal Disease with Renal Failure Unspecified Hypertensive Heart and Renal Disease with Heart and Renal Failure

Dehydration

276.5	Volume Depletion

Dental Conditions

521	Dental Caries Excess Attrition of Teeth Abrasion of Teeth Erosion of Teeth Resorption of Teeth Hypercementosis Ankylosis of Teeth Posteruptive colour change Hard Tissue Diseases of the Teeth, not elsewhere classified Hard Tissue Diseases of the Teeth, unspecified
522	Pulpitis Necrosis of Tooth Pulp Tooth Pulp Degeneration Abnormal Hard Tissue Formation – Tooth Pulp Acute Apical Periodontitis Periapical Abscess CHR Apical Periodontitis Periapical Abscess with Sinus Radicular Cyst Pulp/Periapical Disease, not elsewhere classified
523	Acute Gingivitis Chronic Gingivitis Gingival Recession Acute Periodontitis Chronic Periodontitis

	Periodontiosis Accretions on Teeth Periodontal Disease, not elsewhere classified Gingiv/Periodont Disease, unspecified
525	Exfoliation of Teeth Loss of Teeth due to Accident, Extraction, or Local Peridontal Disease Atrophy of Edentulous Alveolar Ridge Retained Dental Root Dental Disorder, not elsewhere classified Dental Disorder, unspecified
528	Stomatitis Cancrum Oris Oral Aphthae Cellulitis/Abscess Mouth Oral Soft Tissue Cyst Diseases of Lips Leukoplakia Oral Mucosa Oral Epithelium Disturbances, not elsewhere classified Oral Submucosal Figrosis Oral Soft Tissue Diseases, not elsewhere classified

Diabetes with ketoacidosis or hypersmolar coma

250.1	Diabetes with Ketoacidosis
250.2	Diabetes with Hyperosmolarity
250.3	Diabetes with Other Coma

Diabetes with specified manifestations

250.8	Diabetes with Other Specified Manifestations
250.9	Diabetes with Unspecified Complications

Diabetes without specified manifestations

250.0	Diabetes Mellitus without mention of complication

Gastroenteritis

558.9	Other and Unspecified Noninfectious Gastroenteritis
009.0	Infectious Colitis, Enteritis, and Gastroenteritis
009.1	Colitis, Enteritis, and Gastroenteritis, presumed Infectious

Grand Mal seizure disorders

345	Generalized Nonconvulsive Epiliepsy Generalized Convulsive Epiliepsy Petit Mal Status Grand Mal Status Partial Epilepsy Infantile spasm Epilepsia Partialis Continua Epilepsy, not elsewhere classified Epilepsy, unspecified
780.3	Convulsions

Hypertension

401.0	Malignant Hypertension

401.9	Hypertension, unspecified
402.0	Malignant Hypertensive Heart Disease without Heart Failure Malignant Hypertensive Heart Disease with Heart Failure (TAKE OUT HERE)
402.1	Benign Hypertensive Heart Disease without Heart Failure Benign Hypertensive Heart Disease with Heart Failure (TAKE OUT HERE)
402.9	Unspecified Hypertensive Heart Disease without Heart Failure Unspecified Hypertensive Heart Disease with Heart Failure (TAKE OUT HERE)

Hypoglycemia

251.2	Hypoglycemia, unspecified

Kidney / Urinary tract infection

590	Infection of Kidney
599.0	Urinary Tract Infection, unspecified
599.9	Urinary Tract Disorder, unspecified

Falls/Fractures

E880-E888	Falls
800-820	Fractures

Septicemia

0031	Salmonella Septicemia
0223	Anthrax Septicemia
038	Septicemia
0545	Herpetic Speticemia

APPENDIX L: Post-Panel Meeting Questions to Coding Experts

Coding questions:

1. Coding process from the coder's perspective.
2. Types
    a. Should Type 1 be included?
        i. Expert panel recommended not including 1 for all except pneumonia.
        ii. Coding experts from Alberta recommended M and 1 for all.
3. Falls/Fractures - NEW
    a. Does every e-code have an injury code?
    b. Is there a way to exclude falls that occurred in hospital?
    c. Are pathologic fractures and injury fractures mutually exclusive in coding?
4. Septicemia - NEW
    a. Experts recommended to add.
    b. What are the rules for coding this? How does it relate to UTI or pneumonia coding?
5. UTI
    a. Replace with septicemia? Or keep both?
6. COPD and Asthma
    a. Should these be reported together?
7. Diabetes
    a. Are any of the included diagnoses "long-term complications"?
8. Gastroenteritis
    a. Is there overlap with dehydration?
9. Bacterial Pneumonia
    a. Reason for excluding Staphylococcus (482.4) or other specified bacteria (482.8)?
10. Congestive Heart Failure
    a. Expert panel recommended adding codes 402 and 404.
    b. Is it appropriate to exclude the ones that do not specify heart failure? (some will be included in the hypertension group)
11. Grand Mal Seizure Disorders
    a. Take out infantile spasms?
    b. Is 780.3 (Febrile convulsions) used for adults?

APPENDIX M: Multivariate Results from Sensitivity Analysis (Excluding CHF and Pneumonia from ACSC List)

Table M-1: Multivariate analysis of predictors of one-year outcomes for long-stay residents by cognition status using the *original ACSC definition without CHF and pneumonia* among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1 1997 and March 31 2001. (Odds Ratio (95% Confidence Interval). Odds Ratios are adjusted for the other covariates listed and for year of admission to CCC. Highlighted cells indicate differences with original ACSC definition.

Long-stay, Intact Cognition n=2469

	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	**1.58 (1.18-2.12)**	1.06 (0.78-1.44)	**1.26 (1.01-1.57)**
Male Sex	1.05 (0.71-1.55)	1.10 (0.82-1.48)	**1.28 (1.03-1.59)**
Advanced Directives	1.04 (0.74-1.47)	0.89 (0.67-1.20)	**2.74 (2.17-3.52)**
No ADL Impairment (vs Impaired)	0.87 (0.58-1.29)	**0.71 (0.57-0.89)**	0.93 (0.75-1.15)
Mild ADL Impairment (vs Impaired)	0.72 (0.45-1.17)	0.78 (0.56-1.07)	**0.70 (0.52-0.93)**
CHESS=0-1 (vs 4 and up)	**0.31 (0.15-0.66)**	**0.31 (0.17-0.57)**	**0.19 (0.10-0.36)**
CHESS=2-3 (vs 4 and up)	0.49 (0.23-1.08)	**0.45 (0.25-0.81)**	**0.45 (0.24-0.87)**
Depressive Symptoms	**1.65 (1.06-2.56)**	0.98 (0.68-1.41)	1.10 (0.80-1.52)
0-3 Chronic Conditions (vs 4 and up)	0.86 (0.65-1.14)	**1.35 (1.04-1.76)**	1.26 (1.00-1.58)
From Adjoined CCC	0.93 (0.68-1.27)	1.03 (0.74-1.40)	1.03 (0.77-1.36)

Long-stay, Borderline Cognitively Impaired (n=3476) *Table M-1 con't*

	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	**1.56 (1.20-2.02)**	1.20 (0.94-1.53)	1.13 (0.92-1.38)
Male Sex	1.04 (0.76-1.42)	1.21 (0.95-1.56)	**1.36 (1.13-1.65)**
Advanced Directives	0.92 (0.68-1.23)	1.16 (0.95-1.43)	**2.34 (1.97-2.78)**
No ADL Impairment (vs Impaired)	0.83 (0.59-1.15)	0.99 (0.75-1.29)	0.93 (0.74-1.17)
Mild ADL Impairment (vs Impaired)	**0.72 (0.52-0.99)**	0.95 (0.72-1.25)	**0.79 (0.66-0.95)**
CHESS=0-1 (vs 4 and up)	**0.18 (0.12-0.28)**	**0.34 (0.22-0.52)**	**0.18 (0.13-0.25)**
CHESS=2-3 (vs 4 and up)	**0.30 (0.18-0.52)**	**0.51 (0.32-0.81)**	**0.35 (0.26-0.48)**
Depressive Symptoms	0.90 (0.64-1.26)	1.09 (0.86-1.38)	0.96 (0.79-1.17)
0-3 Chronic Conditions (vs 4 and up)	0.87 (0.67-1.14)	1.12 (0.86-1.46)	**1.34 (1.10-1.63)**
From Adjoined CCC	**0.51 (0.35-0.73)**	1.07 (0.79-1.45)	0.83 (0.64-1.07)

Long-stay, Cognitively Impaired (n=5925)

	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.23 (0.96-1.57)	0.99 (0.84-1.17)	**0.72 (0.62-0.83)**
Male Sex	**1.33 (1.01-1.75)**	**1.56 (1.28-1.89)**	**1.54 (1.37-1.72)**
Advanced Directives	**0.57 (0.40-0.82)**	**0.75 (0.60-0.95)**	**1.90 (1.65-2.18)**
No ADL Impairment (vs Impaired)	**0.68 (0.49-0.94)**	0.94 (0.74-1.21)	**0.62 (0.48-0.79)**
Mild ADL Impairment (vs Impaired)	**0.68 (0.51-0.90)**	1.02 (0.82-1.28)	**0.64 (0.54-0.77)**
CHESS=0-1 (vs 4 and up)	**0.39 (0.24-0.64)**	**0.35 (0.25-0.50)**	**0.27 (0.21-0.35)**
CHESS=2-3 (vs 4 and up)	**0.66 (0.44-0.98)**	**0.59 (0.43-0.81)**	**0.45 (0.37-0.56)**
Depressive Symptoms	1.24 (0.93-1.65)	1.06 (0.90-1.26)	1.06 (0.90-1.26)
0-3 Chronic Conditions (vs 4 and up)	**0.70 (0.52-0.93)**	1.12 (0.95-1.32)	1.01 (0.90-1.13)
From Adjoined CCC	**0.63 (0.43-0.92)**	1.04 (0.79-1.38)	1.06 (0.88-1.27)

Table M-2: Multivariate analysis of predictors of one-year outcomes for short-stay residents by cognition status *using the original ACSC definition without CHF and pneumonia* among Complex Continuing Care (CCC) residents aged 65 and over admitted to a CCC in Ontario between April 1 1997 and March 31 2001 (n=22296). (Odds Ratio (95% Confidence Interval). Odds Ratios are adjusted for the other covariates listed and for year of admission to CCC. Highlighted cells indicate differences with original ACSC definition.

Short-stay, Intact Cognition (n=6871)

	ACSC vs. No outcome	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.16 (0.67-1.99)	**1.38** **(1.08-1.78)**	1.04 (0.92-1.17)
Male Sex	1.29 (0.90-1.86)	**1.48** **(1.16-1.88)**	**1.79** **(1.57-2.05)**
Advanced Directives	1.27 (0.75-2.16)	1.18 (0.78-1.78)	**4.54** **(3.86-5.34)**
No ADL Impairment (vs Impaired)	**0.55** **(0.36-0.86)**	**0.48** **(0.37-0.63)**	**0.50** **(0.41-0.60)**
Mild ADL Impairment (vs Impaired)	0.77 (0.45-1.32)	0.78 (0.51-1.22)	**0.54** **(0.44-0.66)**
CHESS=0-1 (vs 4 and up)	**0.14** **(0.03-0.67)**	**0.13** **(0.05-0.33)**	**0.05** **(0.03-0.09)**
CHESS=2-3 (vs 4 and up)	0.30 (0.07-1.34)	**0.25** **(0.10-0.64)**	**0.13** **(0.07-0.22)**
Depressive Symptoms	1.54 (0.84-2.83)	**1.70** **(1.12-2.56)**	**1.45** **(1.19-1.77)**
0-3 Chronic Conditions (vs 4 and up)	0.74 (0.47-1.17)	0.97 (0.73-1.30)	**1.20** **(1.04-1.39)**
From Adjoined CCC	0.86 (0.50-1.49)	0.96 (0.63-1.48)	1.03 (0.79-1.34)

Short-stay, Borderline Cognitively Impaired (n=7115) *Table M-2 continued*

	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.41 (0.93-2.13)	0.85 (0.63-1.15)	**0.88 (0.79-0.98)**
Male Sex	**1.87 (1.26-2.78)**	**1.50 (1.19-1.89)**	**1.66 (1.48-1.86)**
Advanced Directives	1.11 (0.77-1.60)	1.30 (0.94-1.78)	**3.44 (4.18-2.84)**
No ADL Impairment (vs Impaired)	**0.25 (0.17-0.37)**	**0.52 (0.38-0.71)**	**0.48 (0.41-0.56)**
Mild ADL Impairment (vs Impaired)	**0.44 (0.28-0.67)**	**0.68 (0.48-0.97)**	**0.53 (0.45-0.62)**
CHESS=0-1 (vs 4 and up)	**0.25 (0.13-0.48)**	**0.19 (0.11-0.34)**	**0.11 (0.07-0.16)**
CHESS=2-3 (vs 4 and up)	**0.55 (0.30-1.02)**	**0.29 (0.17-0.48)**	**0.25 (0.17-0.35)**
Depressive Symptoms	1.33 (0.89-2.01)	0.98 (0.70-1.38)	1.07 (0.89-1.29)
0-3 Chronic Conditions (vs 4 and up)	**0.78 (0.58-1.04)**	0.87 (0.68-1.11)	**1.13 (1.01-1.26)**
From Adjoined CCC	0.69 (0.42-1.15)	0.86 (0.57-1.30)	0.90 (0.69-1.17)

Short-stay, Cognitively Impaired (n=8310)

	ACSC vs. No out.	Other Hosp vs. No out.	Death vs. No Outcome
Younger Age	1.40 (0.93-2.11)	**1.26 (0.97-1.65)**	**0.88 (0.79-0.97)**
Male Sex	1.34 (0.98-1.83)	**1.56 (1.10-2.21)**	**1.71 (1.55-1.89)**
Advanced Directives	0.90 (0.65-1.25)	1.12 (0.83-1.51)	**2.54 (2.25-2.88)**
No ADL Impairment (vs Impaired)	**0.44 (0.27-0.71)**	**0.46 (0.34-0.62)**	**0.34 (0.30-0.39)**
Mild ADL Impairment (vs Impaired)	**0.55 (0.35-0.86)**	**0.57 (0.45-0.71)**	**0.42 (0.37-0.48)**
CHESS=0-1 (vs 4 and up)	**0.40 (0.19-0.86)**	**0.47 (0.30-0.76)**	**0.23 (0.18-0.28)**
CHESS=2-3 (vs 4 and up)	0.78 (0.42-1.47)	0.89 (0.63-1.26)	**0.40 (0.33-0.49)**
Depressive Symptoms	1.17 (0.82-1.46)	0.86 (0.65-1.22)	1.10 (0.95-1.27)
0-3 Chronic Conditions (vs 4 and up)	1.01 (0.68-1.50)	1.05 (0.82-1.34)	1.02 (0.91-1.15)
From Adjoined CCC	**0.41 (0.19-0.87)**	**0.56 (0.33-0.95)**	**0.68 (0.55-0.84)**