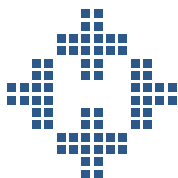# Discharge Outcomes for Long-Stay Patients in Winnipeg Acute Care Hospitals

January 2003

Manitoba Centre for Health Policy
Department of Community Health Sciences
Faculty of Medicine, University of Manitoba

Anita Kozyrskyj, BScPhm, PhD
Charlyn Black, MD, ScD
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THE MANITOBA CENTRE FOR HEALTH POLICY

The Manitoba Centre for Health Policy (MCHP) is located within the Department of Community Health Sciences, Faculty of Medicine, University of Manitoba. The mission of MCHP is to provide accurate and timely information to health care decision-makers, analysts and providers, so they can offer services which are effective and efficient in maintaining and improving the health of Manitobans. Our researchers rely upon the unique Population Health Research Data Repository to describe and explain patterns of care and profiles of illness, and to explore other factors that influence health, including income, education, employment and social status. This Repository is unique in terms of its comprehensiveness, degree of integration, and orientation around an anonymized population registry.

Members of MCHP consult extensively with government officials, health care administrators, and clinicians to develop a research agenda that is topical and relevant. This strength along with its rigorous academic standards enable MCHP to contribute to the health policy process. MCHP undertakes several major research projects, such as this one, every year under contract to Manitoba Health. In addition, our researchers secure external funding by competing for other research grants. We are widely published and internationally recognized. Further, our researchers collaborate with a number of highly respected scientists from Canada, the United States and Europe.

We thank the University of Manitoba, Faculty of Medicine, Health Research Ethics Board for their review of this project. The Manitoba Centre for Health Policy complies with all legislative acts and regulations governing the protection and use of sensitive information. We implement strict policies and procedures to protect the privacy and security of anonymized data used to produce this report and we keep the provincial Health Information Privacy Committee informed of all work undertaken for Manitoba Health.

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Previous research at the Manitoba Centre for Health Policy (MCHP) has documented the health system impact of patients hospitalized for an extended period. This research has shown that patients hospitalized for more than 30 days use a considerable amount of acute care hospital resources. They account for 5% of all hospitalized patients, yet consume 40% of hospital days (DeCoster and Kozyrskyj 2000). These statistics have remained unchanged throughout the 1990s. What has been the impact of these long-stay hospitalizations on patients? Among Manitobans hospitalized for more than 30 days, 13% of patients were discharged to a nursing home (PCH), 20% died in hospital and 14% were transferred to another institution (DeCoster and Kozyrskyj 2002). However, over 50% of long-stay patients did go home. What factors predict who will be discharged home or who will be institutionalized? Could this knowledge improve the hospital discharge process to ensure that patients receive the necessary services in the community or in the institution? Could knowledge of the risk factors result in health system modifications to decrease unnecessary institutionalization? These questions motivated us to pursue an investigation into factors which predicted discharge outcomes in a cohort of long-stay patients.

This is a descriptive study of discharge outcomes of patients hospitalized in acute care hospitals in Winnipeg for more than 30 days over the time period 1993/94 to 1999/00. The primary objective of the study was to identify risk factors for discharge to PCH, death in hospital or transfer to another institution. Secondary objectives were to characterize the "types of patients" which did go home despite the presence of risk factors and to describe one year outcomes of a home discharge.

Working Group
A Working Group was formed to provide advice with respect to the substantive issues concerning the discharge outcomes of long-stay patients. The Working Group provided useful context about "how things work," assisted with the interpretation of results and reviewed initial drafts of this report.

Population, Data Sources and Methods
Data were obtained from the Population Health Research Data Repository. The hospital file was the main file used for this research; other data files used were the population registry, nursing home (known as personal care home or PCH), home care, prescription and Public Access Census 1996 files. The hospital file is built on the basis of each patient separation from hospital, and includes such information as: dates of admission and discharge, discharge outcome (i.e. discharge to PCH, in-hospital death); up to

16 diagnoses, 12 procedures and six services/sub-services (e.g. long-term care, geriatric).

The population of interest was all adult long-stay patients with a medical or surgical diagnosis in Winnipeg acute care hospitals between 1993/94 and 1999/00. "Long-stay" was defined as a hospital stay of more than 30 days. Adult patients were those aged 18 years or older on the date of discharge, transfer or death. The determination of whether a patient was medical or surgical was based on the diagnosis most responsible for the hospital stay. Psychiatric and obstetric long-stay patients were excluded. Patients in Winnipeg's seven acute care hospitals were included, except those patients in designated long-term care beds within the acute care hospitals. Thus patients in the following units were excluded: Rehabilitation Hospital at Health Sciences Centre, the Stroke or Orthopaedic Rehabilitation Unit at St. Boniface, long-term care beds at Seven Oaks Hospital and the personal care home beds at Concordia. Except for the above exclusions, long-stay patients in the following hospitals were included in the study: Grace, Misericordia, St. Boniface, Victoria, Concordia, Seven Oaks, and Health Sciences Centre.

The analysis was restricted to patients admitted from home; those transferred from nursing homes (PCH) and long-term care institutions were excluded.

Four discharge outcomes were reported: 1) discharge home, 2) discharge to nursing home (PCH), 3) died in hospital and 4) transfer to other institution (acute or chronic care hospital). Using discharge home as the comparison category, the likelihood of being discharged to PCH or another institution or of dying in hospital, was determined for a set of risk factors. On the basis of the literature on discharge outcomes of long-stay hospitalizations, the following risk factors were assessed:

● Prehospital sociodemographic: age at the time of separation from hospital, gender, neighbourhood income level, living alone, living in Winnipeg.
● Prehospital health status: major diagnostic group, stroke diagnosis, evidence of cognitive impairment, receipt of home care, number of different prescription medications in the previous year and number of hospitalizations in the previous year.
● Hospital: hospital of stay, stay in a geriatric unit, medical versus surgical patient, rehabilitation care, dialysis treatment, length of stay (LOS), level of comorbidity/complications, in-hospital fall and Percutaneous Endoscopic Gastrostomy tube (PEG tube which is an abdominal feeding tube) insertion; discharge year.

Analyses were conducted by four age groups: 18-64 years old, 65-74 years old, 75-84 years old and 85 years old or greater. The analysis process employed polytomous logistic regression to determine which risk factors predicted discharge to PCH, transfer to other institution and death in hospital versus discharge home. Two other descriptive analyses were conducted. The characteristics of patients "at risk" for a non-home discharge were reported. One year outcomes in all patients discharged home were determined.

Findings

Who were the patients and what happened after hospital discharge?
Over the time period 1993/94 to 1999/00, there were 32,452 hospitalizations in seven acute care Winnipeg hospitals for more than 30 days. Excluding psychiatric/obstetric diagnoses (n=5,242), persons staying in designated long-stay beds (n=3,867) and persons admitted from a long-term care institution or PCH (n=734), the study cohort was composed of 22, 689 hospitalizations for medical/surgical patients. Approximately one-third of these hospitalizations were in persons 75-84 years of age, one quarter were persons 85 years or older, and one-fifth were in each of the remaining two age groups.

Among the 22, 689 long-stay hospitalizations, 50% of the patients were discharged home, 20% died, 16% were discharged to PCH and 14% were transferred to other health care institutions. The percentage of hospitalizations which resulted in a transfer to another institution was similar over the four age groups, as was the proportion dying in hospital over the age of 64 years. The percentage which resulted in a home discharge decreased with age from 70% in persons < 65 years old to 38% in the oldest age group. The reverse age trend was observed for persons going to PCH, i.e. from 3% in the youngest to 28% in the oldest age group.

What were the risk factors for a non-home discharge?
Over a 7-year period, April 1, 1993 until March 31, 2000, risk factors for specific discharge outcomes in 22, 689 long-stay hospitalizations were:

- Patients who received home care prior to their long-stay hospitalization were more likely to be discharged to PCH or another institution (acute or chronic hospital) or die in hospital than go home.
- Persons with stroke or other nervous system disorders were more likely to be discharged to PCH than go home.
- Persons with cognitive impairment were more likely to be discharged to PCH than go home.
- Persons with neoplasms were more likely to die in hospital than go home.

- Persons with multiple comorbidities were more likely to die in hospital than go home.
- Persons with LOS > 90 days were more likely to die in hospital or be institutionalized (PCH or other hospital) than go home.
- Medical patients, patients staying in geriatric units and those receiving rehabilitation were more likely to go home than to die in hospital or be discharged to PCH or another institution.
- Persons who lived outside of Winnipeg were more likely to be transferred to another institution than go home.
- Seniors living in low-income areas were more likely to be discharged to PCH than go home.

These findings were common across all age groups and independent of each other. For example, the increased risk of discharge to PCH or another institution for persons with previous home care use could not be explained by the presence of comorbidities or hospital length of stay.

What were the characteristics of persons with risk factors who did go home?
Overall, 70% of hospital patients < 65 years old, 55% of patients, aged 65-74 years old, 46% of patients, aged 75-84 years old and 38% of patients, aged 85 years or older were discharged home. Patients with risk factors for in-hospital death or institutionalization post-discharge (risk factors included previous home care, stroke or other nervous system disorder, cognitive impairment, neoplasm, multiple comorbidities, LOS), were less likely to be discharged home. The likelihood of these patients being discharged home decreased with age. However, a substantial number of long-stay patients with these risk factors did go home, including:

- half of the patients < 75 years of age
- 30%-40% of persons aged 75-84 years
- 20-30% of the oldest old

Characteristics common to these patients were:
- The overwhelming majority of persons discharged home had few comorbidities, with the exception of persons with cancer.
- The majority of patients were hospitalized for < 90 days, but persons discharged home with cognitive impairment tended to have longer stays.
- The majority of individuals with stroke, cancer cognitive impairment or other nervous system disorders, had had no previous home care, although this statistic was lower among the oldest old.

What happened to patients who went home after long hospitalizations?
Within a year of discharge, 20% of persons died, 8% were admitted to a PCH or a long-term care institution and 34% of persons were rehospitalized

from home. However, a full 38% experienced none of these outcomes. A total of 20% received home care services post-discharge. Seniors were more likely to die (22%). The proportion admitted to a PCH or long-term care facility increased from 5% in persons 65-74 years to 15% in those 85 years or older. The hospital readmission rate decreased from 35% in the youngest elderly to 26% in the oldest elderly living at home.

Independent of age, 37% of seniors experienced no mortality or institutional care after one of these long hospital stays. Home care services were provided to 27% of persons aged 65-74 years, to 22% of persons aged 75-84 years and to 14% of those age 85 years and older within one year of discharge.

Conclusions

Half of long-stay patients returned home. Even a substantial proportion of those with risk factors for not being discharged home did in fact eventually go home. Our findings regarding the determinants of discharge outcomes and one year outcomes following home discharge provide some indication of the type of support services these patients might require. Our findings also point to opportunities to improve discharge outcomes.

1. Previous use of home care is a useful marker of frail functional status which identifies persons not likely to go home after a long hospital stay. Given the low home return rate of seniors previously managed on home care, programs to prevent or reverse functional declines in-hospital and promote independent living in elderly patients are recommended. These programs should include earlier assessment of persons hospitalized for 30 days to identify persons who can be prepared for home discharge, possibly with enhanced home care services, before they experience further decline in functional or cognitive status.

2. Hospital factors had a significant impact on discharge outcomes. Independent of many factors, including markers of health status, LOS was the strongest determinant of in-hospital mortality. While for many of these patients, their poor health status most likely influences both their long hospital stay and the probability of their death, these results also suggest that continued hospitalization impacts negatively on patient opportunity for home discharge and independent living. Although earlier assessment and home discharge may reduce the likelihood of exposure to iatrogenic illness, patient safety systems are also required to reduce adverse events in the hospital setting.

3. Persons with neoplasms were twice as likely to die in hospital and less than one-third of elderly patients with cancer went home. Many argue that the hospital is not the best place to die and patient preferences for place of

death should be respected. Given their high risk of dying in hospital, long-stay cancer patients need to be reviewed after 30 days to determine if they are candidates for a hospice program or being supported at home.

4. Both stroke and cognitive impairment increased the likelihood of institutionalization. Strategies such as WRHA's planned stroke program to prevent, treat and rehabilitate persons with stroke will increase the options for home discharge. For persons with severe stroke, cognitive impairment or PEG tube insertion who cannot be managed at home, earlier assessment during hospitalization will facilitate discharge to a chronic care facility where their care needs can be more appropriately met.

5. Further exploration is required into reasons why seniors who reside in low-income neighborhoods are less likely to be discharged home. This may be a group of patients who lack informal support and do not have the means to pay for formal support services, and could be targeted for enriched home care services post-discharge.

6. Patients discharged home following a long hospital stay were less likely to have physical, mental or functional impairment on admission (the latter as indicated by previous home care use). Although many of these patients had no adverse event in the subsequent year, a sizeable proportion (60%) were at risk of dying, of being admitted to hospital or of being institutionalized. This suggests that individuals discharged home following a long hospitalization may benefit from being targeted for the need for home care. Services directed at disease management in younger individuals may prevent hospitalization, while those aimed at helping the elderly with activities of daily living may prevent institutionalization. In addition, some persons may require end of life care and/or social support services.

1.0 INTRODUCTION

Hospitalization is a sentinel event for many older persons which marks a transition from independent living to institutionalized care or death. Risk factors for nursing home or long-term care facility residence include living alone/absence of caregiver, limitations of activities of daily living, self-reported poor health, cognitive impairment, medical conditions such as stroke, and lower socioeconomic status.

Independent living in the community, which is a desirable state for many people, may be interrupted by a change in health status, leading to hospitalization, nursing home placement, functional impairment and mortality. Hospitalization is a sentinel event for many older persons which marks a transition from independent living to institutionalized long-term care or death (Miller and Weissert 2000). Two Manitoba studies and one in Nova Scotia have documented that independent of other risk factors, admission to hospital resulted in a two-fold increase in the probability of placement in a long-term care facility or nursing home (Glazebrook et al. 1994; Shapiro and Tate 1985; Tomiak et al. 2000). As the population ages, this transition from independent living to hospital, to dependence or death, will continue to gain in importance. A thorough understanding of factors which best predict this transition is indispensible to improving the continuum of health care in the population.

A number of Canadian studies of elder cohorts living in the community have identified the following social and health conditions as risk factors for nursing home or long-term care facility residence: increasing age, living alone/absence of caregiver, limitations in activities of daily living, self-reported poor health, urban residence and lower socioeconomic status (Carriere and Pelletier 1995; Glazebrook et al. 1994; Mustard et al. 1999; Rockwood et al. 1996; Shapiro and Tate 1985; Tomiak et al. 2000; Trottier et al. 2000). Similar predictors of institutionalized care have been reported in other Western countries (Breeze et al. 1999; D'Agostino et al. 1995; Glazebrook et al. 1994). Specific medical conditions which have promoted the institutionalization of the elderly have included stroke, dementia and urinary incontinence (Glazebrook et al. 1994; Rockwood et al. 1996; Thom, Haan et al. 1997; Tomiak et al. 2000; Trottier et al. 2000). Use of home care in the community has also predicted nursing home admission (Liu et al. 1991).

Evaluations of outcomes following hospitalization of the elderly have documented similar predictors of nursing home placement: increasing age, female gender, the presence of a chronic condition, living alone, impaired cognitive status, limitation in daily activities and number of medications (Alarcon et al. 1999; Kane et al. 1983; Wachtel et al. 1984; Wolinsky et al. 1992; Zureik et al. 1995). Many of these factors are pre-admission characteristics. However, loss of function during hospitalization, including that resulting from iatrogenic complications, can compromise the outcome of hospitalization, especially in the elderly. According to Palmer (1995), 25% to 60% of older patients in hospital for an acute illness risk some loss of independent physical functioning. In-hospital complications rates such as falling, confusion and not eating, have been reported to be higher in elderly than in

younger patients (Gillick et al. 1982). Rudberg et al. 1996 categorized determinants of hospital discharge into pre-hospital and post-hospital events and found that increasing age, living alone, hospital site and pre-hospital limitations in activity predicted discharge to a nursing home (Rudberg et al. 1996). Independent of pre-hospital measures, increased length of hospital stay and diminished function over the hospitalization were also significantly associated with nursing home placement.

Sociodemographic factors such as low-income or living alone tend to increase mortality among middle-aged and elderly people; other risk factors for dying among hospitalized patients include multiple comorbidities, functional impairment and polypharmacy.

Sociodemographic factors such as low-income status or living alone, are well known to increase mortality among middle-aged and elderly people (Breeze et al. 1999). Additional factors which increase the risk of dying among the community elderly requiring assistance include older age, male gender, limitations in activity and use of home care (Liu et al. 1991). Once hospitalized, patients with multiple comorbidities, functional impairment or polypharmacy (receiving more than five drugs) are more likely to die (Alarcon et al. 1999; Inouye et al. 1999). For hospitalized patients in whom death is not unexpected, research indicates that fewer people are able to die at home than would wish to. Persons living alone, older patients and women are more likely to die in hospital than at home (Grande et al. 1998). Others have found that younger age, not being married and non-cancer diagnoses were associated with an increased risk of in-hospital death; however, the strongest predictor of dying in hospital was the hospital referral region (Pritchard et al. 1998). Lower socioeconomic status has been found to be associated with a lower likelihood of dying at home in persons with cancer (Higginson et al. 1999).

In the 1990s Manitobans who were hospitalized for more than 30 days accounted for 5% of all hospitalized patients and 40% of hospital days. Among those hospitalized for more than 30 days, 13% were discharged to PCH, 20% died in hospital, and 14% were transferred to another institution; however over 50% went home.

Previous research at the Manitoba Centre for Health Policy (MCHP) has documented the health system impact of patients hospitalized for an extended period. This research has shown that patients hospitalized more than 30 days use a considerable amount of acute care hospital resources. They account for 5% of all hospitalized patients, yet consume 40% of hospital days. These statistics have remained unchanged throughout the 1990s (DeCoster and Kozyrskyj 2000). What patient outcomes are associated with long-stay hospitalizations? Among Manitobans hospitalized for more than 30 days, 13% of patients were discharged to personal care home (PCH), 20% died in hospital and 14% were transferred to another institution. However, over 50% of long-stay patients did go home. What factors predict who will be discharged home or who will be institutionalized? Could this knowledge improve the hospital discharge process to ensure that patients receive the necessary services in the community or in the institution? Could knowledge of the risk factors result in health system modifications to decrease unnecessary institutionalization? These questions motivated us to pursue an investigation into factors which predicted discharge outcomes in a cohort of long-stay patients.

This report, which focuses on long-stay patients in Winnipeg acute care hospitals, was produced by researchers at the Manitoba Centre for Health Policy as part of its contract with Manitoba Health.

1.1 Objectives

The objectives of this study were to:
1. Determine the risk factors for discharge to PCH, death in hospital or transfer to another institution versus discharge home in a population of adult medical and surgical patients who stayed in acute care Winnipeg hospitals for more than 30 days
2. Describe the characteristics of persons with risk factors who were discharged home
3. Document the one-year outcomes of persons discharged home

1.2 Schema for Pathways to Discharge Outcomes

A review of the research literature yielded a useful classification of factors predicting discharge outcome following hospitalization: prehospital sociodemographic and health characteristics and hospital factors.

Figure 1: Characteristics of Patients by Separation Outcomes and Follow-up
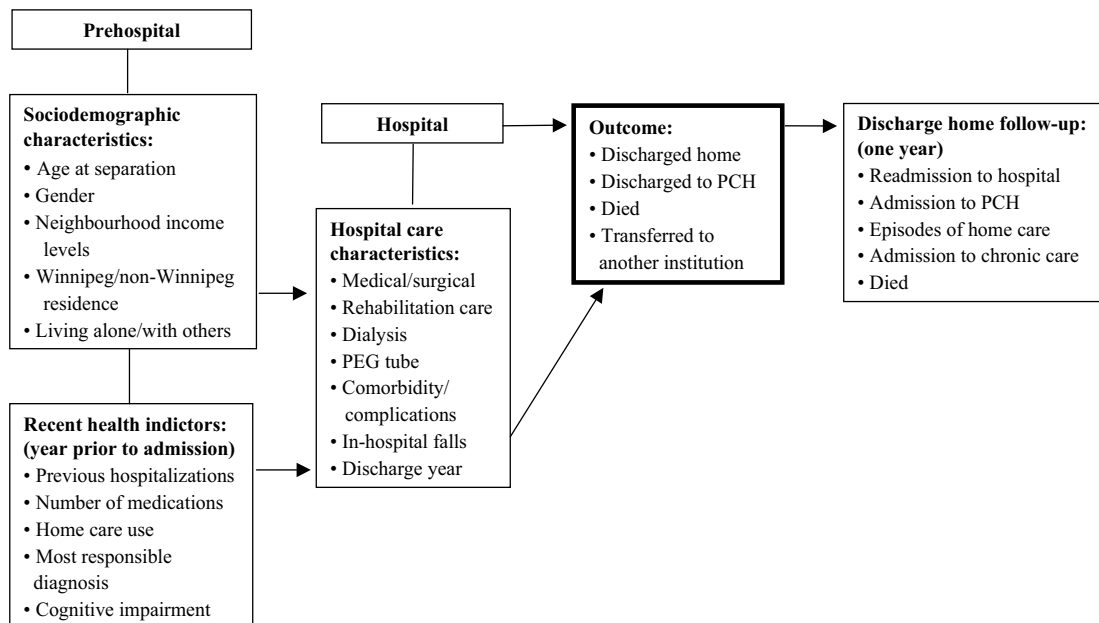
2.0 METHODS

2.1 Working Group

The members of the Working Group formed to advise on the project were:
- David Strang, MD, CMO Deer Lodge, Winnipeg Regional Health Authority
- Garey Mazowita, MD, Director, Primary Care, Winnipeg Regional Health Authority
- Jeff Sisler, MD, Director, Primary Care Oncology, CancerCare, MB
- Jan Currie, VP Nursing, Winnipeg Regional Health Authority
- Jo-Ann Mackenzie, Nursing Director, Geriatrics/Rehabilitation Program Team, Winnipeg Regional Health Authority
- Sharon Macdonald, MD, VP, Community Care, Winnipeg Regional Health Authority
- Marilynne Dvorak, Manager, Long-Term Care, Quality Improvement, Winnipeg Regional Health Authority
- Marlene Permanand, Consultant, Urban Regional Support Services, Manitoba Health
- Antoinette Zloty, Consultant, Continuing Care, Regional Support Services, Manitoba Health
- Loreena McManus, Program Director, Palliative Care, Winnipeg Regional Health Authority
- Harvey Chochinov, MD, Canada Research Chair, Palliative Care, Head, Psychosocial Oncology; Professor, Psychiatry, Community Health Sciences and Family Medicine, University of Manitoba

The Working Group (WG) acted in an advisory capacity with respect to the substantive issues concerning long-stay patients. They assisted with the interpretation of results, reviewed this report, and gave much useful feedback.

2.2 Population Studied

The study population was medical and surgical patients who were hospitalized for > 30 days in a Winnipeg acute care hospital between 1993/94 and 1999/00.

The population of interest was all adult long-stay patients with a medical or surgical diagnosis, who stayed in a Winnipeg acute care hospital between 1993/94 and 1999/00. "Long-stay" was defined as a stay of more than 30 days. Adult patients were those aged 18 years or older at the separation date. The determination of "medical" or "surgical" was made on the basis of ICD-9-CM diagnoses. Psychiatric and obstetric long-stay patients were excluded. Patients in designated long-term care beds within the acute care hospitals—the Rehabilitation Hospital at Health Sciences Centre, the Stroke or Orthopaedic Rehabilitation Unit at St. Boniface, long-term care beds at Seven Oaks Hospital,[1] and the personal care home beds at Concordia—were excluded, since the focus of our study was acute care beds. Hospitals included in the study were: Grace, Misericordia, St. Boniface, Victoria,

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[1] Service codes of patients that were excluded were: at Health Sciences Centre: 3484, 1894, 5918, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87; at Seven Oaks: 73; at St. Boniface: 7234, 7217.

Concordia, Seven Oaks, and Health Sciences Centre. Hospitalizations at the Misercordia Hospital after December 1998 were excluded from the subsequent analysis because acute care beds in this hospital were converted to interim PCH beds in April 1999.

Only individuals who were living independently in the community prior to the hospitalization event were included in the analysis.

Only individuals who were living in the community prior to the hospitalization event were included in the analysis. Thus, persons admitted to hospital from a PCH or a long-term care hospital were excluded.

2.3 Data Source

Data were obtained from the Population Health Research Data Repository. The reliability and validity of the data have been extensively established (Roos et al. 1993; Roos et al. 1991; Williams and Young 1996). The hospital file was the main file used for this research; other data files used were the population registry, personal care home, home care, prescription and public access census 1996 files. The hospital file is built on the basis of patient separations from hospital, and includes such information as: dates of admission and separation (i.e. discharge, transfer or death); up to 16 diagnoses; up to 12 procedures; and up to six services/sub-services (e.g., geriatric).

2.4 Definition of Variables

Measures for Objectives 1 and 2
Four discharge outcome variables were enumerated over the time period 1993/94-1999/00: discharge home, discharge to PCH, death in hospital and transfer to another institution. This time period was selected to describe outcomes in a health care environment following major additions to the personal care home bed supply which occurred in 1993/94 and 1997/2000, resulting in net increases of 236 and 667 beds, respectively.

On the basis of the literature on discharge outcomes of long-stay hospitalizations the following categories of explanatory measures—prehospital sociodemographic, prehospital health status and hospital factors—were related to discharge outcomes.

Prehospital sociodemographic
- age
- gender
- living alone/living with someone
- Winnipeg/non-Winnipeg residence
- neighbourhood income

Prehospital health status
- receipt of home care in the past year
- number of hospitalizations in the past year
- number of different prescription medications in the past year
- most responsible diagnostic group for hospitalization
- hospitalization for stroke
- cognitive impairment

Hospital/treatment factors
- type of patient (medical or surgical)
- type of unit (geriatric, non-geriatric)
- dialysis treatment
- PEG (Percutaneous Endoscopic Gastrostomy) tube insertion
- rehabilitation therapy
- comorbidity/complications index
- occurrence of in-hospital fall
- length of stay
- hospital of stay
- year of discharge (1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000)

Definitions for the outcome and explanatory variables and data source from which they were derived are described in detail in the Appendix I. Although the comorbidity/complications index was categorized as a hospital factor, it was also a measure of prehospital health status.

Measures for Objective 3
In the analysis of one-year outcomes of persons discharged home the following six categories of outcomes were reported: death, admission to PCH, admission to a long-term care hospital (Deerlodge, Riverview), receipt of home care, rehospitalization and none of the above.

2.5 Procedures

Separate analyses were conducted by four age groups: 18-64 years old, 65-74 years old, 75-84 years old and 85 years old or greater.

Objective 1: Predictors of discharge outcomes
Long-stay adult patients in Winnipeg acute care beds from 1993/94 to 1999/00 were categorized by their discharge outcomes. In comparison to being discharged home, the likelihood of being discharged to PCH or another institution, or of dying in hospital was determined for the explanatory variables of interest. The likelihood was reported as an odds ratio and 95% confidence interval. An odds ratio significantly greater than "1" indicated that the likelihood of the outcome was increased in comparison to being discharged home. An odds ratio significantly less than "1" indicated

that the likelihood of the outcome was decreased in comparison to being discharged home. Significance was achieved if the value of "1" was not included in the 95% confidence interval. Odds ratios were derived from multivariate models to control for the effect of other variables. In other words, reported odds ratios could be attributed solely to the effect of the relevant explanatory variable.

Polytomous logistic regression analysis was used in the modelling process to select odds ratios which were statistically significant. Unlike the more familiar binary logistic regression, multiple outcomes can be considered simultaneously in polytomous regression, with the actual probability of each outcome factored into the calculations. This represents the real-life scenario of hospitalized patients in which any of the discharge outcomes could occur and is the best technique for determining which factors, if any, can indicate the likely outcome for a patient. Explanatory variables in the model were retained at the 95% level of confidence (indicating statistical significance) using the backwards elimination process.

Objective 2: Characteristics of "at risk" patients being discharged home
A description of the characteristics of patients discharged home, but possessing risk factors for non-home discharge, was obtained. This included the frequency distribution of health (comorbidity), hospital (length of stay) and sociodemographic (gender, living arrangements, income) characteristics of these patients.

Objective 3: One year outcomes of persons discharged home
Descriptive statistics of the one year outcomes of persons discharged home were reported according to six categories: death, admission to PCH, admission to a long-term care hospital (Deerlodge, Riverview), receipt of home care, rehospitalization and none of the above. They were reported as the frequency of home discharges for which these outcomes were a first event and for which the outcomes were a final event in the year following discharge home. The time to first event was also determined.

3.0 RESULTS

3.1 How the Study Population was Derived

Over the time period 1993/94 to 1999/00, there were 32,532 hospitalizations of adults in seven acute care Winnipeg hospitals for more than 30 days. Following the implementation of exclusions, a total of 22,689 hospitalizations in 19,193 patients were included for study.

Table 1: Adult hospitalizations over 30 days, including exclusions

	NUMBER
All adult hospitalizations for > 30 days in Wpg hospitals (medical, surgical, psychiatric, obstetric, including HSC Rehabilitation Hospital, Seven Oaks longterm care unit, St Boniface Rehab and Stroke units)	32,532
EXCLUDE:	
Psychiatric and obstetric diagnoses	5,242
Medical/surgical patients in designated long-stay beds: Seven Oaks long-term care (73)*, HSC Rehabilitation Hospital (3484, 1894, 5918, 78-87)*, St. Boniface Stroke and Rehabilitation units (7234, 7217)*	3,743
Medical/surgical patients in Misercordia beds after Dec 1998	124
Medical/surgical patients admitted from PCH	567
Medical/surgical patients admitted from LTC	167
FINAL COHORT	
Number of hospitalizations for > 30 days in Winnipeg acute care beds, following exclusions	22,689
Number of persons hospitalized for > 30 days in Wpg acute care beds, following exclusions	19,193

* hospital service codes

Approximately one-third of these hospitalizations were in persons 75-84 years of age, one-quarter were persons 85 years or older, and 20% were in each of the remaining two age groups.

3.2 Distribution of Hospital Discharge Outcomes by Age

Table 2: Proportion of hospitalizations by discharge outcome, 1993/94 to 1999/00

	Discharge home	Discharge PCH	In-hospital death	Transfer to other institution
18-65 yr (n=4,705)	69.9%	2.7%	13.0%	14.3%
65-74 yr (n=4,316)	54.5%	8.9%	20.8%	15.9%
75-84 yr (n=7,633)	45.7%	17.7%	22.0%	14.7%
85+ yr (n=6,035)	37.7%	28.1%	21.8%	12.5%
Total (n=22,689)	50.2%	15.7%	19.8%	14.3%

Half of the long-stay patients were discharged home, 20% died in hospital, 16% were admitted to PCH and 14% were transferred to another institution. The percent discharged home decreased, while the percent going to PCH increased with advancing age. With the exception of patients < 65 years old in which in-hospital mortality was lowest, the proportion of persons dying in hospital did not change with age. The percent of persons transferred to other institutions also remained constant with age.

Table 3: Proportion of transfers to other institutions by specific destination, 1993/94 to 1999/00

	Winnipeg acute care hospital	Non-Winnipeg acute care hospital	Winnipeg long-term care hospital	Transfer out of province or other
18-65 yr (n=674)	38.4%	29.2%	29.5%	2.8%
65-74 yr (n=687)	25.3%	20.1%	53.4%	1.2%
75-84 yr (n=1,120)	20.1%	16.0%	62.4%	1.5%
85+ yr (n=754)	21.4%	6.1%	71.4%	1.2%
Total (n=3,235)	25.3%	17.3%	55.7%	1.6%

The majority of transfers to other hospitals were to long-term care facilities in Winnipeg (Deerlodge, Riverview), one-quarter of patients went to acute care Winnipeg hospitals and 17% were transferred to acute care hospitals outside of Winnipeg. The percent of patients transferred to long-term care increased and conversely, transfers to acute care hospitals decreased with age.

3.3 Predictors of Discharge Outcomes: In-hospital death, discharge to PCH, transfer to other institution versus discharge home

3.3.1 Patients of all ages

Presented in Table 4 and Table 5 are the factors which significantly increased the risk of discharge to PCH, death in hospital or transfer to another institution in all age groups. The likelihood of an outcome is presented as the odds ratio (with 95% confidence interval) and the referent category was discharge home. To simplify the reporting of the results, the phrase "compared to being discharged home" was not repeated. Table 4 reports prehospital sociodemographic and health status factors and Table 5 reports the hospital factors associated with discharge outcomes. The complete models, reporting all factors significantly associated with any of the discharge outcomes in age-specific groups, are reported in Appendix B. All reported odd ratios were adjusted for the factors retained in the multivariate models described in Appendix B. This included the categorical variable which denoted the specific hospital in which the stay occurred, although odds ratios for specific hospitals were not reported.

Table 4: Likelihood of three discharge destinations in comparison to going home by prehospital factors

Odds Ratio (95% CI)	Discharge to PCH	Hospital Death	Transfer to Institution
Age 18-64 years			
Not in Winnipeg	0.53 [0.31-0.90]		1.86 [1.65-2.03]
In Winnipeg	1.00		1.00
Prior home care	1.34 [1.01-1.77]	1.28 [1.13-1.44]	1.14 [1.00-1.29]
No home care	1.00	1.00	1.00
Neoplasm		2.50 [1.87-3.34]	1.40 [1.05-1.88]
Stroke	1.94 [1.01-3.73]		2.19 1.70-2.82]
Nervous system disorder*	4.65 [2.18-9.89]	2.46 [1.38-4.39]	2.53 [1.69-3.78]
Cognitive impairment	9.68 [4.29-21.9]	5.06 [1.98-13.0]	2.72 [1.56-4.76]
Other diagnosis	1.00	1.00	1.00
Age 65-74 years			
Not in Winnipeg		0.86 [0.73-1.00]	1.90 [1.68-2.15]
In Winnipeg		1.00	1.00
Prior home care	1.55 [1.31-1.83]	1.13 [1.02-1.25]	
No home care	1.00	1.00	
Neoplasm		2.21 [1.71-2.85]	
Stroke	1.83 [1.33-2.53]	1.29 [1.05-1.58]	2.17 [1.78-2.63]
Nervous system disorder*	2.08 [1.21-3.57]		2.26 [1.49-3.42]
Cognitive impairment	2.42 [1.65-3.56]		1.63 [1.12-2.38]
Other diagnosis	1.00	1.00	1.00
Age 75-84 years			
Not in Winnipeg			1.88 [1.68-2.11]
In Winnipeg			1.00
Prior home care	1.48 [1.34-1.62]	1.21 [1.13-1.30]	1.14 [1.05-1.23]
No home care	1.00	1.00	1.00
Neoplasm		2.18 [1.78-2.67]	1.38 [1.06-1.79]
Stroke	1.93 [1.59-2.33]	1.23 [1.07-1.41]	1.98 [1.70-2.32]
Nervous system disorder*	3.05 [2.08-4.46]		1.51 [1.02-2.23]
Cognitive impairment	2.75 [2.16-3.50]		1.40 [1.06-1.84]
Other diagnosis	1.00	1.00	1.00
Age 85 years or older			
Not in Winnipeg			1.72 [1.42-2.09]
In Winnipeg			1.00
Prior home care	1.40 [1.27-1.54]	1.22 [1.12-1.33]	1.12 [1.02-1.24]
No home care	1.00	1.00	1.00
Neoplasm		2.12 [1.60-2.80]	1.93 [1.32-2.82]
Stroke	1.54 [1.29-1.86]		1.78 [1.46-2.16]
Nervous system disorder*	1.72 [1.08-2.75]	1.59 [1.01-2.50]	
Cognitive impairment	1.51 [1.20-1.90]		
Other diagnosis	1.00	1.00	1.00

Table 5: Likelihood of three discharge destinations in comparison to going home by hospital factors

Odds Ratio (95% CI)	Discharge to PCH	Hospital death	Transfer to Institution
Age 18-64 years			
LOS > 120 days	8.28 [5.52-12.4]	1.54 [1.14-2.08]	1.63 [1.25-2.13]
LOS 91-120 days		1.65 [1.23-2.21]	
LOS 61-90 days		0.78 [0.62-0.99]	
LOS 60 days or less	1.00	1.00	1.00
Multiple comorbidity (4+)		3.48 [2.91-4.15]	1.27 [1.04-1.55]
Some comorbidity (1-3)		1.17 [1.00-1.36]	
No comorbidity		1.00	1.00
Discharged in 1993		0.70 [0.50-0.99]	0.67 [0.49-0.93]
Discharged in 1997			0.72 [0.56-0.93]
Discharged in 1998			1.30 [1.03-1.63][
Discharged in 1999			1.57 [1.25-1.96]
Discharged in 2000		1.00	1.00
Age 65-74 years			
LOS > 120 days	6.65 [5.10-8.67]	1.85 [1.44-2.37]	1.50 [1.15-1.97]
LOS 91-120 days	1.69 [1.24-2.31]		
LOS 61-90 days	0.71 [0.54-0.92]		
LOS 60 days or less	1.00	1.00	1.00
Multiple comorbidity (4+)		2.68 [2.28-3.14]	
Some comorbidity (1-3)	1.33 [1.04-1.69]	0.84 [0.74-0.96]	
No comorbidity	1.00	1.00	
Discharged in 1993		0.67 [0.50-0.91]	
Discharged in 1994		0.74 [0.58-0.95]	
Discharged in 1995	0.53 [0.33-0.84]		0.75 [0.57-0.97]
Discharged in 2000	1.00	1.00	1.00
Age 75-84 years			
LOS > 120 days	7.16 [6.05-8.46]	1.65 [1.38-1.98]	1.96 [1.61-2.39]
LOS 91-120 days	1.87 [1.56-2.25]	1.36 [1.14-1.63]	
LOS 61-90 days	0.65 [0.55-0.76]	0.87 [0.75-0.99]	0.75 [0.64-0.88]
LOS 60 days or less	1.00	1.00	1.00
Multiple comorbidity (4+)	0.73 [0.56-0.95]	2.21 [1.94-2.51]	
Some comorbidity (1-3)		0.90 [0.82-0.98]	
No comorbidity	1.00	1.00	
Discharged in 1995	0.58 [0.46-0.74]		0.78 [0.64-0.95]
Discharged in 1997	0.69 [0.55-0.88]		
Discharged in 1999	1.60 [1.30-1.98]		1.24 [1.03-1.50]
Discharged in 2000	1.00		1.00
Age 85 years or older			
LOS > 120 days	7.00 [5.78-8.48]	2.88 [2.34-3.55]	2.13 [1.67-2.72]
LOS 91-120 days	2.05 1.70-2.47]		1.59 [1.27-2.01]
LOS 61-90 days	0.61 [0.52-0.71]	0.80 [0.68-0.94]	0.62 [0.51-0.75]
LOS 60 days or less	1.00	1.00	1.00
Multiple comorbidity (4+)	0.68 [0.49-0.94]	2.24 [1.83-2.73]	
Some comorbidity (1-3)		0.82 [0.72-0.93]	
No comorbidity	1.00	1.00	
Discharged in 1994	0.78 [0.62-0.97]		
Discharged in 1995	0.77 [0.62-0.96]		
Discharged in 1996	0.58 [0.46-0.72]		0.75 [0.59-0.96]
Discharged in 1997	0.78 [0.61-0.99]		0.62 [0.47-0.83]
Discharged in 1998			0.75 [0.59-0.97]
Discharged in 1999	1.73 [1.40-2.14]		1.43 [1.14-1.79]
Discharged in 2000	1.00		1.00

Previous home care users were 1.5 times more likely than non-users to die or be discharged to another facility than go home.

The single sociodemographic factor to predict a non-home discharge outcome in all ages was location of residence. Non-Winnipeg residents were twice as likely as Winnipeg residents to be transferred to an institution than to go home. Receipt of home care within the year prior to hospital admission was associated with an increased likelihood of in-hospital death and institutionalization (PCH, other hospital) post-discharge. In terms of the actual odds ratio, previous home care users were approximately 1.5 times as likely as non-users to die or be discharged to an institution than go home. Among the diagnoses responsible for the hospitalization, neoplasms and stroke and/or other nervous system disorders increased the likelihood of dying in hospital. Cognitive impairment, stroke and other nervous system disorders increased the likelihood of transfer to PCH or another institution.

In most age groups the presence of comorbidites/complications and a length of stay of 3+ months increased the likelihood of dying in hospital. Persons discharged from hospital in 1999 and 2000 were more likely to be transferred to PCH or another facility than in previous years.

The presence of multiple comorbidities/complications increased the likelihood of dying in hospital, as did a length of stay (LOS) beyond three months in most age groups. As the LOS increased beyond four months, the likelihood of being transferred to a PCH or another institution was increased. In comparison to persons discharged in 2000, persons discharged in 1999 were more likely to be transferred to PCH or another institution. Hospitalization in years prior to 1999 was associated with a decreased likelihood of admission to PCH. Although not reported in these tables (see Appendix B), some hospital factors were associated with a decreased likelihood of a non-home outcome (or increased likelihood of going home); these included being a surgical patient, being hospitalized on a geriatric unit and receiving rehabilitation therapy.

Patients with a cancer diagnosis had a two-fold increase of dying in hospital than going home in comparison to patients with other conditions; patients with multiple comorbidities were three-fold more likely to die in hospital than patients with no condition.

The strongest predictors of mortality in hospital were a cancer diagnosis and the presence of multiple comorbidities. In comparison to patients with other conditions, persons with cancer had a two-fold increased risk of dying in hospital than going home. The risk of dying in hospital was approximately three-fold higher among patients with multiple comorbidities when compared to patients with no comorbidities. LOS of > 120 days, and diagnoses of cognitive impairment or stroke/other nervous system disorders were associated with discharge to PCH to a greater extent than other factors. The latter were also the strongest predictors of transfer to another institution.

3.3.2 Patients aged 18-64 years (n=4,437 excluding missing values)

In addition to the factors described in section 3.3.1, males in the youngest age group were more likely to be transferred to an institution (see Appendix B). One or more hospitalizations in the past year also increased the likelihood of dying in hospital and institutionalization post-discharge. The likelihood of dying in hospital was increased in persons with infections and cognitive impairment. Hospital admission for circulatory, genitourinary and

musculoskeletal disease, or for injury and poisoning increased the likelihood of transfer to another institution.

Among 2,898 patients hospitalized in 1996 and onwards, for which prescription medication data was available, the number of different medications in the past year was not predictive of discharge outcomes.

3.3.3 Patients aged 65-74 years (n=4,056 excluding missing values)

Patients 65 years and older who were living alone or in low-income neighbourhoods were more likely to be discharged to a PCH than go home.

In addition to the factors described in section 3.3.1, living alone was associated with an increased likelihood of being transferred to an institution than going home (see Appendix B). Living alone also increased the likelihood of being discharged to PCH. One or more hospitalizations in the previous year also increased the likelihood of an in-hospital death, as did disorders of the circulatory, respiratory, genitourinary and digestive system and the insertion of a PEG tube.

Among 2,544 patients hospitalized in 1996 and onwards, for which prescription medication data was available, the number of different medications in the past year was not retained in the model predicting discharge outcomes.

3.3.4 Patients aged 75-84 years (n=7,161 excluding missing values)

In addition to the measures reported in section 3.3.1, male patients were more likely to be discharged to an institution than home (see Appendix B). Living in a low-income neighbourhood also increased the likelihood of being discharged to PCH. Disorders of the circulatory, respiratory and genitourinary system increased the likelihood of dying in hospital.

Among 4,365 patients hospitalized in 1996 and onwards, for which prescription medication data was available, the number of different medications in the past year was also retained in the model. However, this measure predicted few discharge outcomes and in a way which was not anticipated, i.e., greater number of different medications was associated with an decreased likelihood of being discharged to PCH than going home. Further, the measure altered the influence of measures such as income status and dialysis, which were felt to be more useful predictors of discharge outcomes. Subsequently, the model with the prescription use measure was not chosen.

3.3.5 Patients aged 85 years or older (n=5,543 excluding missing data)

In addition to the variables identified in section 3.3.1, male patients were more likely to die in hospital than go home (see Appendix B). Discharge to PCH was more likely among patients living in low-income neighbourhoods.

Hospitalization for injury and poisoning increased the likelihood of transfer to another institution. A PEG tube insertion and an in-hospital fall almost doubled the likelihood of hospital mortality.

Among 3,013 patients hospitalized in 1996 and onwards, for which prescription medication data was available, the number of different medications in the past year was also retained in the model. However, this measure predicted few discharge outcomes, some of which were not plausible, i.e., greater number of different medications was associated with a decreased likelihood of being discharged to PCH than going home. The measure did not alter the influence of the measures described above and a decision was made not to select the model with the prescription use measure.

3.4 Characteristics of At Risk Patients Who Went Home

Overall, 70% of hospital patients < 65 years old, 55% of hospital patients, aged 65-74 years old, 46% of hospital patients, aged 75-84 years old and 38% of hospital patients, aged 85 years or older were discharged home. In the presence of risk factors for in-hospital death or institutionalization post-discharge (identified in section 3.3) the proportion discharged home was reduced, especially with advancing age. However, a substantial number of patients with these risk factors did go home. This included approximately half of the patients < 75 years of age, 30%-40% of persons aged 75-84 years and 20-30% of the oldest old. The proportion of patients with cognitive impairment who went home was lower than that among patients with other risk factors. The health and social characteristics of persons discharged home which are reported by risk factor in Tables 6 and 7, are highlighted here.

The overwhelming majority of 'at risk' persons discharged home had few comorbidities except for those with cancer among whom half had multiple comorbidities.

Common to all age groups was that the overwhelming majority of persons discharged home had few comorbidities (Table 6). The one exception was persons with cancer among whom half had multiple comorbidities. Eighty percent, and for many risk factors more than 90% of patients who went home had a hospital LOS of < 90 days. Further, the proportion of patients discharged home dropped off substantially when LOS increased to 61-90 days. Persons with cognitive impairment stayed longer before home discharge. In addition, the majority of individuals with stroke, cancer, cognitive impairment or other nervous system disorders had had no previous home care, although this statistic was lower among the oldest old.

Table 6: Health and hospital characteristics of persons with risk factors discharged home by percent

Risk factor (%)	Home discharge	No previous home care	Few Comorbidities	LOS 30-60 days	LOS 61-90 days
Age 18-64 years					
Prior home care	57		84	66	17
Stroke diagnosis	42	84	84	64	20
Nervous system	55	58	100	67	15
Cancer diagnosis	53	89	53	80	14
Cognitive impairment	39	100	87	48	22
Multiple comorbidities	47	79		76	15
Age 65-74 years					
Prior home care	50		86	67	19
Stroke diagnosis	40	81	97	53	23
Nervous system	39	48	100	62	23
Cancer diagnosis	35	78	46	77	14
Cognitive impairment	30	54	98	52	53
Multiple comorbidities	38	72		79	11
Age 75-84 years					
Prior home care	42		92	67	19
Stroke diagnosis	34	66	99	56	26
Nervous system	28	39	99	64	17
Cancer diagnosis	28	72	50	82	12
Cognitive impairment	21	40	95	61	22
Multiple comorbidities	33	63		77	13
Age 85+ years					
Prior home care	35		96	68	20
Stroke diagnosis	16	43	97	57	22
Nervous system	21	26	100	60	16
Cancer diagnosis	28	55	60	77	15
Cognitive impairment	17	29	98	64	17
Multiple comorbidities	25	52		74	19

In terms of sociodemographic characteristics (Table 7), a greater proportion of elderly patients who went home were female and lived alone. Approximately one-third lived in a low-income neighbourhood and this increased to 40% in the oldest old. Only 20% of non-elderly persons (< 65 years old) with cancer who went home came from low-income neighbourhoods.

Table 7: Social characteristics of persons with risk factors discharged home by percent

Risk factor	In those with risk factor who went home			
	Home discharge	Female	Living alone	Lowest income
Age 18-64 years				
Prior home care	57	56	44	32
Stroke diagnosis	42	41	36	33
Nervous system	55	51	43	32
Cancer diagnosis	53	45	36	19
Cognitive impairment	39	56	48	26
Multiple comorbidities	47	53	33	20
Age 65-74 years				
Prior home care	50	61	49	32
Stroke diagnosis	40	56	41	26
Nervous system	39	48	51	23
Cancer diagnosis	35	50	42	24
Cognitive impairment	30	45	48	25
Multiple comorbidities	38	50	42	26
Age 75-84 years				
Prior home care	42	66	59	34
Stroke diagnosis	34	58	54	28
Nervous system	28	57	48	32
Cancer diagnosis	28	50	47	24
Cognitive impairment	21	55	55	26
Multiple comorbidities	33	48	45	19
Age 85+ years				
Prior home care	35	75	74	41
Stroke diagnosis	16	63	68	47
Nervous system	21	60	58	37
Cancer diagnosis	28	61	68	37
Cognitive impairment	17	70	70	36
Multiple comorbidities	25	48	62	38

3.5 One Year Outcomes in Persons Discharged Home

Seventy percent of patients < 65 years old, 55% of patients 65-74 years old, 46% of persons 75-84 years old and 38% of patients 85 years and older were discharged home. Age-specific outcomes at one year in patients discharged home are reported in Table 8, including hospital readmission, mortality, receipt of home care, admission to PCH, admission to a long-term care facility and no event. First event denotes the outcome which occurred first following hospital discharge. Final event indicates the last outcome to occur within one year of discharge, using the following hierarchy: died, admitted to long-term care, admitted to PCH, readmitted to hospital and home care. That is, if a person was hospitalized following admission to PCH they would be counted in the PCH category. If a person was not admitted to any institution and received home care they were placed in the home care category.

Table 8: One year outcomes in persons discharged home, by percent

	Age 18-64		Age 65-74		Age 75-84		Age 85+	
	First Event	Final Event	First Event	Final Event	First Event	Final Event	First Event	Final Event
Died	1.6	13.2	1.8	22.3	2.2	22.0	2.6	22.1
Admitted to LTC	1.0	1.7	2.5	3.1	1.9	4.3	1.5	4.3
Admitted to PCH	0.1	0.5	0.6	2.6	1.9	5.9	4.2	10.9
Admitted to hospital	47.6	43.3	45.3	34.7	45.6	30.6	49.5	26.5
Home care only	14.3	5.9	22.6	10.1	18.4	9.0	11.7	5.7
No event	35.4	35.4	27.3	27.3	30.0	28.1	30.5	30.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Overall, 20% of persons died, 8% were admitted to a PCH or long-term care institution, 34% of persons were rehospitalized from home and 38% experienced none of these outcomes, but may have received home care. Table 9 reports the average time to event post-discharge. On average, long-term care placement occurred within 86 days, death within 88 days, hospital readmission within 101 days and PCH placement within 144 days of discharge. A total of 20% of persons received home care services post-discharge, on average, within 18 days of discharge and 50% of the time within 2 days.

Table 9: Average time to first event for each outcome, all ages

	18-64	65-74	75-84	85+
Died	79.8	82.0	88.6	98.1
Admitted to LTC	75.5	69.2	81.6	71.6
Admitted to PCH	79.3	147.4	144.1	145.5
Admitted to hospital	97.1	94.6	108.0	101.3
Home care (average time)	13.0	17.4	18.9	22.7
Home care (median time)	1	2	3	3

3.5.1 Patients Aged < 65 Years Old

Within one year of discharge, 13% of patients < 65 years old died, 2% were admitted to a PCH or long-term care facility, and 43% were readmitted to hospital. The balance, 41%, experienced none of these outcomes.

Within one year of discharge to home of the 3,290 long-stay hospitalizations in persons <65 years old, 13% died, 2% were admitted to a PCH or long-term care institution, and 43% were readmitted to hospital from home. Hospital readmission was the most common first event following discharge home (48%) and occurred on average, within 97 days of discharge. Time to event for the other outcomes was approximately 80 days.

Forty-one percent experienced no mortality or institutional care (6% received home care and 35% did not). Home care services were provided to 19% of persons < 65 years old. On average, home care was provided within

13 days of discharge following a long-stay hospitalization. Home care services were provided within 2 days in 50% of the long-stay hospitalizations.

3.5.2 Patients Aged 65 Years or Older (Seniors)

Within one year of a home discharge following a long-stay hospitalization, 22% of seniors died. The proportion admitted to a PCH or long-term care facility increased from 6% in persons 65-74 years to 15% in those 85 years or older. The hospital readmission rate decreased from 35% in the youngest elderly to 26% in the oldest elderly living at home.

Independent of age, 37% experienced no mortality or institutional care (6-10% received home care and 27-31% did not). Home care services were provided to 27% of persons aged 65-74 years, to 22% of persons aged 75-84 years and to 14% of those age 85 years and older within one year of discharge. Home care was provided, on average, within 17-20 days of home discharge. The median time to receipt of home care was 2-3 days post-discharge.

Rehospitalization was the most common first event following discharge home occurring in close to 50% of discharges, usually within 100 days following discharge. Persons died on average, within 80-100 days of discharge. They were admitted to a long-term care facility within 70-80 days and a PCH within 145 days of discharge.

3.6 Limitations

A population-based approach using administrative data provides a system-wide perspective of how long-stay hospitalizations affect patient outcomes, and because it covers the entire population of patients, this approach has less potential for a selection bias. It also makes it possible to review all long-stay cases over a number of years to identify trends in discharge outcomes over time.

On the other hand, there were a number of limitations to the use of health care administrative data sources. These ranged from the potential under-coding of measures such as rehabilitation therapy and cognitive impairment, to the differential coding by hospitals of geriatric unit beds. Further, while the comorbidity index was a potential measure of medical complications, the hospital data did not permit temporal sequencing of diagnoses which would help identify whether patients with multiple comorbidities had pre-exisiting conditions or hospital acquired complications.

Within one year of discharge 22% of seniors died. Admission to a PCH or long-term care facility increased from 6% for persons 65-74 years old to 15% for persons 85 years or older. 37% of seniors experienced no mortality or institutional care. Rehospitalization was the most common first event within one year following discharge, occurring in close to 50% of discharges.

4.0 DISCUSSION

This study investigated four discharge outcomes over the years 1993/94 to 1999/00: discharge home, discharge to PCH, death in hospital and tranfer to another facility.

Which characteristics predict what happens to medical or surgical patients who are hospitalized in Winnipeg hospitals for more than 30 days? Our investigation evaluated four discharge outcomes: discharge home, discharge to PCH, death in hospital and transfer to another institution. The study spanned the years 1993/94 to 1999/00, spanning major bed changes in the Winnipeg system. Patient characteristics were divided into three categories: prehospital sociodemographic, prehospital health status and hospital factors.

In the seven-year evaluation period, there were 22, 689 hospitalizations of medical and surgical patients in acute Winnipeg hospitals which resulted in a length-of-stay of greater than 30 days. On average, these patients were hospitalized for 80 days, and there was substantial variation in length of stay among patients (range: 31 - 2046 days). Five findings are noteworthy:

● Previous home care use consistently identified frail persons who were at increased risk of not being discharged home.
● A diagnosis of cancer was the strongest predictor of dying in hospital.
● Stroke and cognitive impairment predicted institutionalization (PCH or other hospital).
● Independent of previous home care use, diagnosis and level of comorbidity, hospital length of stay was an important determinant of not being discharged home.
● Sociodemographic factors were not major predictors of whether persons were discharged home.

There were four findings which were not unexpected because they were related to how the health care system functions:

● Persons not residing in Winnipeg were more likely to be transferred to another institution, including acute care hospitals outside of Winnipeg closer to their home.
● Patients receiving rehabilitation or those hospitalized on geriatric units (geriatric units do not accept stroke patients who are not rehabilitation candidates) were more likely to go home.
● Persons receiving dialysis were less likely to be discharged to PCH because most facilities do not provide dialysis treatment.
● Patients with LOS > 120 days were more likely to be transferred to PCH, likely because they had been panelled and were awaiting placement.

In the following paragraphs, we highlight several findings which present opportunities to improve discharge outcomes of long-stay hospitalizations

and to improve the discharge planning process to meet the needs of patients discharged.

Predictors of discharge outcomes; opportunities for change

Persons previously managed with home care not going home

The likelihood of any non-home outcome, dying in hospital or being transferred to another institution, was increased if patients had previously received home care. Our measure of home care was a binary variable which identified persons who received, in the year prior to hospital admission, a wide range of home care services from limited assistance with chores to extensive skilled nursing care. Using a similar measure, others have also observed that provision of home care in the community predicts nursing home admission and mortality (Liu 1991; Miller and Weissert 2000). Traditional measures of general health status, such as number of previous hospitalizations and number of different drugs did not consistently predict discharge outcomes. Thus, previous use of home care may be a valuable proxy for at-risk functional status and can be easily obtained from the patient at the time of hospital admission.

Previous home care was a strong predictor of not going home, but up to 60% of persons with home care prior to hospital admission did go home. Changes in functional status during hospitalization are commonly reported as events which prevent persons from returning home (Rudberg et al. 1996). While we were unable to measure deterioration in functional status, we observed that persons with previous home care who were discharged home had few comorbidities/complications and were hospitalized for < 90 days. These findings suggest that extended hospital LOS may lead to further deterioration in the functional status of those previously requiring assistance, but living independently in the community. The fact that only 35% of the oldest age group, previously managed on home care, went home likely illustrates the greater impact of a long-stay hospitalization on function in the elderly. Research shows that older patients are at higher risk of cognitive and functional declines when hospitalized in a busy acute care medical ward. Modifications to prevent or reverse functional declines in elderly patients include environmental changes to assist with orientation and comfort, multidimensional assessment linked to non-pharmacologic prescriptions, interdisciplinary team rounds, family conferences, and early discharge planning. Many of these are characteristic of geriatric units, but incorporating them into general medical units that treat elderly patients may improve discharge outcomes in the elderly.

Patients who received home care prior to admission were more likely to die in hospital or be tranferred to another facility. However, up to 60% did go home. Research shows that older patients are at higher risk of cognitive and functional declines when hospitalized in a busy acute care medical ward. Environmental changes which prevent or reverse functional declines, may facilitate home discharge.

40% of persons discharged home, and who had received home care prior to admission, remained in their home with no major event over the following one-year period.

Another interpretation of the association between previous home care use and no home discharge following a lengthy hospitalization is reluctance by health professionals to send these patients back home because "they had already tried home care." Our data which shows that 40% of persons discharged home remained in their home with no major adverse events over the following one-year period, should reinforce to health care providers that discharge to home care is a viable option.

Persons with cancer dying in hospital

A cancer diagnoses was a strong predictor of death in hospital. The association between cancer and death is not a surprising one, but individuals can be given options of where they want to die. Patients who are dying might be more appropriately cared for by home care if they wish to die at home, or in a hospice (Grande et al. 1998). The literature documents that many patients expressing a preference for dying at home actually die in hospital; (Pritchard et al. 1998) the latter occurs less often in areas with an increased availability of hospice care.

Only 50% of Manitobans with cancer were discharged following a long-stay hospitalization; this decreased to 30% in the elderly. Although these patients had a range of comorbidities, the majority had a LOS for < 90 days.

Only 50% of Manitobans with cancer were discharged home following a long-stay hospitalization; this decreased to 30% in the elderly. These patients had a range of comorbidities, but the majority had LOS for < 90 days. Interestingly, younger patients with cancer who were discharged home, were predominantly high-income. Low-income persons with cancer in Britain have also been reported to be much less likely to die at home than persons living in high-income areas (Higginson et al. 1999). Higginson et al. 1999 report that the percentage of cancer deaths in hospital has not changed over the past decade, suggesting that the "hospitalization of death" is a well accepted practice. Changes are advocated to improve the end of life care of persons with cancer. This would include inquiry into patient preferences about place of death and the increased availability of hospice care and home care. In the last year, WRHA has created a Palliative Care subprogram which should improve access to palliative care beds, palliative care home care services and hospice care.

Adverse outcomes among persons with longer hospital stays

A hospital LOS beyond 90 days increased the likelihood of remaining in hospital and dying.

Independent of the indicators of health status that we were able to measure, hospital LOS beyond 90 days increased the likelihood of institutionalization and dying. The oldest old were 3 times more likely to die in hospital if they were hospitalized for 120 days or longer. Patients at risk for not being discharged home, but who did go home, predominantly were discharged within 90 days. The likelihood of home discharge decreased dramatically beyond this time period.

Patients are susceptible to the detrimental effects of hospitalization, such as iatrogenesis and loss of independence (Potts et al. 1993, Rudberg et al. 1996). Medical error or complications during hospitalization have contributed to the deaths of thousands of patients (Kohn et al. 2000). Our indirect measures of these events, i.e., LOS and level of comorbidity, were both strong predictors of hospital mortality. Prolonged hospital LOS has been shown to yield similar results as complications data from clinical records in assessments of hospital outcomes (Sochalski and Aiken 1999). Level of comorbidity was measured with the Charlson index based on diagnoses associated with the hospitalization, which also included complications as a result of treatment (Roos et al. 1997). A higher Charlson index may represent iatrogenic disease, although we would have been more confident with this interpretation if other measures of health status had been retained in our multivariate models. A complication which we were able to measure is injurious fall in hospital, which reduced the likelihood of home discharge in our study only in the oldest old. There are many risk factors for falls in elderly patients (Institute for Clinical Evaluative Sciences 1998; Mayo et al. 1994; Mustard and Mayer 1997). Not infrequently, these risk factors such as prescription medications, are the outcome of care delivered in the hospital and can be prevented with modifications to the hospital environment (Patrick et al. 1999).

Institutionalization following acute care for stroke

Persons with stroke were at increased likelihood of long-stay hospitalization, but 40% of stroke patients did go home. The latter were mainly patients with few comorbidities/ complications, and the majority did not require previous home care.

Persons with stroke were at increased likelihood of being institutionalized, but up to 40% of stroke patients did go home. These were mainly patients with few comorbidities/complications and the majority did not receive home care prior to the hospitalization event. Most rehabilitation care for stroke is provided in the acute care setting, but is this an ideal environment for providing this service? The increased availability of community rehabilitation programs and supports to care for persons with stroke can increase the proportion of persons going back to their homes.

WRHA intends to develop a stroke program that would specialize in the prevention, early treatment and rehabilitation of these patients. Given the impact of this disorder on reducing level of independence, primary prevention is the key.

Disability from stroke can be superimposed on persons with diminished functional status (60% of oldest old hospitalized for stroke received home care prior to admission). These patients may not be candidates for home discharge because they require an increased level of nursing care. Comprehensive assessment of disability should be made as soon as the patient's medical status has been stabilized. At this time, interventions being provided to the patient should be evaluated and matched to the care environment that can best provide that service.

Cognitive impairment and transfer to PCH

In comparison to the other risk factors for not being discharged home, persons with cognitive impairment were the least likely to go home following a long-stay. The hospital setting may contribute to anxiety and confusion of persons with cognitive impairment. Cognitive impairment is a risk factor for delirium, a complication which can contribute to a patient's deterioration. Risk factors for delirium include vision impairment, severe illness, metabolic and electrolyte imbalance, the use of psychoactive medications and infections. Not infrequently, these factors are the outcomes of care delivered in the hospital setting. Programs to recognize and manage risk factors for delirium can help to reduce its incidence or duration (Inouye et al. 1999).

PEG tube and transfer to another institution

PEG tubes offer an alternative to nasogastric tubes. For patients with dysphagic stroke, PEG tubes have been found to be superior to nasogastric tubes in terms of mortality, missed feeds, nutrition, and eventual discharge home (Mayo, Gloutney and Levy, 1994). Persons with PEG tubes were more likely to be transferred to another institution, such as a chronic care hospital. Most nursing homes will not accept patients with PEG tubes because these patients often have multiple health problems. It is recommended that criteria be developed for PEG tube insertion to assess the need for the PEG tube in the first place. Similar to cases of severe stroke, earlier assessment of patients with PEG tubes will facilitate discharge to a chronic care facility where their care needs can be more appropriately managed.

Discharge year and transfer to PCH

Patients discharged from hospital in 1999 and 2000 were more likely to go to a PCH than those in years prior. The opening of 194 interim PCH beds in 1999, plus the implementation of policies to reduce the length of time for panelling and placement were contributing factors.

Our analyses indicate that persons discharged prior to 1999 were less likely, and those discharged in 1999 were more likely to be discharged to PCH. The latter may be an artifact of the fact that only the first 3 months of 2000 were included in the analysis. We performed a sensitivity analysis, combining the data for 1999 and 2000; this did not alter the decreased likelihood of PCH admission in years prior to 1999. It is plausible that individuals were entering nursing homes at an increased rate at the end of the study period. Since 1999, the WRHA has implemented a number of changes to enhance the efficiency of the nursing home assessment and placement process. In 1999, 194 interim PCH beds were added to the system subsequent to the conversion of acute care beds in Misericordia Hospital. Further, several policies were implemented to reduce the length of time necessary for panelling and nursing home placement for patients in Winnipeg hospitals.

What happens to persons who are discharged home following a long hospital stay?

A full 40% of persons discharged home had no major adverse event within one year of discharge.

A full 40% of persons discharged home had no major adverse event within one year of discharge. They did not die, were not institutionalized and were not readmitted to hospital. This percentage did not decrease with age. This finding is reassuring, and reinforces our assessment that people discharged home following a long hospitalization were typically much healthier than those not discharged home. A small percentage had mulitple comorbidities, cognitive impairment or functional impairment (the latter as indicated by previous home care use). Even patients discharged home with these risk factors had few other comorbidities.

Thirty percent of patients died within the year, or were institutionalized and one-third were again admitted to hospital from home. This information provides guidance with respect to the planning of resources to prevent institutionalization, hospitalization and perhaps death. As the most common initial event, hospital readmission is an important outcome to prevent because it can lead to another long-stay hospitalization and not returning home. Readmission to hospital occurred, on average, within 100 days following discharge home indicating that deterioration in health status did not occur right away. This finding provides reassurance that long-stay patients were not discharged home prematurely; it also presents timely opportunities for intervention.

A total of 20% of persons discharged home received home care, usually within 2 days following discharge. Home care services can prevent hospitalization or institutionalization. Recognizing that hospital readmission rates were lower, while institutionalization rates were higher with increasing age, home care needs will also be different by age. Services for the younger could be targeted at disease management to prevent hospitalization, while those in the elderly need to focus on disease management and activities of daily living to prevent institutionalization. In addition, some persons may require end of life care. The social characteristics of persons discharged home also provide valuable information to the planning of home care services. Female seniors living alone or those who have low incomes may also require social support.

5.0 CONCLUSIONS

This is one of several reports undertaken by the Manitoba Centre for Health Policy to develop an understanding of why 40% of Winnipeg acute hospital beds are occupied by patients with very long hospital stays. This report details the outcomes of persons with long hospital lengths of stay, defined as hospitalizations for 30 days or longer. We observed that half of long-stay patients returned home. Even a substantial proportion of those with risk factors for not being discharged home did in fact eventually go home. Exploration of the types of supports needed by long-stay patients who return home are needed for the planning of community-based services. Our findings regarding the determinants of discharge outcomes and one year outcomes following home discharge provide some indication of the type of support services these patients might require. Our findings also point to opportunities to improve discharge outcomes.

The most consistent predictor of not going home was use of home care. Given that < 50% of seniors previously managed on home care went home, programs to prevent or reverse functional declines during hospitalization and promote independent living in elderly patients are recommended. Assessment before 60 days would identify candidates for discharge even in the presence of other risks.

1. The most consistent predictor of not going home was previous use of home care. We recommend this as a marker of functional status which can be easily obtained at time of hospital admission. Given that at most, half of the seniors previously managed on home care went home following a long-stay hospitalization and few of these patients had been hospitalized for less than 90 days, programs to prevent or reverse functional declines during hospitalization and promote independent living in elderly patients are recommended. These types of programs, which focus on rehabilitation therapy, are normally characteristic of geriatric units. Implementing these types of programs, as was achieved when the Geriatric Unit at the Victoria Hospital was converted to a Medical Rehabilitation Unit in 1998, can increase rates of home discharge. A component of these programs should be earlier assessment of persons hospitalized for 30 days to identify persons ready for home discharge before they experience further decline in functional or cognitive status. Our data suggest that assessment before 60 days would identify candidates suitable for discharge even in the presence of other risk factors.

2. Hospital factors had a significant impact on discharge outcomes. Independent of many factors, including markers of health status, LOS was the strongest determinant of in-hospital mortality. While for many of these patients, their poor health status most likely influences both their long hospital stay and the probability of their death, these results also suggest that continued hospitalization impacts negatively on patient opportunity for home discharge and independent living. Although earlier assessment and home discharge may reduce the likelihood of exposure to iatrogenic illness, patient safety systems are also required to reduce adverse events in the hospital setting.

Long-stay cancer patients require assessment to determine if they are candidates for a hospice program or being supported at home.

3. Persons with neoplasms were twice as likely to die in hospital and less than one third of elderly patients with cancer went home. Many argue that the hospital is not the best place to die and patient preferences for place of death should be respected. Given their high risk of dying in hospital, discharge planning for cancer patients who are near end-of-therapy should consider community-based palliative care. With the recent implementation of a Palliative Care subprogram at WRHA, access to palliative care in the community will be enhanced.

Earlier assessment of patients with severe stroke, cognitive impairment or PEG tube insertion will facilitate discharge to a chronic care facility where their care needs can be more appropriately met.

4. Both stroke and cognitive impairment increased the likelihood of institutionalization. Strategies such as WRHA's planned stroke program to prevent, treat and rehabilitate persons with stroke will increase the options for home discharge. Organized stroke unit care, such as that provided at the Stroke Unit at St. Boniface Hospital, has been shown to reduce the need for dependency and institutional care (Lincoln et al 2000; Stroke Unit Trialists' Collaboration 1997). For persons with severe stroke, cognitive impairment or PEG tube insertion who cannot be managed at home, earlier assessment during hospitalization will facilitate discharge to a chronic care facility where their care needs can be more appropriately met.

5. Further exploration is required into reasons why low-income seniors are less likely to be discharged home after a long-stay hospitalization. This may be a group of patients who lack informal support and do not have the means to pay for formal support services, and could be targeted for home care services post-discharge.

Individuals discharged home following a long hospitalization may benefit from home care to mitigate the chances of being readmitted to hospital.

6. Patients discharged home following a long hospital stay were generally healthy; a small percent had physical, mental or functional impairment (the latter as indicated by previous home care use). Although many of these patients had no adverse event in the subsequent year, a sizeable proportion (60%), were at risk of dying, of being admitted to hospital or of being institutionalized. This suggests that individuals discharged home following a long hospitalization may benefit from being targeted for home care. Services directed at disease management in younger individuals may prevent hospitalization, while those aimed at helping the elderly with activities of daily living may prevent institutionalization. In addition, some persons may require end of life care and/or social support services.

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APPENDIX A

Table A1: Definition of variables

Variable type and description		How defined
Discharge outcomes		
Died in Hospital		As recorded under the separation variable in the hospital abstract record
Discharge to Personal Care Home		Admitted to PCH, as recorded in the PCH file, during hospital stay or within 7 days of discharge
Transfer to Other Institution		As recorded under the transfer variable in the hospital abstract record if no death or admission to PCH
Discharge Home		In the absence of a hospital death, discharge to PCH and transfer to other institution
Prehospital Sociodemographic factors		
Age	18-64 yo, 65-74 yo, 75-84 yo, 85+ yo	Age on admission as recorded in the hospital abstract record
Gender	Male/female	As recorded in the hospital abstract record
Living arrangements	Living alone/not living alone	Using marital status in the Manitoba Health registry, patients who were recorded as being married or living with children were classified as "not living alone"; all others were classified as "living alone".
Residence location prior to admission	Winnipeg/non-Winnipeg	Classified according to postal code address
Neighbourhood Income	Income quintile (rural and urban combined)	Average household income data by enumeration area, as provided by the 1996 Canadian census, were used to rank neighbourhoods into five income quintiles.
Prehospital health status		
Prior hospital admissions	Number in year prior to long-stay	Record of hospital admission(s) in the hospital abstract file
Prior medications	Number of different prescriptions in year prior to long-stay	Number of prescriptions at the ATC4 level classification recorded in the prescription databases
Prior home care	Home care visit in year prior to long-stay	Record of receipt of home care documented in the home care file
Responsible diagnosis	Infection, neoplasm, disorders of the endocrine, nervous, circulatory, mental, respiratory, genito-urinary, digestive, musculoskeletal systems, injury	Major disease groupings of the ICD9 Classification System

Variable type and desription		How defined
Stroke	Yes/no	Patients with a stroke diagnosis in the first position, indicating most responsible[2]
Cognitive Impairment	Yes/no	Patients with diagnoses for dementia and other cognitive impairment (290.0-290.9, 294.0, 294.1, 294.8, 294.9, 291.1, 291.2, 292.82, 292.83, 331.0, 331.1, 331.3, 331.7, 331.9, 797, 7993) in any of the 16 diagnosis fields on hospital abstract record
Hospital factors		
Comorbidity/ complications	No comorbidities, some comorbidities (1-3), multiple comorbidities (4-11)	Diagnoses of the long-stay admission were classified by the Charlson index which contains 19 categories of comorbidity, using ICD-9-CM diagnosis codes. Each category has an associated weight which is based on the adjusted risk of one-year mortality. For the regressions, patients were either categorized as having no or any comorbidities.
Length of stay	< 60 days, 61-90 days, 91-120 days, > 120 days	As recorded in the hospital abstract
Rehabilitation care	Yes/no	Presence of rehabilitation care in any of the 16 diagnosis fields[2] or the 12 procedure fields[3] in hospital abstract record
Dialysis	Yes/no	Dialysis recorded in any of 16 diagnosis fields or 12 procedure fields in hospital abstract record
PEG tube insertion	Yes/no	PEG tube insertion (Percutaneous Endoscopic Gastrostomy) in any of 12 procedure fields in hospital abstract record
In-hospital fall	Yes/no	Presence of an injurious fall diagnosis in any of the 16 diagnosis fields, and accident location recorded as "hospital."
Geriatric Unit	Yes/no	If primary service code, i.e., the service code where patient spent most days, was geriatric or long-stay unit in hospital abstract record (09, 72, 73, 70, 71; subservice codes; 77, 78-87 (HSC only), 93, 94, 95, 96, 97, 98, 99)
Type of patient	Medical/surgical	Based on the DRG classification of medical and surgical diagnose
Year of discharge	Categorical variable	1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000 (1st 3 months only)
Hospital of stay	Grace, Misericordia, St. Boniface, Victoria, Concordia, Seven Oaks, Health Sciences	From hospital identifier in hospital abstract record, Misercordia hospitalizations excluded after December 1998

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[2] The hospital abstract record has room for 16 diagnosis codes. The code that appears first is the most responsible, that is, the one that contributed the most to the patient's stay in hospital.
[3] The hospital abstract record has room for 12 procedure codes. The code that appears first is the one that is the primary procedure.

APPENDIX B

Table B1: Likelihood of three discharge destinations in comparison to going home, age <65 years

Odds ratio (95% CI)	Discharge to PCH	Hospital death	Transfer to institution
Prehospital factors			
Sociodemographics			
Male gender (vs female)			1.14 [1.04-1.26]
Not in Winnipeg (vs Winnipeg)	0.53 [0.31-0.90]		1.86 [1.65-2.03]
Health status			
Prior home care (vs no home care)	1.34 [1.01-1.77]	1.28 [1.13-1.44]	1.14 [1.00-1.29]
One+ prior hospitalizations (vs none)		1.23 [1.06-1.43]	
Infection (vs none)		2.57 [1.58-4.19]	
Neoplasm (vs other)		2.50 [1.87-3.34]	1.40 [1.05-1.88]
Endocrine disorders (vs none)		0.62 [0.40-0.98]	
Mental disorder (vs other)	0.14 [0.04-0.56]	0.03 [0.005-0.13]	0.20 [0.11-0.34]
Nervous system disorder (vs other)	4.65 [2.18-9.89]	2.46 [1.38-4.39]	2.53 [1.69-3.78]
Circulatory disease (vs other)			1.55 [1.10-2.20]
Respiratory disease (vs none)		1.67 [1.12-2.49]	
Digestive disease (vs other)			0.68 [0.48-0.97]
Genitourinary disorder (vs none)	3.50 [1.21-10.2]		
Musculoskeletal disorders (vs none)			1.87 [1.22-2.85]
Injury & poisoning (vs other)			2.23 [1.74-2.85]
Stroke diagnosis (vs other)	1.94 [1.01-3.73]		2.19 [1.70-2.82]
Dementia diagnosis (vs none)	9.68 [4.29-21.9]	5.06 [1.98-13.0]	2.72 [1.56-4.76]
Hospital factors			
Surgical patient (vs medical)	0.60 [0.46-0.80]	0.80 [0.72-0.89]	
Stay on geriatric unit (vs not)		1.96 [1.47-2.61]	
Rehab therapy (vs none)	0.62 [0.40-0.95]	0.32 [0.21-0.47]	
LOS > 120 days (vs 60 days or less)	8.28 [5.52-12.4]	1.54 [1.14-2.08]	1.63 [1.25-2.13]
LOS 91-120 days (vs 60 days or less)		1.65 [1.23-2.21]	
LOS 61-90 days (vs 60 days or less)		0.78 [0.62-0.99]	
Multiple comorbidity (4+) (vs none)		3.48 [2.91-4.15]	1.27 [1.04-1.55]
Some comorbidity (1-3) (vs none)		1.17 [1.00-1.36]	
Discharged in 1993 (vs 2000)		0.70 [0.50-0.99]	0.67 [0.49-0.93]
Discharged in 1997 (vs 2000)			0.72 [0.56-0.93]
Discharged in 1998 (vs 2000)			1.30 [1.03-1.63]
Discharged in 1999 (vs 2000)			1.57 [1.25-1.96]

Table B2: Likelihood of three discharge destinations in comparison to going home, age 65-74 years

Odds ratio (95% CI)	Discharge to PCH	Hospital death	Transfer to institution
Prehospital factors			
Sociodemographics	1.27 [1.08-1.48]		1.12 [1.01-1.23]
Living alone (vs not)		0.86 [0.73-1.00]	1.90 [1.68-2.15]
Not in Winnipeg (vs Winnipeg)			
Health status			
Prior home care (vs no home care)	1.55 [1.31-1.83]	1.13 [1.02-1.25]	
One+ prior hospitalizations (vs none)		1.16 [1.01-1.33]	
Neoplasm (vs other)		2.21 [1.71-2.85]	
Endocrine disorders (vs none)		0.62 [0.40-0.98]	
Mental disorder (vs other)		0.43 [0.21-0.85]	0.50 [0.27-0.92]
Nervous system disorder (vs other)	2.08 [1.21-3.57]		2.26 [1.49-3.42]
Circulatory disease (vs other)		1.34 [1.02-1.75]	
Respiratory disease (vs none)		1.43 [1.05-1.94]	
Digestive disease (vs other)		1.67 [1.20-2.32]	
Musculoskeletal disorders (vs none)		0.50 [0.27-0.93]	
Injury & poisoning (vs other)		0.52 [0.34-0.78]	
Stroke diagnosis (vs other)	1.83 [1.33-2.53]	1.29 [1.05-1.58]	2.17 [1.78-2.63]
Dementia diagnosis (vs none)	2.42 [1.65-3.56]		1.63 [1.12-2.38]
Hospital factors			
Surgical patient (vs medical)	0.60 [0.50-0.71]	0.76 [0.69-0.83]	
Stay on geriatric unit (vs not)	0.75 [0.58-0.99]	0.84 [0.71-0.99]	0.58 [0.46-0.73]
Dialysis treatment (vs none)	0.60 [0.36-1.00]		0.71 [0.54-0.94]
PEG tube (vs none)		1.36 [1.08-1.71]	1.34 [1.07-1.68]
Rehab therapy (vs none)		0.43 [0.35-0.53]	
LOS > 120 days (vs 60 days or less)	6.65 [5.10-8.67]	1.85 [1.44-2.37]	1.50 [1.15-1.97]
LOS 91-120 days (vs 60 days or less)	1.69 [1.24-2.31]		
LOS 61-90 days (vs 60 days or less)	0.71 [0.54-0.92]		
Multiple comorbidity (4+) (vs none)		2.68 [2.28-3.14]	
Some comorbidity (1-3) (vs none)	1.33 [1.04-1.69]	0.84 [0.74-0.96]	
Discharged in 1993 (vs 2000)		0.67 [0.50-0.91]	
Discharged in 1994 (vs 2000)		0.74 [0.58-0.95]	
Discharged in 1995 (vs 2000)	0.53 [0.33-0.84]		0.75 [0.57-0.97]

Table B3: Likelihood of three discharge destinations in comparison to going home, age 75-84 years

Odds ratio (95% CI)	Discharge to PCH	Hospital death	Transfer to institution
Prehospital factors			
Sociodemographics			
Male gender (vs female)		1.10 [1.03-1.18]	1.12 [1.04-1.21]
Lowest income (vs highest)	1.18 [1.01-1.37]		
Next lowest income (vs highest)	0.83 [0.69-1.00]		
Not in Winnipeg (vs Winnipeg)			1.88 [1.68-2.11]
Health status			
Prior home care (vs no home care)	1.48 [1.34-1.62]	1.21 [1.13-1.30]	1.14 [1.05-1.23]
Infections (vs none)	0.26 [0.08-0.83]		0.46 [0.22-0.95]
Neoplasm (vs other)		2.18 [1.78-2.67]	1.38 [1.06-1.79]
Mental disorder (vs other)		0.55 [0.33-0.89]	
Nervous system disorder (vs other)	3.05 [2.08-4.46]		1.51 [1.02-2.23]
Circulatory disease (vs other)		1.25 [1.04-1.51]	0.74 [0.58-0.94]
Respiratory disease (vs none)		1.47 [1.20-1.81]	
Digestive disease (vs other)	0.56 [0.32-0.96]		
Genitourinary disease (vs none)		1.53 [1.04-2.25]	
Musculoskeletal disorders (vs none)		0.31 [0.20-0.49]	
Injury & poisoning (vs other)	1.45 [1.07-1.97]	0.53 [0.40-0.69]	1.75 [1.42-2.17]
Stroke diagnosis (vs other)	1.93 [1.59-2.33]	1.23 [1.07-1.41]	1.98 [1.70-2.32]
Dementia diagnosis (vs none)	2.75 [2.16-3.50]		1.40 [1.06-1.84]
Hospital factors			
Surgical patient (vs medical)	0.84 [0.75-0.93]	0.89 [0.83-0.96]	
Stay on geriatric unit (vs not)	0.79 [0.68-0.91]	0.78 [0.70-0.87]	0.70 [0.60-0.81]
Rehab therapy (vs none)	0.61 [0.53-0.69]	0.48 [0.43-0.55]	0.66 [0.58-0.75]
Dialysis treatment (vs none)	0.65 [0.43-0.98]		
LOS > 120 days (vs 60 days or less)	7.16 [6.05-8.46]	1.65 [1.38-1.98]	1.96 [1.61-2.39]
LOS 91-120 days (vs 60 days or less)	1.87 [1.56-2.25]	1.36 [1.14-1.63]	
LOS 61-90 days (vs 60 days or less)	0.65 [0.55-0.76]	0.87 [0.75-0.99]	0.75 [0.64-0.88]
PEG tube (vs none)		1.46 [1.19-1.79]	1.41 [1.13-1.75]
In-hospital fall (vs none)	1.25 [1.01-1.55]	1.67 [1.38-2.03]	1.38 [1.05-1.81]
Multiple comorbidity (4+) (vs none)	0.73 [0.56-0.95]	2.21[1.94-2.51]	
Some comorbidity (1-3) (vs none)		0.90 [0.82-0.98]	
Discharged in 1995 (vs 2000)	0.58 [0.46-0.74]		.0.78 [0.64-0.95]
Discharged in 1997 (vs 2000)	0.69 [0.55-0.88]		
Discharged in 1999 (vs 2000)	1.60 [1.30-1.98]		1.24 [1.03-1.50]

Table B4: Likelihood of three discharge destinations in comparison to going home, age 85+ years

Odds ratio (95% CI)	Discharge to PCH	Hospital death	Transfer to institution
Prehospital factors			
Sociodemographics			
Male gender (vs female)		1.20 [1.10-1.30]	
Lowest income (vs highest)	1.23 [1.07-1.42]		
Second lowest income (vs highest)	1.31 [1.08-1.58]		
Middle income (vs highest)	0.73 [0.61-0.88]		
Not in Winnipeg (vs Winnipeg)			1.72 [1.42-2.09]
Health status			
Prior home care (vs no home care)	1.40 [1.27-1.54]	1.22 [1.12-1.33]	1.12 [1.02-1.24]
Neoplasm (vs other)		2.12 [1.60-2.80]	1.93 [1.32-2.82]
Mental disorder (vs other)	2.33 [1.49-3.63]		1.97 [1.14-3.39]
Nervous system disorder (vs other)	1.72 [1.08-2.75]	1.59 [1.01-2.50]	
Circulatory disease (vs other)		1.71 [1.39-2.10]	
Respiratory disease (vs none)	0.60 [0.43-0.84]		
Digestive disease (vs other)			0.58 [0.36-0.94]
Genitourinary disease (vs none)			0.37 [0.15-0.86]
Musculoskeletal disorders (vs none)		0.36 [0.24-0.55]	0.64 [0.41-0.99]
Injury & poisoning (vs other)		0.57 [0.43-0.75]	2.05 [1.58-2.67]
Stroke diagnosis (vs other)	1.54 1.29-1.86]		1.78 1.46-2.16]
Dementia diagnosis (vs none)	1.51 [1.20-1.90]		
Hospital factors			
Surgical patient (vs medical)	0.89 [0.80-0.99]	0.86 [0.77-0.95]	
Stay on geriatric unit (vs not)	0.68 [0.60-0.79]	0.70 [0.62-0.79]	0.62 [0.53-0.73]
Rehab therapy (vs none)	0.66 [0.58-0.75]	0.49 [0.43-0.57]	0.70 [0.60-0.82]
LOS > 120 days (vs 60 days or less)	7.00 [5.78-8.48]	2.88 [2.34-3.55]	2.13 [1.67-2.72]
LOS 91-120 days (vs 60 days or less)	2.05 [1.70-2.47]		1.59 [1.27-2.01]
LOS 61-90 days (vs 60 days or less)	0.61 [0.52-0.71]	0.80 [0.68-0.94]	0.62 [0.51-0.75]
PEG tube (vs none)		1.91 [1.35-2.70]	
In-hospital fall (vs none)		1.59 [1.30-1.94]	1.33 [1.05-1.68]
Multiple comorbidity (4+) (vs none)	0.68 [0.49-0.94]	2.24 [1.83-2.73]	
Some comorbidity (1-3) (vs none)		0.82 [0.72-0.93]	
Discharged in 1994 (vs 2000)	0.78 [0.62-0.97]		
Discharged in 1995 (vs 2000)	0.77 [0.62-0.96]		
Discharged in 1996 (vs 2000)	0.58 [0.46-0.72]		0.75 [0.59-0.96]
Discharged in 1997 (vs 2000)	0.78 [0.61-0.99]		0.62 [0.47-0.83]
Discharged in 1998 (vs 2000)			0.75 [0.59-0.97]
Discharged in 1999 (vs 2000)	1.73 [1.40-2.14]		1.43 [1.14-1.79]