Long-Stay Patients in Winnipeg Acute Care Hospitals

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

Carolyn DeCoster, RN, MBA
Anita Kozyrskyj, BSc (Pharm), PhD

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EXECUTIVE SUMMARY

This study explores the use of Winnipeg acute care hospitals by long-stay patients, that is, patients who stay in hospital for more than 30 days. The objectives of the study were to describe hospital use over time by long-stay patients, with consideration of the changes in the hospital and nursing home bed supply in Winnipeg, and to identify characteristics of and risk factors for long-stay patients.

Previous research at the Manitoba Centre for Health Policy and Evaluation (MCHPE) has consistently documented that long-stay patients use a considerable proportion of acute care hospital resources. This may be an inappropriate use of acute care resources, for example, when patients could be discharged to an alternate level of care, but the alternative is either not available or difficult to access. Both patients and hospitals are disadvantaged in this situation: patients, because they are not receiving optimum care, and may in fact suffer detrimental effects by being hospitalized; and hospitals, because their resources are not available for other, more appropriately hospitalized 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 and Evaluation (MCHPE), as part of its contract with Manitoba Health. This topic was of particular concern to the Winnipeg Regional Health Authority. WRHA is involved in providing the continuum of services for patients with long term care needs, and therefore has concerns about the appropriateness of care for long-stay patients.

Working Group

A Working Group was formed to provide advice with respect to the substantive issues concerning long-stay patients. The Working Group helped to delineate historical and ongoing changes to the Winnipeg hospital system, and provided useful context about "how things work." They assisted with the interpretation of results, reviewed this report, and gave much useful feedback.

Population, Data and Variables

The population of interest was all adult long-stay patients with a medical or surgical diagnosis, in Winnipeg acute care hospitals between 1991/92 and 1997/98. "Long-stay" was defined as a stay of more than 30 days; patients who stayed in hospital 30 days or less were excluded. 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 patient's most responsible diagnosis, that is, the one that accounted for the largest portion of the patient's stay, as coded in the hospital abstract. 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, for example patients in personal care home beds in Concordia. The seven hospitals were: Health Sciences Centre, St. Boniface, Grace, Misericordia, Victoria, Concordia, and Seven Oaks.

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, personal care home (PCH), 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 separation (i.e. discharge, transfer or death); up to 16 diagnoses; up to 12 procedures; and up to six services/sub-services (e.g., medicine, surgery, intensive care, panelled for PCH.)

The literature on hospital long-stay patients indicated that a variety of factors—socio-demographic, illness, and system—were related to long lengths of stay. In addition, the Working Group suggested specific characteristics that were of interest. Characteristics that were supported by the literature or the Working Group, and were also available in the data for analysis were:

- *Sociodemographic*: age at the time of separation from hospital, gender, neighbourhood income level, living alone, living at home pre-admission, living in Winnipeg;
- *Illness*: major diagnostic group, major procedure group (for surgical patients), cognitive impairment, comorbidity, inhospital fall, and for patients who went to a PCH or chronic care facility, level of care;

- *Treatment*: rehabilitation care, ventilatory support, dialysis, and PEG tube (Percutaneous Endoscopic Gastrostomy) insertion;
- *Health care system*: hospital of stay, stay in a geriatric unit, and destination at separation.

Methods and Findings

Historical Patterns

Trends in the use of acute care beds for long-stay patients were analyzed from 1991/92 to 1997/98. We chose this time period so that we could look at hospitalizations before, during and after big changes in the hospital and nursing home bed supply. Most of the Winnipeg hospital bed closures occurred in 1992/93 and 1993/94, with a total of 515 beds closed. Large changes in the PCH bed supply occurred in 1993/94 and 1997/98 with net increases of 236 and 193 beds, respectively. Usage over time was assessed using standardized rates of long-stay separations and days per 1000 population, as well as an in-year analysis of long-stay patients and days.

From 1991/92 until 1997/98 inclusive, about half a million adult inpatients separated from Winnipeg's seven acute care hospitals. Of these, more than 32,000 had stays of more than 30 days. After excluding patients whose most responsible diagnosis was obstetric or psychiatric, and patients in designated long term care beds within the acute care hospitals, there were 22,749 separations for analysis from 1991/92 to 1997/98.

Changes in the bed supply occasioned a dip in the annual proportion of hospital days devoted to long-stay patients from 37.9% in 1991/92 to 35.2% in 1993/94. However, the proportion soon rebounded and stayed at approximately 39% from 1995/96 to 1997/98. The proportion of patients who were long-stay in any given year was constant at about 5% throughout, from 1991/92 to 1997/98. These findings suggest that adding PCH beds only temporarily reduces the hospital population of long-stay patients.

With hospital restructuring, the rate of long-stay days per 1000 Manitobans fell more than the rate of long-stay separations, because there was a decrease in the mean length of stay for these patients. Mean length of stay (LOS) dropped by about one-sixth between 1991/92 and

1995/96, and then remained at about 80 days for the latter three years of the study period. The median length of stay, however, did not change but stayed at around 53 days since 1991/92.

Characteristics and predictors of long-stay patients

The characteristics of long-stay patients were analyzed using five years of data, 1993/94 to 1997/98. First, we estimated the proportion of long-stay patients and the proportion of bed-days they consumed according to the different characteristics described previously (see page 2). Looking at the impact of various characteristics another way, we calculated the mean length of stay for patients with the characteristic in question. Next, we performed multivariate linear regression to estimate which factors had the greatest impact on length of stay. Regression estimates the independent impact of the various characteristics on length of stay, as well as exploring the impact of interactions between characteristics.

All persons entering a personal care home or chronic care facility must have their application approved by a review panel. Separate regression models were used to explore the characteristics that increased post-panel length of stay for patients who were discharged to a personal care home or chronic care facility. In addition to the variables described above, measures of PCH characteristics were included, such as whether it was an ethnoreligious home, and whether it was for-profit or not-for-profit.

From April 1, 1993 until March 31, 1998, there were 10,037 long-stay hospitalizations for medical diagnoses and 5,934 long-stay hospitalizations for surgical diagnoses. These patients consumed over 1.3 million days: 837,264 and 500,789 days for medical and surgical diagnoses respectively. What characteristics are associated with the longest stays?

- Adjusting for disease, treatment and system factors, sociodemographic characteristics of the patients contributed very little.
- Fewer than 10% of long-stay days in Winnipeg hospitals were used by non-Winnipeggers, and being a non-Winnipeg resident did not predict a longer stay.
- Many long-stay days, 35%, were used by patients who were eventually discharged home. Patients discharged to PCH used 31% of days, patients who died, 20%, and the rest were for patients transferred to another hospital, usually Deer Lodge or Riverview.

- The single largest determinant of length of stay, independent of other factors, was discharge destination. Discharge to a PCH increased length of stay by 173% and 89% for medical and surgical patients, respectively, compared to patients discharged home.
- Not surprisingly, specific disease conditions were associated with extended lengths of stay. Nervous system (including stroke diagnoses), mental disorder, circulatory, musculoskeletal, and respiratory or digestive system conditions accounted for three-fourths of the medical long-stay days, and two-thirds of the surgical long-stay days.
- Long-stay patients with a stroke diagnosis had a significantly longer stay than those without stroke. The impact of stroke was increased depending on several other characteristics, for example, whether the patient had rehabilitation therapy, stayed on a geriatric unit, or was assessed as requiring chronic care.
- Independent of disease factors, an inhospital fall was associated with an extended length of stay of 26% and 45% for medical and surgical patients, respectively.
- Cognitive impairment increased length of stay by 16% for both medical and surgical patients.
- The Working Group identified certain treatment characteristics as being associated with prolonged hospital care: rehabilitation therapy, dialysis, PEG tube insertion or ventilatory support. Patients requiring these services did not consume the majority of long-stay bed-days but, as anticipated, patients who needed these therapies had significantly longer lengths of stay than those who did not. Long-stay medical patients requiring dialysis stayed 6% longer, rehabilitation 12% longer, and a PEG tube 32% longer. For surgical patients, if they required ventilatory support they could be expected to stay 5% longer, rehabilitation 13% longer, and a PEG tube 25% longer.
- The hospital of stay made a big difference to the length of stay for patients discharged to PCH. The shortest-to-longest difference was 35% for medical and 43% for surgical patients. For patients discharged home, hospital of stay had less impact; the shortest-to-longest difference was 11% and 15% for medical and surgical patients, respectively.
- There were 1600 long-stay patients who were transferred to a nursing home or chronic care facility. Just over half of their stay was spent pre-panelling and the rest waiting for transfer. Longer post-panel stays were associated with a stay on a geriatric unit and going to an ethnoreligious personal care home.

Conclusions

1. Not all long-stay patients are candidates for PCH placement—a large number of them return home. Patients who went home had an average length of stay of about 60 days, and one wonders if this could be shortened. Exploration of the kinds of supports that are needed by long-stay patients who return home might be useful in planning for community-based services. Our findings on patient disease and treatment characteristics associated with long lengths of stay provide some guidance on the type of support services needed, but this is an area requiring further study.

2. The single largest determinant of length of stay, independent of other factors, was discharge destination. The shortest length of stay, approximately 60 days, was observed in patients who were discharged home. Patients who died in hospital were hospitalized for 77 and 95 days for medical and surgical, respectively. Patients awaiting transfer to another hospital, (usually Deer Lodge or Riverview) were hospitalized for 81 days. And those awaiting placement in a PCH were hospitalized for 159 and 208 days for medical and surgical, respectively. WRHA has adopted a variety of tactics to shorten the application and panelling process and to improve the use of hospital resources. This study should be repeated at the end of 2001/02 to assess the effect of these changes.

3. The considerable variation in length of stay between hospitals suggests that there is still room for improved efficiency. For patients discharged home, the spread between hospitals was quite narrow, with a difference between shortest- and longest-stay hospital of 11% and 15% for medical and surgical patients respectively. However, the spread between hospitals was much wider for medical patients discharged to PCH, 35% for medical patients and 43% for surgical. WRHA might want to investigate these differences further.

4. Given the impact of stroke on length of stay, WRHA's plans to develop a stroke unit that would specialize in the prevention, early treatment and rehabilitation of these patients should be supported.

5. Both cognitive impairment and having an injurious fall increased the length of stay; these may be interrelated. They are associated with some of the same risk factors, for example, visual impairment and being on psychoactive medications. Furthermore, somebody who suffers from a cognitive deficit may not be aware of their own physical deficits and therefore be at higher risk of falling. Or, patients who suffered an injurious fall may be in hospital longer and consequently exposed to more of the factors associated with cognitive disturbances. Therefore, interventions aimed at reducing the incidence of one may help to reduce the incidence of the other as well.

   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; however, incorporating them into general medical units that treat elderly patients with acute care needs may improve outcomes in the elderly without incurring additional costs to the hospital. Winnipeg hospitals have been incorporating such changes bit-by-bit, and should continue.

6. Therapies like PEG tube insertion and dialysis were found to contribute significantly to a longer hospital stay. Both of these therapies may indicate individuals who are too unstable to be discharged from an acute care hospital. Invasive therapies like these may prolong life but compromise any opportunity for independence. Patients, families and health care providers should consider these implications in deciding whether to undergo these therapies.

7. It is not surprising that patients who require rehabilitation therapy would stay in hospital longer. The availability of more rehabilitation services offered sooner and in an appropriate environment may help patients to be discharged sooner at a higher functional level.

8. The need for chronic care was associated with a longer post-panel length of stay. In the fall of 1999, there were 35 patients waiting for one of 120 chronic care beds in Winnipeg. At the same time there were 240 patients waiting for placement in one of 5,000 PCH beds. A re-evaluation of the need for chronic care beds in Winnipeg may be necessary; possibly some resources for acute or personal care home beds should be redirected to chronic care.

9. Sociodemographic characteristics were not significant factors in lengthening the hospital stay for long-stay patients.

1.0 INTRODUCTION

Research undertaken by the Manitoba Centre for Health Policy and Evaluation (MCHPE) has found that long-stay patients use a considerable proportion of acute care hospital resources. The use of acute care hospital beds by long-stay patients may be inappropriate, both from the point of view of the patient and the hospital. Often this is portrayed as a recent phenomenon because of health-care funding cutbacks and bed closures in the early- to mid-nineties. The following sentence encapsulates the concern; it might be surprising to readers that this excerpt is from a paper published in 1980:

> Across North America concern has been expressed about the so-called "back-up" of geriatric patients in acute hospitals, focusing on those who have recovered from the acute stage of illness, but for whom prompt transfer is not made to rehabilitation facilities, chronic care institutions or home care programs. This concern has been heightened by the anticipated growth in the absolute number of the elderly and their increasing proportion of the total population (Shapiro, Roos and Kavanaugh, 1980).

Black, Roos and Burchill (1993) reported that about 4% of 1991/92 separations from Winnipeg hospitals were for long-stay patients (defined there as 60 days or more), consuming about 49% of the hospital days. However, this study did include some beds in chronic care facilities; in contrast, Brownell, Roos and Burchill (1999) documented the use of Winnipeg *acute* hospital beds from 1989 to 1996. They found that, although hospital days used per 1000 Winnipeg residents declined by 23% in that time period, the proportion of hospital days consumed by long-stay patients stayed remarkably stable at around 44%.

An additional finding by Black et al., (1995) was that Winnipeg and non-Winnipeg residents had very different hospital use patterns; although non-Winnipeg residents used 37% more short-stay hospital days, Winnipeg residents used 79% more long-stay hospital days, a pattern that was surprising even to those who were close to the system. The reason for this difference was not understood, but implied that use of Winnipeg hospitals by long-stay patients could potentially be reduced.

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

its contract with Manitoba Health. This issue was of particular concern to the Winnipeg Regional Health Authority. WRHA is involved in providing the continuum of services for patients with long term care needs, and therefore has concerns about the appropriateness of care for long-stay patients.

1.1 Objectives

The objectives of this study were to analyze Manitoba hospital separation data to:

1. Describe the characteristics of adult medical and surgical patients who stayed in Winnipeg acute care hospitals for more than 30 days, defined as long-stay patients;
2. Analyze the use of Winnipeg acute care hospitals by long-stay patients over time, with consideration of changes in the supply of hospital and nursing home beds in Winnipeg; and
3. Determine if there were identifiable risk factors that were associated with longer stays for patients who were in hospital more than 30 days. Potential risk factors included sociodemographic, diagnostic, treatment, and health care system characteristics.

1.2 Background

Factors associated with hospital long length of stay

A review of the research literature suggests that the factors contributing to long length of stay in hospital can be categorized into three broad areas: patient sociodemographic characteristics, health problems, and system factors.

Sociodemographic characteristics

Long-stay patients were often older, although the definition of "older" varied from over-65 to over-75 (Coid and Crome, 1986; Hertzman et al., 1990; Tatara et al., 1993; Lewis and Purdie, 1988; Cooper, 1991; Falcone, Bolda and Leak, 1991; Styrborn and Thorslund, 1993). However, age alone may not be a predictor in the absence of other social or health problems. Maguire, Taylor and Stout (1986) found an association between increasing age and length of stay, but noted that even among patients aged 85 years or older, 72% were discharged within 28 days. Falcone, Bolda and Leak (1991) found that older people without heavy care needs did not have a delayed discharge. Women tended to be at increased risk for long stay (Coid and Crome, 1986; Hertzman et al., 1990; Tatara et al., 1993; Cooper, 1991; Shapiro, Tate and Tabisz, 1992). This may be related not only to the fact that, on average, women lived longer than men, but also were more likely to suffer adverse social circumstances, such as isolation, poverty, inadequate housing and poor access to transportation.

Conflicting results have been obtained regarding residence prior to hospitalization. Cooper (1991) found that patients who did not live in their own homes prior to hospitalization were more likely to have long-stays in hospital, whereas Coid and Crome (1986) reported that home ownership tended to prolong hospital stay if patients were too ill to live alone, and relatives refused to care for them or sell the patients' homes. Lewis and Purdie (1988) discovered that living alone placed patients at higher risk for a long stay in hospital, while Maguire, Taylor and Stout (1986) found that living arrangements and social supports were not significant predictors of length of stay.

Health problems

Researchers in the United Kingdom (Coid and Crome, 1986; Maguire Taylor and Stout, 1986; Kalra, Smith and Crome, 1993), New Zealand (Lewis and Purdie, 1988), Sweden

(Styrborn and Thorslund, 1993), the United States (Wallace, 1994), and Canada (Hertzman et al., 1990; Mayo et al., 1997) have reported that patients with stroke were more likely to have an extended hospital stay. Mayo, et al. (1997) stated that "stroke patients in Canada spend, on average, twice as many days in acute care hospitals as do stroke patients in many other parts of the world." Similarly Hertzman, Pulcins, Barer et al. (1990) in examining long-stay patients in British Columbia hospitals found that most of the use could be accounted for by only a few diagnoses, including stroke, cognitive impairment, heart disease, and persons awaiting admission elsewhere. Other frequently found diagnoses in long-stay patients include musculoskeletal conditions and dementia (Coid and Crome, 1986; Lewis and Purdie, 1988).

Patients who required heavy levels of care, who needed more help with activities of daily living, such as eating, dressing, walking or bathing, or who were incontinent were also at risk of long hospitalizations (Styrborn and Thorslund, 1993; Falcone, Bolda and Leak, 1991; Cooper, 1991; Maguire, Taylor and Stout, 1986; Rudberg, Sager and Zhang, 1996). In addition, some research found that patients experiencing confusion, disorientation, and sensory disturbance were at risk for extended hospital stay (Falcone, Bolda and Leak 1991; Wallace, 1994; Mayo et al., 1997). However, Shapiro, Tate and Tabisz (1992) reported that level of care, behaviour problems and cognitive impairment did not delay nursing home placement for residents of Winnipeg, when other factors such as choice of home were taken into account. Cognitive impairment may not have been an important distinguishing characteristic in the latter study since a high proportion, 77%, of the study sample were cognitively impaired.

System factors

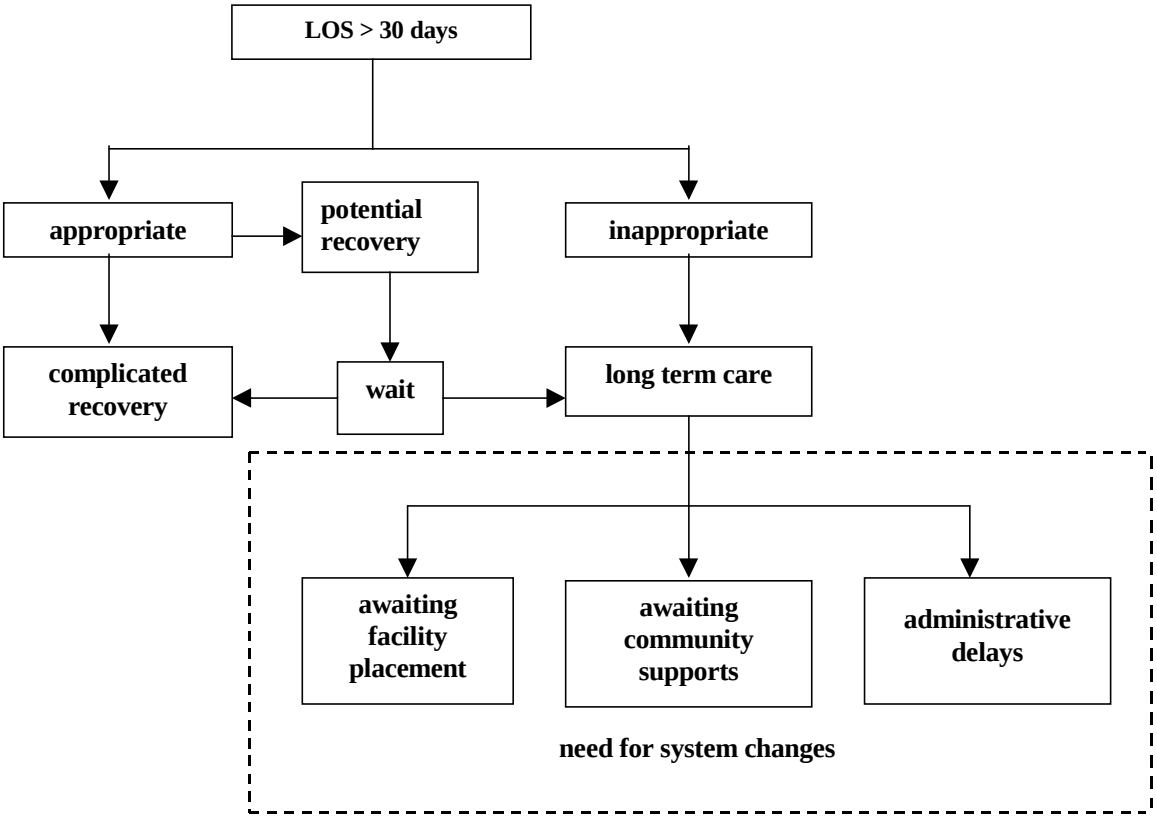
Several system factors have been cited as being responsible for extended hospital stay: delays in paperwork, organizing community supports, securing family support, availability of nursing home beds, and financial considerations, such as poverty, and, in the United States, lack of medical insurance (Coid and Crome 1986; McClaran, Tover-Berglas and Glass, 1991; Tracey, Taylor and McConnell, 1998; Barrett, McDonald and Parfrey, 1994; Rudberg, Sager and Zhang, 1996; Wallace, 1994; Falcone, Bolda and Leak, 1991.)

Inappropriate versus appropriate long stays

An issue that has also been examined is the time spent in acute-care settings when acute care is no longer required (Figure 1). Although some patients do require hospital care for an extended period of time, some patients are in need of an alternate level of care and are awaiting discharge. Such time has variously been referred to as bed-blocking, inappropriate bed-days, and non-medical bed-days (Lewis and Purdie, 1988; Falcone, Bolda and Leak, 1991; Mayo et al., 1997; McClaran, Tover-Berglas and Glass, 1991; Styrborn and Thorslund, 1993; Tracey, Taylor and McConnell, 1998; Barrett, McDonald and Parfrey, 1994). As Hertzman et al. (1990) point out, the conditions accounting for many of the long-stay days are not those for which new technological treatments have been found; thus hospitalization may not be appropriate. They describe the hospital as the "default" facility in Canada—the place where people go to or stay, not because it is the most appropriate for meeting their needs, but because alternatives have not been explored or do not exist.

Coid and Crome (1986) examined the differences between long-stay patients in the UK who still required acute care and those who were staying inappropriately. Inappropriate long-stay patients tended to be older than appropriate long-stay patients, and had greater functional deficits in activities of daily living. Differences in discharge delays were evident between the two groups: whereas among the appropriate long-stay patients clinical problems prevented discharge, for the inappropriately delayed, almost 50% were delayed by social and health system factors.

Figure 1: Routes of appropriate vs. inappropriate long-stay use



Interestingly, a number of other researchers have also identified administrative factors as one of the major reasons for delays in the discharge process for patients no longer requiring acute care. In a review of extended hospital stays in St. John's, Newfoundland, Barrett et al. (1994) reported that at least 21% of avoidable hospital days occurred as a result of delays in discharge planning. Mayo et al. (1997) examined length of stay for stroke patients in Montreal, and concluded that the strongest factors contributing to non-medically necessary stays were system-related rather than patient-related (i.e., hospital factors and discharge destination). Similarly, Tracey, Taylor and McConnell (1998) reported that long delays in discharge planning were responsible for increasing length of stay in Belfast.

Implications of long length of stay in hospital

Detrimental effects of hospital on older patients

The effects of long term hospitalization can be severe, especially among 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 addition, older patients are at increased risk of cognitive dysfunction, mood disorders and malnutrition. These losses can lead to prolonged hospital stay and if there is a failure to restore independence prior to discharge, then patients are at increased risk of death, or placement in a nursing home (Rudberg, Sager and Zhang, 1996; Palmer and Bolla, 1997; Palmer et al., 1994; Potts et al., 1993).

Restoration of independence prior to discharge is hampered by the hospital environment itself, which is geared towards acute, short-stay patients. As Campion, Bang and May (1983) wrote:

> Acute-care hospitals lack areas where patients can congregate for meals or for recreational and social activities. . . . Hospital staff have not been trained to care for the long term needs of the elderly. In the acute-care hospital environment rampant testing and ancillary procedures can result in the 'overmedicalization' of patients and can exacerbate the problem of escalating health-care costs.

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 modifications are characteristic of geriatric units; however, incorporating them into general medical units that treat elderly patients for acute care needs may improve outcomes in the elderly without incurring additional costs to the hospital (Landefeld et al., 1995). In Winnipeg, hospitals are incorporating these features bit-by-bit into active medical units.

Health care system costs

One of the arguments for transferring long-stay patients out of acute care hospitals is that of cost. The theory is that since hospital beds are more costly to operate, transferring patients to an appropriate, less expensive alternative will save money. This may be true on a system-

wide level, but it may not reduce the specific hospital costs, because the marginal cost of long-stay patients is generally lower than the marginal cost for other patients (Hertzman et al., 1990; Hochstein, 1985). Long-stay patients consume few of the diagnostic and other high technology resources in the hospital; if they were all to be discharged and replaced by patients whose acute care needs are more intense, no cost savings would result. On the other hand, if more costly acute care beds were closed and an equivalent number of less costly, long term care beds were opened, then there would be savings to the system.

2.0 METHODS

2.1 Working Group

The members of the Working Group formed to advise on the project were:

- Joyce Davison, PhD, Family Medicine, Winnipeg Hospital Authority[1]
- Netha Dyck, RN, Director, Personal Care Home Program, Winnipeg Community and Long Term Care Authority
- Florence Landygo, Health Records Consultant/Analyst, Manitoba Health
- Jo-Ann Mackenzie, Nursing Director, Geriatrics/Rehabilitation Program Team, Winnipeg Hospital Authority
- Lindsay Nicolle, MD, Medical Director, Medicine Program Team, Winnipeg Hospital Authority
- Phil St. John, MD, Geriatrician, Health Sciences Centre and St. Boniface General Hospital

The Working Group (WG) acted in an advisory capacity with respect to the substantive issues concerning long-stay patients. For instance, one of the questions of interest to the WG was the proportion of long-stay patients residing outside Winnipeg. Other areas of interest were assessing the relationships between long-stay patients and various therapies, e.g., oxygen therapy, dialysis, or PEG tube insertion. The WG helped to delineate historical and ongoing changes to the Winnipeg hospital system, and provided useful context about "how things work." They assisted with the interpretation of results, reviewed this report, and gave much useful feedback.

2.2 Population studied

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 1991/92 and 1997/98. "Long-stay" was defined as a stay of more than 30 days. We focused on adult medical and

[1] In April 1998, two health authorities were established in Winnipeg: the Winnipeg Hospital Authority (WHA) and the Winnipeg Community and Long Term Care Authority (WCA). These two authorities were joined into the Winnipeg Regional Health Authority on December 1, 1999.

surgical patients at the request of the Winnipeg Regional Health Authority, since these patients are the ones who use most of the long-stay 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,[2] 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,[3] St. Boniface, Victoria, Concordia, Seven Oaks, and Health Sciences Centre.

Previous MCHPE reports have used 45 days or 60 days to define long hospital stays. However, a chart-review study conducted by MCHPE using an established utilization review tool found that after 30 days, only 20% of medical patients still needed acute care (DeCoster, Peterson and Kasian, 1996). Moreover, the Working Group felt that 30 days was a more practical definition; by that time, the patient was clearly not a short-stay patient, and it was an appropriate time for alternative treatment options to be considered.

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, Sharp and Cohen, 1991; Roos et al., 1993; Williams and Young, 1997). The hospital file was the main file used for this research; other data files used were the population registry, personal care home 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., medicine, surgery, intensive care, panelled for PCH.)

[2] 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

[3] Misericordia General Hospital became a personal care home as of April 1, 1999; since this study period ended on March 31, 1998, Misericordia was included in the analyses.

2.4 Definition of variables

The literature on hospital long-stay patients indicated that a variety of factors—socio-demographic, illness, and system—were related to long lengths of stay. In addition, the Working Group recommended additional characteristics that were of interest. Characteristics that were supported by the literature or the Working Group, and were also available in the hospital separation data were separated into four groups: sociodemographic, illness, treatment and system.

Sociodemographic

Sociodemographic factors included *age* at the time of separation from hospital, *gender*, living arrangements, Winnipeg/non-Winnipeg residence, type of residence prior to admission, and neighbourhood income level. *Living arrangements* were determined 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." Postal code information was used to determine if the patient was a *Winnipeg resident* or not. The hospital file indicates if a patient was transferred from another facility, such as a hospital or nursing home; this information was used to determine *type of residence prior to admission*. Patients who were not coded as coming from another hospital or nursing home were assumed to be admitted from home. Five *neighbourhood income levels*, or quintiles, were assigned using average household income data by enumeration area, as provided by the 1996 Canadian census. The income level of the neighbourhood in which the patient resided was determined by postal code information in the population registry.

Illness

Patients were classified into a *major diagnostic group* depending on the most responsible diagnosis, that is, the one that contributed the most to the patient's stay in hospital. Diagnostic groups are organized by body systems, for example, musculoskeletal, circulatory, and so on. Surgical patients were additionally categorized into a *major procedure group*, also organized by body system.

A patient was determined to have a *cognitive impairment* if there was a relevant ICD-9-CM code in any of the 16 diagnosis fields.[4] A *comorbidity* is a concurrent medical condition that is not the cause of the patient's admission to hospital, but may contribute to the outcome of care. We used the Charlson index to assess the presence of comorbidities; the index contains nineteen categories of comorbidity using ICD-9-CM diagnosis codes (Charlson et al., 1987). The occurrence of an *inhospital fall* was determined by the presence of an injurious fall diagnosis code in any of the 16 diagnosis fields, with accident location recorded as "hospital." For patients who were transferred to a nursing home or to a chronic care facility, the PCH file was used to determine the *level of care* at the time of transfer. The PCH file contains six possible levels of care, including respite care and chronic care.

Treatment

Certain treatment factors that were available in the hospital file were thought to potentially influence length of stay. These included *rehabilitation care*, *ventilatory support*, *dialysis*, and *PEG tube* (Percutaneous Endoscopic Gastrostomy) insertion. The Working Group thought that oxygen therapy would have an impact on length of stay, but this information was unavailable in our data.

System

Factors related to the health care system itself that potentially had an impact on length of stay were hospital of stay, geriatric unit, and destination at separation. *Hospital of stay* refers to one of the seven Winnipeg acute care hospitals: Grace, Misericordia, St. Boniface, Victoria, Concordia, Seven Oaks, or Health Sciences Centre. If the primary service code was that of a geriatric or long-stay unit, the patient was coded as being on a *geriatric unit*.[5] Separation transfer codes were used to classify *destination at separation* into four categories: home, nursing home, another hospital, or died.

[4] These were: 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

[5] Some of the characteristics identified are likely to be undercoded or miscoded in the abstract. Cognitive impairment, and rehabilitation are likely undercoded. Geriatric units are possibly miscoded, since that service code is sometimes applied to units where patients are awaiting placement rather than receiving active geriatric services (See Limitations, page 48).

2.5 Procedures

Long length of stay: historical patterns

The use of acute care beds for long-stay adult patients was analyzed from 1991/92 to 1997/98. We chose this time period so that we could look at hospitalizations before, during and after big changes in the hospital and nursing home bed supply. Also, these dates preceded changes related to the regionalization of the Winnipeg hospital system. Most of the Winnipeg hospital bed closures occurred in 1992/93 and 1993/94, with a total of 515 beds closed. Major changes in the personal care home bed supply occurred in 1993/94 and 1997/98, with net increases of 236 and 193 beds, respectively.

Hospital use rates

Long-stay separations and days per 1000 adult population were calculated; all rates were directly adjusted to the 1992 population. Average length of stay for long-stay patients was also calculated.

Allocation of in-year resources

Separation data become available when the patient leaves the hospital, by discharge, death or transfer. With long-stay patients, separation data can distort actual usage. The fiscal year spans April 1 to March 31, for example, April 1, 1993 until March 31, 1994. If a patient stays in a hospital from, say, March 15, 1993 until April 20, 1994, there will be no record of that patient's stay in the 1993/94 data. It will be recorded only at discharge, on April 20, 1994, yielding one separation and a length of stay of 401 days in the 1994/95 data. Because of this potential for distortion, we calculated "in-year" usage, that is, attributing the number of long-stay patients and days to the fiscal year in which they actually occurred.

Characteristics and predictors of long-stay patients

The characteristics of long-stay patients were analyzed using the most recent five years of data (1993/94 to 1997/98); for this part of the analysis, patients who stayed 30 days or less were excluded. We conducted both univariate and multivariate analyses.

First, we conducted a univariate analysis, that is, we looked at the distribution of long-stay patients and bed-days according to each of the different characteristics individually, as

described previously (see Definition of Variables, page 19). We also calculated the mean length of stay for patients with the characteristic in question. For example, one characteristic was *age*. We looked at all long-stay days, and estimated the proportion used by patients aged 18 to 44, 45 to 64, 65 to 74, 75 to 84, and 85 or older. We also looked at average length of stay for long-stay patients in each of those age categories.

The proportion of hospital bed-days attributed to patients with particular characteristics does not distinguish between use by many patients with shorter stays, or by a few individuals with much longer stays. Also, describing long stays in terms of each individual characteristic ignores the fact that each patient has a number of characteristics acting simultaneously. Nor do we know if some factors are related to one another. For instance, the effects of stroke on length of stay could vary with the patient's need for and response to rehabilitation therapy. Or, the impact of living alone on length of stay could be greater for patients who are discharged home than for patients discharged to a nursing home.

To untangle these effects, and to determine which factors have the greatest impact on length of stay in long-stay patients, a multivariate linear regression analysis was conducted. Regression sorts out the independent effects of each characteristic, after taking into account the effect of all other characteristics. It also explores the impact of interactions between characteristics. The sociodemographic, illness, treatment and system factors were converted to dichotomous variables and regressed on the outcome variable of length of stay. The definitions for each of the explanatory variables that were used in the regression equation are in Appendix A. It was necessary to log-transform the outcome variable, length of stay, to achieve a normal distribution since the data were skewed to the right.

It is important to remember that only long-stay patients were included in the multiple linear regression. We did not try to determine factors that might differentiate between long-stay patients and short-stay patients. We felt that such a comparison would be biased because:

(a) we would be comparing very different types of patients with different types of characteristics, for example, somebody having uncomplicated abdominal surgery versus

somebody who was admitted for the same type of surgery but then suffered a severe stroke as a complication, who had a PEG tube and was eventually admitted to a PCH; and

(b) some characteristics are not relevant to short-stay patients but are important in long-stay patients.

Stages of hospitalization for long-stay patients discharged to a long term care facility

We conducted further analyses on long-stay patients who were discharged either to a personal care home or to a chronic care facility. In order for patients to enter these facilities, they must be *panelled*, that is, be assessed by a review panel as having needs that require care in either a personal care home or chronic care facility. We assumed that hospital days after panelling were for non-acute care. Therefore, for these patients, we calculated the proportion of their stay that occurred before and after panelling.

First we looked at the mean length of stay from admission to panelling, and then from panelling to discharge. We also searched for any *non-acute* codes, that is, service, sub-service or V-codes[6] that would indicate that the patient was no longer acute, such as alternate level of care, or stay on a non-acute unit such as personal care unit, geriatrics or long term care.[7] In the subset of patients for whom non-acute care codes were recorded, the mean lengths of stay from admission to date of non-acute care, and from date of non-acute care to panelling were also determined.

Determinants of LOS from panel date to discharge, defined as PCH/chronic waiting time, were identified from multivariate regression modelling. In addition to the sociodemographic, illness, treatment and system factors, characteristics of PCHs such as ethnoreligious and proprietary status, i.e., for-profit or not-for-profit, were also considered.

[6] V-codes are diagnostic codes that indicate the patient is in hospital for other than a medical reason: V604, no other household member able to render care; V605, holiday relief care; V632, person awaiting admission to adequate facility elsewhere; V638, other specified reasons for unavailability of medical facilities.

[7] These include primary service codes: 09, 72, 73, 70, 71; subservice codes; 77, 78-87 (HSC only), 93, 94, 95, 96, 97, 98, 99.

3.0 RESULTS

3.1 Long length of stay: historical patterns

From 1991/92 until 1997/98 inclusive, about half a million adult inpatients separated from Winnipeg's seven acute care hospitals. Of these, 32,000 had stays of more than 30 days. After excluding patients whose most responsible diagnosis, i.e., the one that accounts for most of the patient's stay, was obstetric or psychiatric, and patients in designated long term care beds within the acute care hospitals, there were 22,749 separations for analysis from 1991/92 to 1997/98.

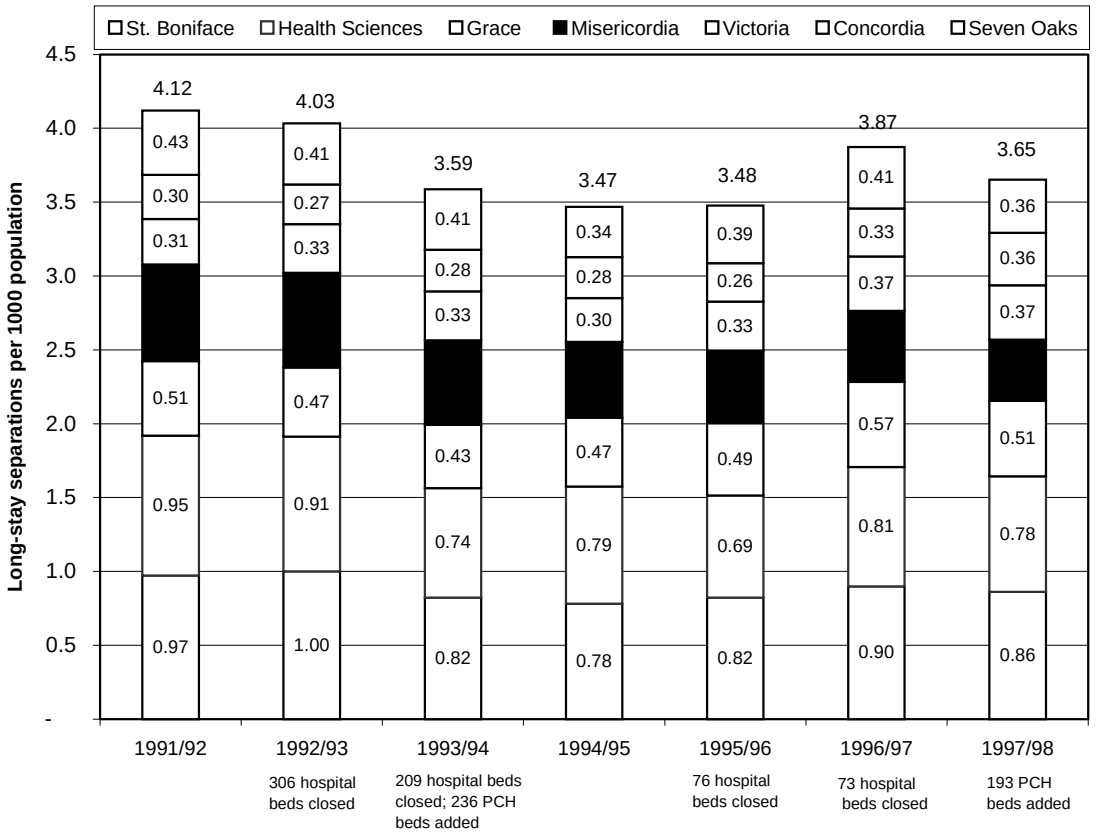
Rates

Figure 2 illustrates the rate of long-stay medical and surgical separations per 1000 population; the chart also indicates when there were large changes in the Winnipeg hospital and PCH bed supply. Over the seven-year period, there were 727 fewer acute hospital beds,[8] and 462 more personal care home beds. The biggest changes were in 1992/93 and 1993/94 with the closure of 515 hospital beds and the addition of 236 PCH beds. These changes were followed by a 15% decrease in the rate of long-stay separations from 4.1 per 1000 in 1991/92, to 3.5 in both 1994/95 and 1995/96. In 1995/96 and 1996/97, 149 more hospital beds closed. Paradoxically, in 1996/97 the long-stay separation rate increased to 3.9, near 1991/92 levels. It dropped to 3.7 in 1997/98, when 193 new nursing home beds opened.

Most of the hospital bed closures occurred in the teaching hospitals (St. Boniface and Health Sciences), and, not surprisingly, long-stay separation rates decreased more at the teaching hospitals. Long-stay separation rates fell 18% between 1991/92 and 1994/95 at the teaching hospitals, whereas they declined 14% at the community hospitals. (1994/95 was used as the comparison year since it followed the biggest changes in the hospital and PCH bed supply.) By 1997/98, the long-stay separation rate increased by 4% and 6%, relative to 1994/95 for teaching and community hospitals, respectively.

[8] Of the 727 acute care beds closed, 69 were paediatric.

Figure 2: Long-stay medical-surgical separations
1991/92 to 1997/98, directly standardized to 1992 population



The rate of long-stay days per 1000 population showed more dramatic changes (Figure 3). The rate fell 30.3% from 405.0 in 1991/92 to 282.3 in 1994/95, and stayed near that level through 1997/98. Again there was a difference between teaching and community hospitals. From 1991/92 to 1994/95, the rate of long-stay days per 1000 population fell 44% at the teaching hospitals, and 17% at the community hospitals. The rate then stabilized at the community hospitals, but increased 13% at the teaching hospitals between 1994/95 and 1997/98.

Average length of stay

Since the separation rate increased over the last three years but the days per 1000 stayed nearly the same, it follows that the average length of stay per long-stay patient decreased. For both medical and surgical long-stay patients, the average length of stay declined over time (Table 1). For medical patients it fell steadily from a high of 98.7 in 1991/92 to 81.0

days in 1997/98, a decrease of 18%; for surgical patients, the decrease was 16%, from 96.0 days in 1991/92 to 80.9 days in 1997/98.

Figure 3: Long-stay medical-surgical days

1991/92 to 1997/98, directly standardized to 1992 population

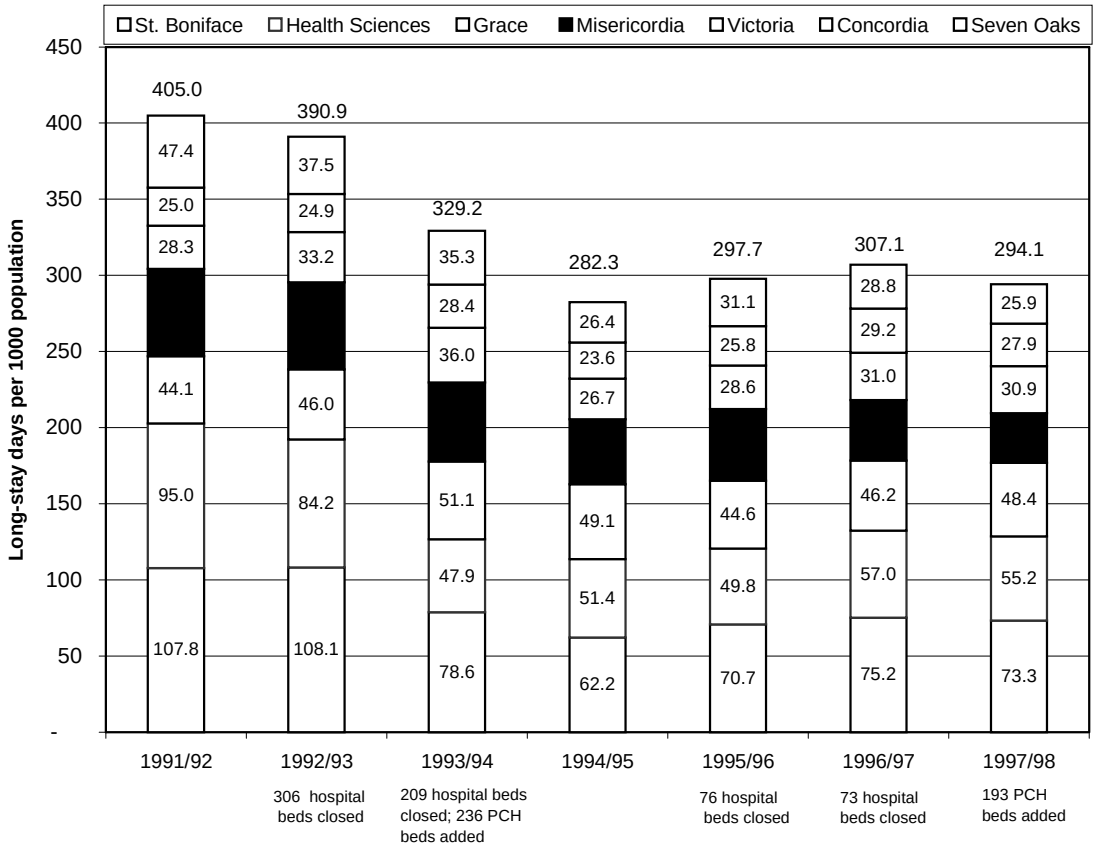


Table 1: Mean length of stay for long-stay medical and surgical patients in Winnipeg acute care hospitals, 1991/92 to 1997/98

	91/92	92/93	93/94	94/95	95/96	96/97	97/98	Change
Medical	98.7	94.4	85.8	84.6	82.6	79.4	81.0	- 18.0%
Surgical	96.0	95.9	93.8	83.0	82.4	82.3	80.9	-15.7%

Because the mean length of stay can be influenced by outliers, we also looked at the median length of stay (Table 2). The median is the mid-point, the point by which half the long-stay patients were discharged. For instance, in 1991/92, half the long-stay medical patients in Winnipeg acute care hospitals were discharged by 56 days, and half stayed longer than 56 days. The medians changed very little over time for both medical and surgical long-stay patients.

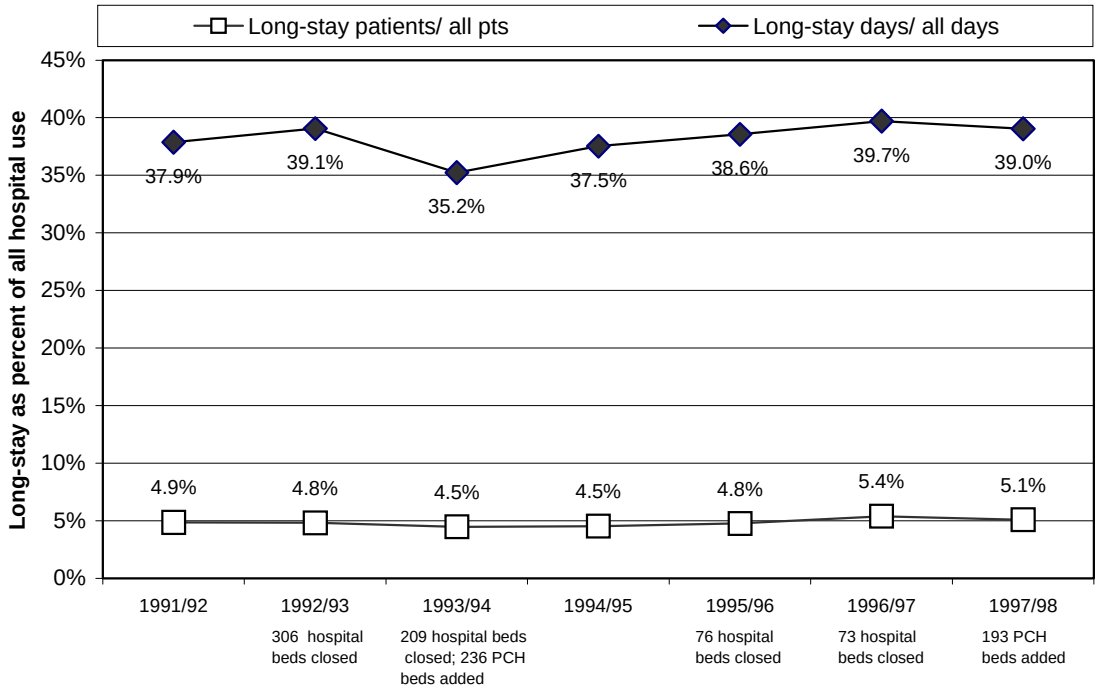
Table 2: Median length of stay for long-stay medical and surgical patients in Winnipeg acute care hospitals, 1991/92 to 1997/98

	91/92	92/93	93/94	94/95	95/96	96/97	97/98
Medical	56.0	54.0	55.0	53.0	56.0	52.0	55.0
Surgical	51.0	50.5	52.0	51.0	51.0	54.0	54.0

In-year analysis

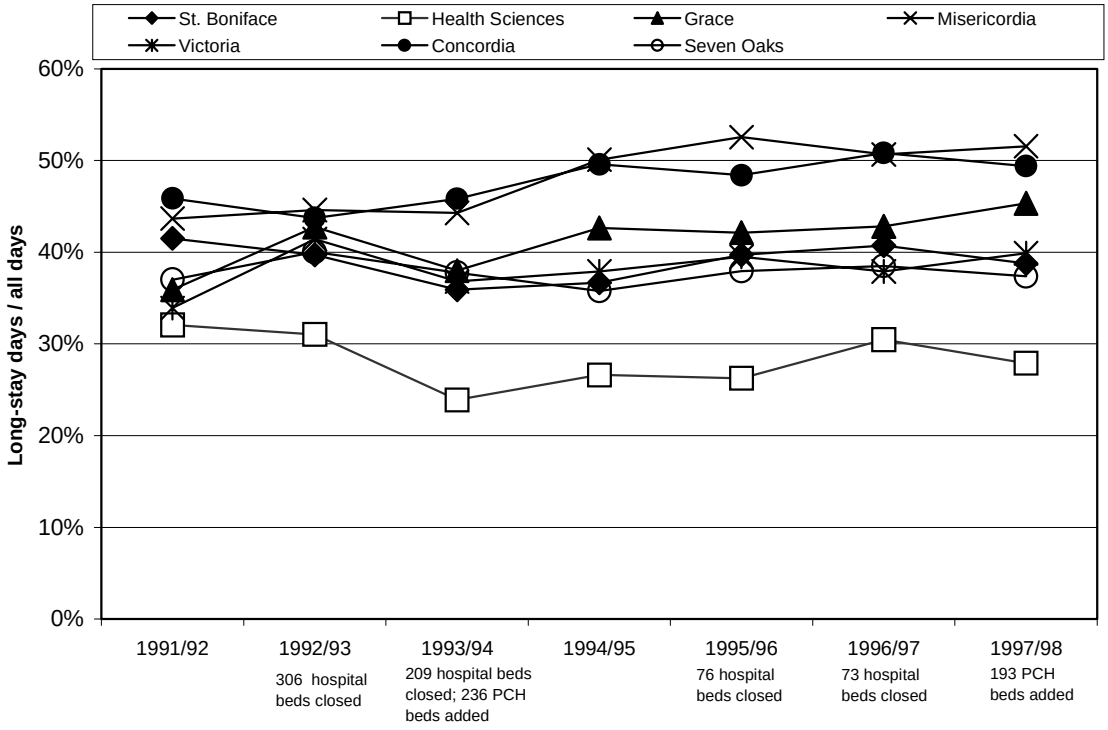
Recall that we next allocated long-stay patients and days to the fiscal year in which they occurred, since separation data attribute all patients and days to the year of discharge. We called this the in-year analysis. Figure 4 shows the percentage of long-stay patients and days in Winnipeg acute care hospitals in each year. The proportion of long-stay patients was approximately 5% for the entire period. The proportion of hospital days that they consumed fell from 39.1% in 1992/93 to 35.2% in 1993/94, as hospital beds closed and PCH beds opened, and increased gradually up to around 39% thereafter. It is interesting that despite changes in total available resources, the proportion of patients and days that are long-stay has remained quite stable.

Figure 4: In-year long-stay patients and days
1991/92 to 1997/98, Winnipeg acute care hospitals



When each hospital was analyzed separately, there was a tendency for the proportion of in-year days to diverge over time (Figure 5). In 1991/92, proportions ranged from 32.1% to 45.9%, a difference of 13.8%; in 1997/98, the range was 27.9% to 51.6%, for a difference of 23.7%. The proportion of long-stay days decreased at one hospital (Health Sciences), stayed relatively constant at three (Seven Oaks, Concordia, St. Boniface), and increased for three (Grace, Misericordia and Victoria). This pattern was due mainly to long-stay days for patients with a medical diagnosis; the spread for surgical diagnoses was tighter throughout (data not shown).

Figure 5: Medical-surgical long-stay days
1991/92 to 1997/98, as a percent of all in-year days



Winnipeg vs. Non-Winnipeg residents

To what extent were Winnipeg hospital resources used by long-stay patients who did not live in Winnipeg? In general, very little. For medical diagnoses, the proportion of long-stay days (in-year calculation) that were consumed by non-Winnipeg residents ranged from a high of 6.3% in 1991/92 to a low of 4.8% in 1997/98 (Table 3). Not unexpectedly, for surgical

diagnoses, the proportion was higher, ranging from 12.5% in 1992/93 to 16.6% in 1995/96. Both teaching hospitals tended to have higher proportions of non-Winnipeg long-stay days, which probably reflects referral patterns and more complex levels of care. However, this pattern is more pronounced for Health Sciences Centre: from 10.0% to 20.3% of long-stay medical days, and from 24.9% to 33.8% of long-stay surgical days at HSC were used by non-Winnipeg residents.

Table 3: Proportion of long-stay days used by Winnipeg and non-Winnipeg residents, 1990/91 to 1997/98

	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Medical Diagnoses							
Winnipeg residents	93.7%	94.4%	94.7%	94.0%	94.6%	94.1%	95.2%
Non-Winnipeg residents	6.3%	5.6%	5.3%	6.0%	5.4%	5.9%	4.8%
Surgical Diagnoses							
Winnipeg residents	84.6%	87.5%	85.9%	86.8%	83.4%	85.8%	86.0%
Non-Winnipeg residents	15.4%	12.5%	14.1%	13.2%	16.6%	14.2%	14.0%

3.2 Characteristics associated with long-stay days

From April 1, 1993 until March 31, 1998, there were 10,037 long-stay hospitalizations for medical diagnoses and 5,934 long-stay hospitalizations for surgical diagnoses in Winnipeg acute care hospitals. These patients consumed over 1.3 million days: 837,264 and 500,789 days for medical and surgical diagnoses, respectively.

Univariate analyses

Distributions of characteristics of interest

As described, the distribution of bed-days used by long-stay medical and surgical patients was estimated for each characteristic separately, as well as the mean length of stay associated with patients having each characteristic. Only a few of the more interesting findings will be described here: diagnosis, hospital of stay and discharge destination. We focus on long-stay days, rather than patients, because days are a better representation of resource consumption. The distribution of long-stay patients followed the same pattern as that of long-stay days.

The types of diagnoses that accounted for the majority of long-stay days differed somewhat between medical and surgical patients. For medical patients, the top five categories were nervous system (including stroke), mental disorder, respiratory, circulatory and musculoskeletal. Together, these five diagnostic groups accounted for 75% of the long-stay days used (Figure 6). For surgical patients, the top five diagnostic categories were musculoskeletal, nervous system, circulatory, mental disorder and digestive, accounting for 68% of the days used (Figure 7).

Figure 6: Percent of long-stay medical days by major diagnostic categories, 1993/94 to 1997/98

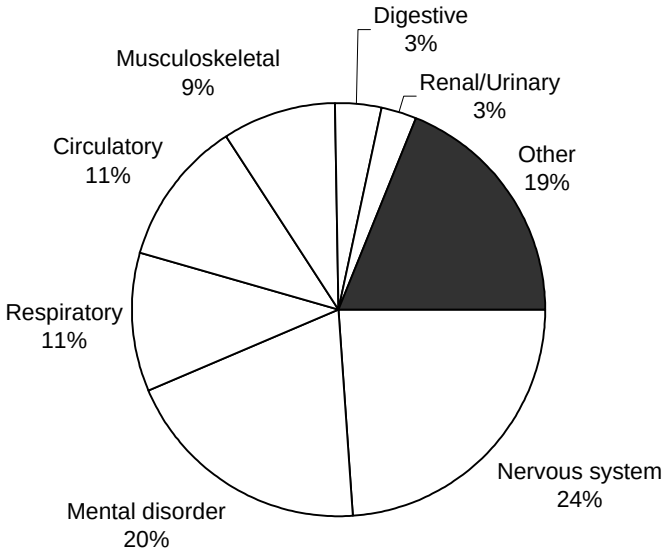
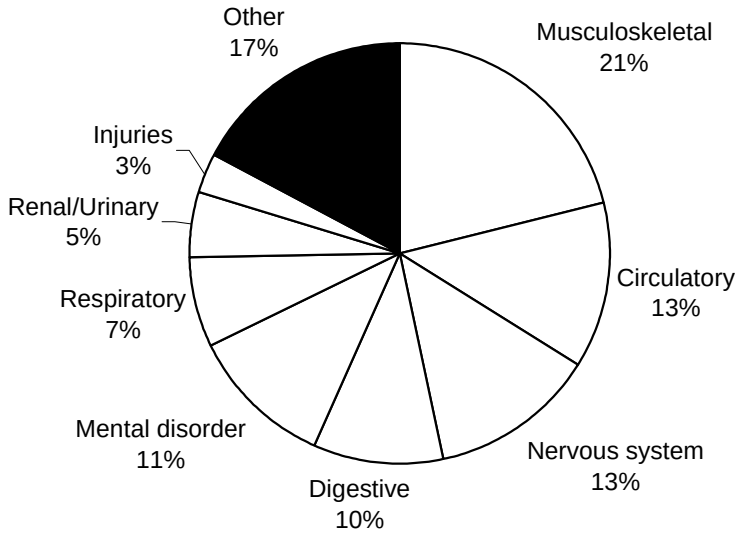


Figure 7: Percent of long-stay surgical days by major diagnostic categories, 1993/94 to 1997/98



The distribution of bed-days among the seven Winnipeg hospitals was somewhat different between medical and surgical, with the teaching hospitals (St. Boniface and Health Sciences Centre) having over half (53%) of the surgical bed-days, while the medical bed-days were somewhat more evenly distributed among all hospitals (Figures 8 and 9).

For surgical patients, patients who did eventually go home (Figure 10) consumed most of the bed-days (41%). For medical patients, the highest proportion of bed-days were consumed by patients who went to a nursing home (36%),[9] but almost one-third (31%) were for patients who went home. For both medical and surgical diagnoses, about one-fifth of the long-stay bed-days were used by patients who died. The "transfer to other hospital" category might seem quite high; most of the patients who were transferred to another hospital were transferred to a chronic care facility such as Deer Lodge or Riverview.

[9] Transfers to nursing homes included both admissions and readmissions.

Figure 8: Percent of long-stay medical days by hospital of stay, 1993/94 to 1997/98

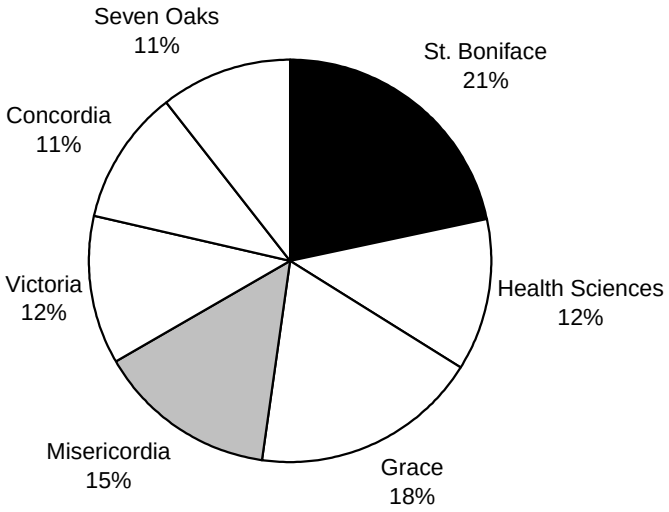


Figure 9: Percent of long-stay surgical days by hospital of stay, 1993/94 to 1997/98

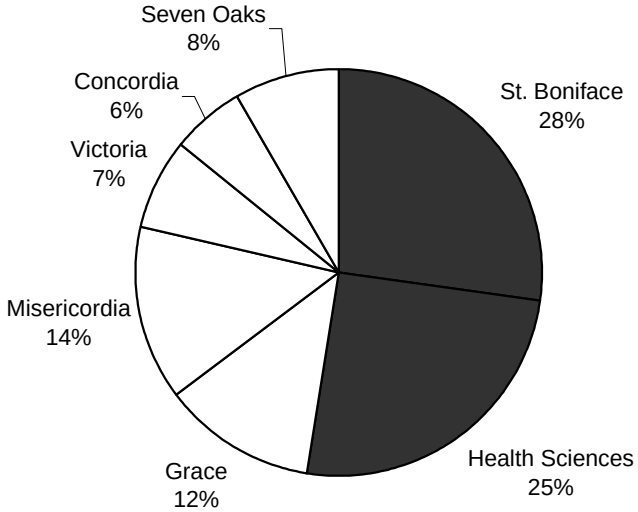
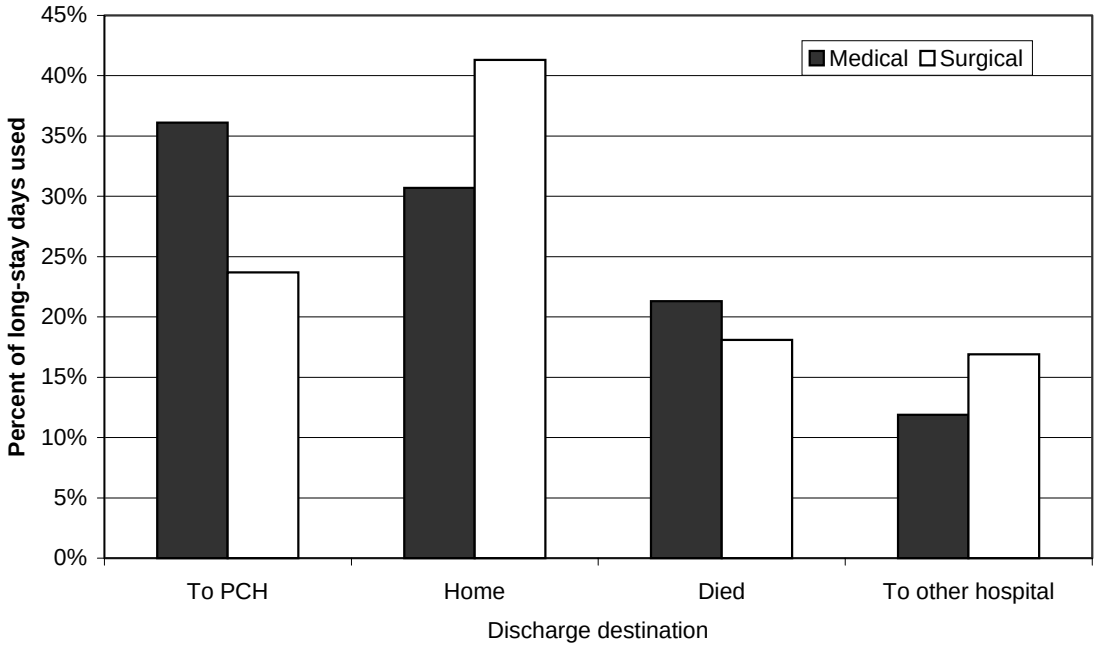


Figure 10: Percent of long-stay days by discharge destination, 1993/94 to 1997/98



Mean lengths of stay

Table 4 shows the mean length of stay (LOS) for individuals with or without the characteristic of interest. In this table, characteristics were dichotomized, or grouped into two categories, as described in Appendix A. We will only discuss differences of five days or more; if the difference is less than five days, we considered them to be equivalent.

Table 4: Mean length of stay in long-stay hospitalizations by diagnosis type and risk factors, Winnipeg acute care hospitals, Manitoba residents, 1993/94 to 1997/98

	Mean LOS	
	Medical	**Surgical**
Sociodemographic		
Age		
75 + years old	90.7	93.7
< 75 years old	67.7	75.0
Gender		
Female	84.4	88.4
Male	81.9	79.5
Living alone		
Yes	86.3	92.7
No	79.3	74.7
Residence prior to hospitalization		
Home	84.0	85.2
PCH/hospital	78.0	80.6
Neighbourhood income quintiles		
High	93.5	91.8
Low	71.7	76.3
Residence location prior to hospitalization		
Winnipeg	85.0	90.0
Non-Winnipeg	62.6	61.2
Illness		
Stroke diagnosis		
Yes	98.5	115.7
No	81.1	83.3
Multiple comorbidity		
Yes	85.5	85.9
No	80.0	82.1
Cognitive impairment		
Yes	136.9	213.2
No	76.1	80.3
Level of care on admission to PCH		
Level 1	192.9	156.0
Level 2	166.1	236.4
Level 3	170.6	257.5
Level 4	182.2	225.6
Level 6	172.8	229.1
Occurrence of inhospital falls		
Yes	145.9	183.2
No	81.6	80.0

Table 4, Cont'd	Mean LOS Medical	Mean LOS Surgical
Rehabilitation care		
Yes	86.7	100.3
No	83.0	81.9
Dialysis treatment		
Yes	64.9	86.6
No	83.8	84.3
PEG tube		
Yes	119.7	109.4
No	82.7	83.0
Ventilatory support		
Yes	71.6	81.3
No	83.8	84.9
System		
Hospital		
St. Boniface	82.8	91.5
Health Sciences Centre	65.5	71.2
Grace	97.8	94.6
Misericordia	84.0	92.0
Victoria	90.4	90.2
Concordia	89.3	91.1
Seven Oaks	77.0	77.0
Hospitalized in geriatric/long term care unit		
Yes	99.2	136.0
No	79.5	77.0
Destination at separation		
PCH	158.6	208.3
Hospital	81.3	81.1
Died	77.1	94.9
Home	56.0	61.5

Sociodemographic characteristics: Among long-stay patients with medical diagnoses, mean LOS was longer for patients aged 75 years or older, living alone, living in Winnipeg, and from the three highest neighbourhood income quintiles. Mean LOS was slightly longer for patients who lived at home prior to hospitalization compared to those who were transferred from another facility. For patients with a surgical diagnosis, the pattern is similar with the addition of a longer mean LOS for females compared to males.

Disease characteristics: Patients with a stroke diagnosis, cognitive impairment, or an inhospital fall had longer mean stays than those without; the differences were more striking for patients with a surgical than medical diagnosis. Patients who were admitted to a nursing home or chronic care facility had long lengths of stay, and, other than Level 1 Care, there was little difference between levels of care. The presence of comorbidities made little difference to LOS.

Treatment characteristics: Long-stay patients with surgical diagnoses had longer stays if they required rehabilitation therapy or a PEG tube. Patients with medical diagnoses also had a longer stay if they needed a PEG tube. For surgical patients who received ventilatory support or dialysis, the mean lengths of stay were similar. For medical patients, stays were about 20 days *shorter* for patients who received dialysis and about 10 days shorter for patients who received ventilatory support, compared to those who did not receive these therapies.

System characteristics: The mean LOS was shortest for Health Sciences Centre and Seven Oaks and longest at Grace Hospital; this was true for both surgical and medical diagnoses, although the LOS was more dispersed for patients with medical diagnoses. As one would expect, patients who were in a geriatric unit had longer LOS. Patients who went home had the shortest mean LOS, 56.0 days for medical patients and 61.5 days for surgical patients; patients who went to PCH stayed the longest, at 158.6 and 208.3 days for medical and surgical patients, respectively.

Analyzing more than one variable

The mean length of stay for patients with or without various characteristics is useful to gauge the effect of each characteristic, and we can make judgement calls about how big a difference might be clinically relevant. However, patients do not have just one characteristic at a time. In order to obtain more information about the independent effects of each characteristic, and interactions between characteristics, we used multivariate linear regression. In linear regression, the impact of each variable on length of stay can be estimated, independent of the impact of every other variable. Regression also explores the impact of interactions between characteristics.

The models that best predicted length of stay are in Appendix B. Table 5 lists the variables that were found in the regression to have a statistically significant impact on length of stay. Overall, these variables explained 37% of the variation in hospital length of stay for medical patients, and 35% of the variation in length of stay for surgical patients. While these proportions are substantial, they indicate that over 60% of the variation in length of stay is not explained by our model.

The regression equation is somewhat difficult to interpret because the outcome variable, length of stay, had to be log-transformed. Furthermore, there was a difference in the impact of some characteristics for patients going home compared with patients going to a PCH. Table 5 therefore summarizes the findings of the regression equations for medical and surgical patients separately. Most of the findings are similar to the patterns seen in Table 4, that is, most of the factors that were associated with a longer mean length of stay in the univariate analysis were also found to have a significant impact in the regression model. Differences between the two analyses are indicated with a †.

Table 5: Factors significantly associated with increased length of stay for long-stay patients

Medical patients	Surgical patients
Sociodemographic: • Gender: Male† • Age: <75 for discharge home†, 75+ for discharge to PCH • High income neighbourhood • Lived alone: alone for discharge home; not alone for discharge to PCH† • Admitted from home • Lived in Winnipeg	Sociodemographic: • Gender: female for discharge home; male for discharge to PCH† • Age: less than 75 years† • Lived alone • Admitted from home • Lived in Winnipeg*
Disease: • Stroke diagnosis* • Cognitive impairment • Inhospital fall	Disease: • Stroke diagnosis* • Cognitive impairment • Inhospital fall
Treatment: • Dialysis†* • Rehabilitation • PEG tube	Treatment: • Dialysis* • Ventilatory support† • Rehabilitation • PEG tube
System: • Hospital of stay: Victoria or Grace for discharge home; Grace or Concordia for discharge to PCH • geriatric unit stay*	System: • Hospital of stay: Grace for discharge home; Concordia or St. Boniface for discharge to PCH • Geriatric unit stay

† opposite direction from mean length-of-stay analysis (Table 4)

* greater impact on persons discharged to PCH than those who went home

The regression model found that male gender predicted a longer length of stay for both surgical and medical patients discharged to a PCH and for medical patients discharged home. This finding is opposite to the mean length-of-stay (MLOS) analysis, as is the finding for age: in the regression, younger age was associated with a longer stay (except for medical patients going to PCH), whereas in the MLOS analysis, older patients stayed longer. These findings of the regression model suggest that although the mean length of stay is longer for females and for patients older than age 75, there are probably other contributory factors, such as illness or treatment. Patients who lived alone were likely to have a longer stay, except in the case of medical patients going to PCH. Patients who were admitted from home and who

lived in Winnipeg were also likely to have a longer stay. However, as will be seen following, sociodemographic factors had a minor impact on length of stay.

Disease factors that were associated with a longer length of stay were the same for medical and surgical patients: the presence of a stroke, the presence of cognitive impairment, and having an inhospital fall. The impact of a stroke was greater for patients going to a PCH compared to patients going home.

For both medical and surgical patients, dialysis, rehabilitation therapy, and PEG tube insertion were associated with longer lengths of stay, and for surgical patients, ventilatory support as well. That these treatments are associated with longer stays is not surprising since they would indicate patients with greater care requirements. The effect of dialysis for medical patients was opposite to the direction found in the mean length of stay analysis.

The regression found some hospitals were associated with a longer stay than others, and these differed depending on discharge destination. This finding is discussed in more detail in *Impact of discharge destination* on page 44.

Impact of characteristics on length of stay for long-stay patients

The shortest LOS was observed among surgical and medical patients discharged home. Using the LOS for persons discharged home as the referent point, the relative contribution of individual characteristics or risk factors, independent of the other characteristics, is shown in Figures 11 and 12. Figures 11 and 12 were developed because the regression equations were lengthy and somewhat difficult to interpret due to the log form of the outcome variable, LOS (See appendix B). The horizontal bars represent the characteristics that had a statistically significant impact on length of stay, *after controlling for all other characteristics*, i.e., they show the impact of each factor independently of each other.

The values in Figures 11 and 12 are predicted from the regression models:

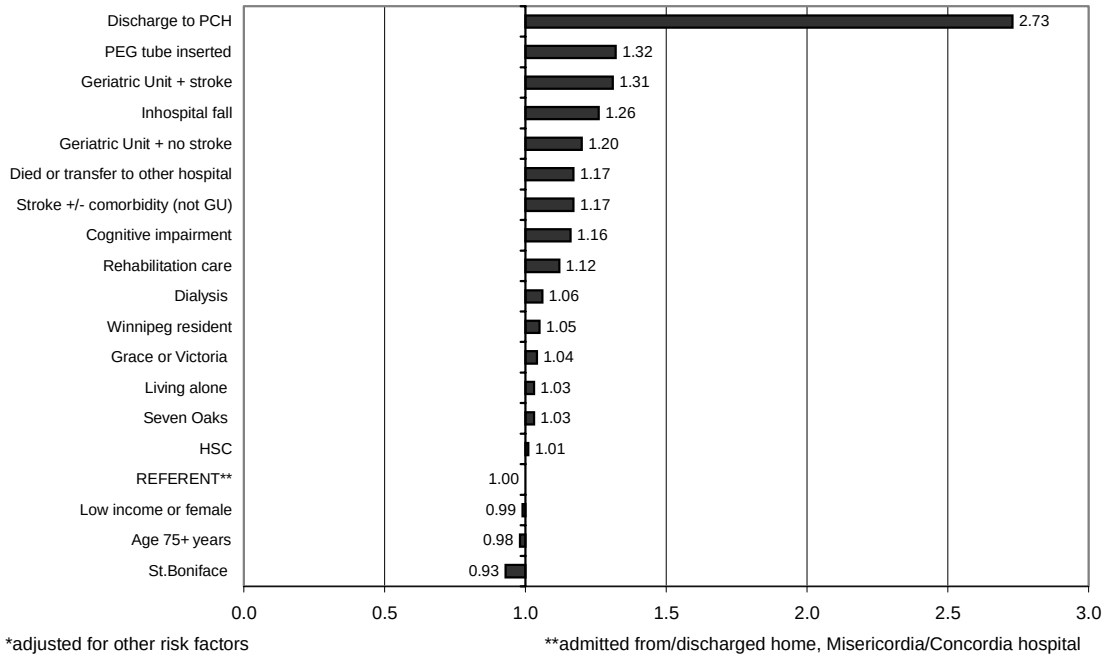
$$\frac{\text{predicted mean length of stay for patients } \textit{with} \text{ the characteristic}}{\text{predicted mean length of stay for patients } \textit{without} \text{ the characteristic}}$$

Each horizontal bar can be interpreted as: "patients with that characteristic stayed *x times as long as* patients without that characteristic." One can express these results as a ratio or as a percentage.

The referent category for medical long-stay patients is the group of patients that were admitted from and discharged home, and stayed at Misericordia or Concordia Hospital.[10] The referent category was given a value of "1" (or 100%), and the other horizontal bars show LOS in relation to the referent value. Values above 1 indicate that the risk factor increased LOS, and values less than 1 indicate that the risk factor decreased LOS. For instance, patients aged 75 years or older stayed 0.98 times as long (or 2% shorter) as patients younger than 75; patients with cognitive impairment stayed 1.16 times as long (or 16% longer) as patients without cognitive impairment.

[10] Misericordia was chosen as the referent hospital since it was already slated to be converted into a PCH. Concordia was found to be not statistically different from Misericordia, and so became part of the referent category.

Figure 11: Relative length of stay* for patients with different characteristics
Long-stay medical patients, Winnipeg acute hospitals, 1993/94 to 1997/98



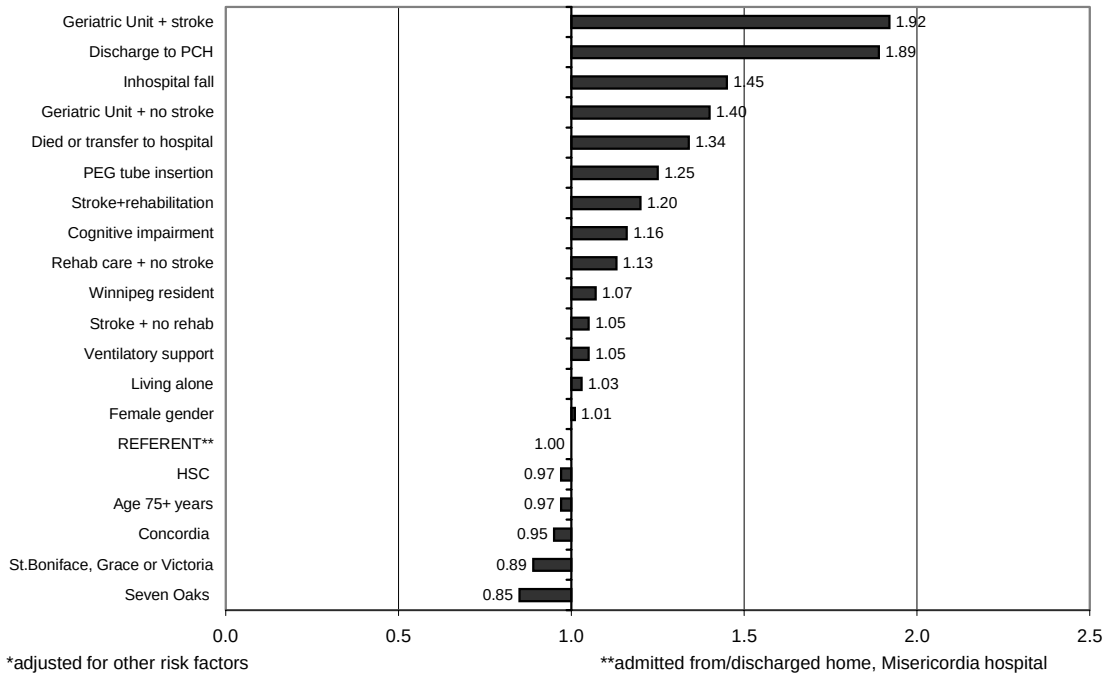
Medical: Sociodemographic factors had a limited impact on LOS for medical long-stay patients (Figure 11). Length of stay was decreased by 1% to 2% in persons aged 75 years or older in comparison to persons who were younger, in persons living in low-income neighbourhoods in comparison to their high-income counterparts, and in female patients in comparison to male patients. Living alone or living in Winnipeg increased LOS by a factor of 1.03 to 1.05 (3% to 5%) over persons living with someone or those not living in Winnipeg. The hospital where the patient stayed also did not play a large role. In comparison to Concordia or Misericordia Hospitals, LOS was 1.04 longer (4%) at Grace or Victoria hospitals, or 0.93 as long (7% shorter) at St. Boniface hospital. Thus, the difference in LOS between the hospital with the shortest and longest LOS was at most 11%.

Certain disease and treatment characteristics contributed to an increased length of stay. Patients who required rehabilitation had a 12% longer stay than those who did not. The presence of cognitive impairment increased LOS by 16%. Stroke increased LOS by 17%, and stroke coupled with being hospitalized on a geriatric unit increased length of stay by

31%. Patients stayed 1.26 times (26%) longer if they had an injurious fall in hospital and 1.32 times (32%) longer if they needed a PEG tube.

Long-stay patients who died or were transferred to another hospital stayed 1.17 times (17%) longer than the referent category. Patients hospitalized on a geriatric unit stayed 1.2 times (20%) longer if they did not have a stroke, and 1.31 times (31%) longer if they did have a stroke, in comparison to patients who were not on geriatric units. The factor that added the most to LOS for these patients was being discharged to a personal care home; these patients stayed 2.73 times as long as patients going home. In other words if the mean length of stay for patients going home was 56 days, the model predicts that patients going to PCH would stay 153 days on average.

Figure 12: Relative length of stay* for patients with different characteristics
Long-stay surgical patients, Winnipeg acute hospitals, 1993/94 to 1997/98



Surgical: Figure 12 illustrates the results for long-stay patients with surgical diagnoses, and they are slightly different than for patients with medical diagnoses. The referent category was patients hospitalized at Misericordia Hospital, who were admitted from and

discharged home. Similar to the LOS of medical patients, sociodemographic factors did not have a major impact: being 75 years or older was associated with a 3% shorter LOS, being female with a 1% longer LOS, living alone with a 3% longer LOS, living in Winnipeg with a 7% longer LOS. Neighbourhood income quintile was not a predictor for long-stay patients with surgical conditions.

Compared to Misericordia, all other hospitals had shorter mean LOS for surgical long-stay patients. Surgical long-stay patients at Seven Oaks Hospital stayed 0.85 times as long (15% shorter), at St. Boniface, Grace or Victoria, 0.89 times as long (11% shorter), at Concordia 0.95 times as long (5% shorter) and at HSC 0.97 times as long (3% shorter). (It must be remembered that this graph illustrates the effect of each significant characteristic independent of all others, that is, after all other sociodemographic, disease and treatment characteristics have been controlled for.)

Patients who needed rehabilitation therapy or a PEG tube had an increased length of stay by 13% and 25%, respectively. Patients with cognitive impairment stayed 16% longer than patients who did not have cognitive impairment. The effect of stroke is complex, because it interacted with other terms. In comparison to persons without a stroke diagnosis, patients who had a stroke but no rehabilitation therapy stayed 5% (1.05) longer, stroke patients who had rehabilitation therapy stayed 20% (1.20) longer, and patients who had a stroke, no rehabilitation care and had a geriatric unit service code stayed 1.92 times or almost twice as long.[11]

Patients who died or were transferred to another hospital stayed 34% longer. Being discharged to a personal care home lengthened the stay by 1.89 times, i.e., almost double, compared to persons discharged home; this was less than the impact for patients with medical diagnoses for whom being transferred to a nursing home almost tripled the length of stay.

[11] Geriatric units do not accept patients who cannot be rehabilitated; however some units that are coded as geriatric units are in fact not "true" geriatric units but units where patients who are no longer acute are awaiting placement or transfer.

Impact of discharge destination

The contribution of some of the risk factors was dependent on whether persons were discharged home or to PCH. The effect of this interaction with discharge destination was a change in the weight of the risk factor. Patients with a stroke or dialysis stayed longer if they were discharged to PCH than if they were discharged home; this was true of both medical and surgical patients (Table 5). Among surgical patients, Winnipeg residents stayed 54% longer than non-Winnipeg residents if they went to PCH but only 6% longer if they went home, suggesting that waits for personal care homes are more significant for Winnipeg residents. Of interest is that surgical patients with a stroke diagnosis and no rehabilitation were hospitalized for a much longer time period if they were discharged to PCH than home (data not shown), suggesting that they were severely disabled by their strokes.

There was also an interaction between hospital of stay and discharge destination. Among long-stay medical patients discharged home, St. Boniface Hospital patients had the shortest LOS, while those in Victoria hospital had the longest; the difference in length of stay between the shortest- and longest-stay hospitals was 11% (Table 6). Changing the discharge destination to PCH, length of stay was shortest in HSC patients and longest in Grace Hospital patients, and the shortest-to-longest difference was 35%. For long-stay patients with surgical diagnoses the pattern was similar: for patients discharged home, the difference between shortest- and longest-stay hospitals was 15%, and, for patients discharged to PCH, the difference was 43%.

Table 6: **Effect of hospital and discharge destination for long-stay patients in Winnipeg acute care hospitals, percent difference in expected LOS, 1993/94 to 1997/98**

Hospital	Medical patients discharged to		Surgical patients discharged to	
	Home	PCH	Home	PCH
Concordia	0	0	-5%	+28%
Grace	+3%	+10%	-11%	+26%
Health Sciences Centre	+1%	-25%	-3%	+3%
Misericordia (referent)	0	0	0	0
St Boniface	-7%	-17%	-11%	+23%
Seven Oaks	+3%	-24%	-15%	-15%
Victoria	+4%	-16%	-11%	+23%

Stages of hospitalization for panelled long-stay patients

Table 7 shows the mean length of stay for long-stay patients who were panelled for PCH or chronic care, excluding patients who died.[12] The panel date was either the assessment date in the PCH file, or the date of a subservice code from the hospital file indicating the patient was panelled, whichever occurred later. This analysis included only a handful of non-Winnipeg residents, 39 in total. The total average length of stay for patients with a medical diagnosis was 169.4 days, and just over 50% of the days (89.3), were spent prior to panelling. The total average length of stay for patients with a surgical diagnosis was 245.9 days, 140.8 (57.3%) of which were spent prior to panelling.

Table 7: Mean length of stay for different stages among panelled patients, 1993/94 to 1997/98

	Medical Diagnoses	Surgical Diagnoses
Mean LOS (days)	(n = 1257)	(n = 348)
Admission to panel date	89.3 (52.7%)	140.8 (57.3%)
Panel date to discharge	80.1 (47.3%)	105.1 (42.7%)
Admission to discharge	169.4	245.9
Using non-acute service codes	(n = 656)	(n = 186)
Admission to non-acute status	25.4 (14.9%)	39.6 (15.7%)
Non-acute status to panel date	63.1 (37.2%)	100.5 (40.2%)
Panel date to discharge	81.3 (47.9%)	110.5 (44.1%)
Admission to discharge	169.8	250.6

[12] This analysis differs from the mean length of stay analysis where we used the "transfer to" code from the hospital abstract to estimate mean length of stay for patients with different discharge destinations.

Recall that we also searched for any *non-acute* codes, that is, service, sub-service or V-codes that would indicate that the patient was no longer acute, such as alternate level of care, or stay on a non-acute unit such as personal care unit, geriatrics or long term care.[13] About half of the panelled patients identified in Table 7 had non-acute subservice codes: 656 patients (52%) with a medical diagnosis and 186 (53%) with a surgical diagnosis. (See bottom half of Table 7.) Using this approach, only about 15% of the stay for both surgical and medical patients was acute: for medical patients, on average, 25.4 of the total 169.8 days were acute; for surgical patients, 39.6 of the 250.6 days. In other words, 85% of the days spent by this subset of long-stay patients panelled for PCH or chronic care were not acute. The proportion of the stay between being coded as non-acute until panelling was 37.2% and 40.2% for medical and surgical patients respectively, and almost half of the stay was spent after panelling, awaiting transfer to a long term care facility.

Regression models for patients discharged to PCH or chronic care

Separate regression analyses were carried out among long-stay patients who were discharged to a PCH or chronic care facility. This also permitted the use of a level of care assessment, which is done only among persons panelled for PCH or chronic care. Excluded from this regression were patients assessed as requiring respite care. The outcome variable was the length of time between panelling and discharge. Note the difference here: in the previous models the outcome was the entire length of stay in hospital; here the outcome is only the time between panelling and discharge.[14] For this model, variables were added to characterize PCHs: ethnoreligious vs. secular, and proprietary vs. non-proprietary.

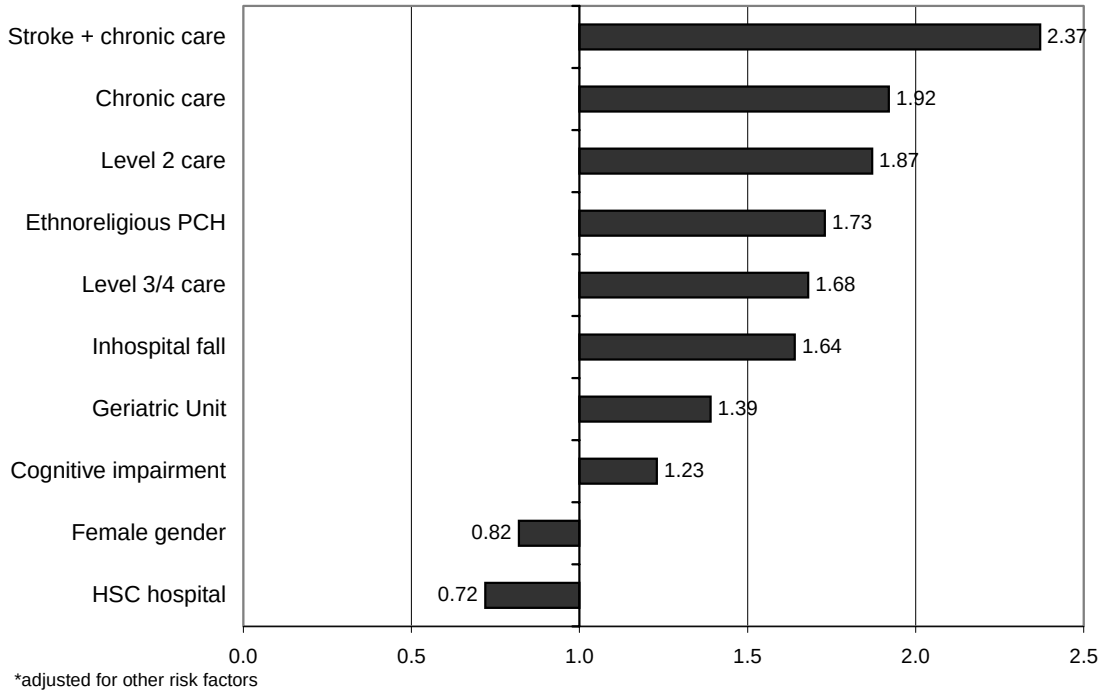
Figure 13 shows the factors found to be significant predictors of increased post-panel length of stay for medical patients. The only significant socioeconomic factor was being female which predicted a stay that was 0.82 times as long, or 18% shorter compared to males. Significant system characteristics included hospital of stay, with Health Sciences Centre

[13] These include primary service codes: 09, 72, 73, 70, 71; subservice codes; 77, 78-87 (HSC only), 93, 94, 95, 96, 97, 98, 99.

[14] Subservice code "99" or "93" was used to determine panel date. Occasionally there was more than one instance of use of this code, possibly because a panelled patient suffered an acute episode and was no longer transferable for that period. Where this happened, the latest date was used.

being predictive of a stay that was 0.72 as long (28% shorter) and a stay on a geriatric unit predictive of an increased stay of 39%. Treatment or disease factors that were significant predictors of increased length of stay were cognitive impairment (1.23), and an inhospital fall (1.64). Stroke was not significant except for patients who also required chronic care; in these patients post-panel length of stay was expected to be increased by 2.37 times. Level of care required relative to Level 1 was a significant predictor, with Level 3 or 4 predicting a stay about 2/3 longer (1.68), while Level 2 and chronic care almost doubled the LOS. Choice of an ethnoreligious home was also important, increasing length of stay by 1.73 times (73% longer).

Figure 13: Relative post-panel waiting time*
Long-stay medical patients, Winnipeg acute care hospitals, 1993/94 to 1997/98
(post-panel stay relative to patients without any of these characteristics)

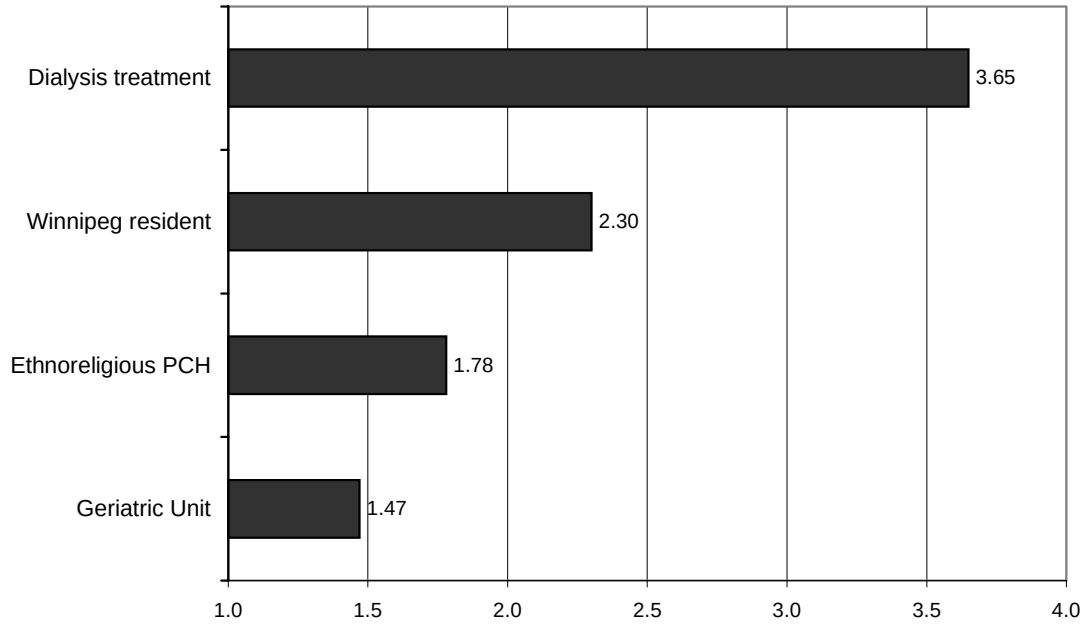


*adjusted for other risk factors

For patients with a surgical diagnosis, four variables were predictive of longer stay post panelling (Figure 14). A stay on a geriatric unit predicted a stay almost 1½ times longer (1.47). Choice of an ethnoreligious PCH added 78% to the post-panel stay. Winnipeg residents stayed more than twice as long (2.3 times) as non-Winnipeg residents. The factor

that increased post-panel length of stay the most was dialysis treatment, which predicted a stay that was over 3½ times longer (3.65).

Figure 14: Relative post-panel waiting time*
Long-stay surgical patients, Winnipeg acute care hospitals, 1993/94 to 1997/98
(post-panel stay relative to patients without any of these characteristics)



*adjusted for other risk factors

3.3 Limitations

A population-based approach using administrative data provides a system-wide perspective of how Winnipeg hospitals are used for long-stay patients. The advantage to such an approach is that it makes it possible to review all long-stay cases over a number of years, rather than focussing on individual cases or samples of cases. There are also limitations in using secondary data, that is, data collected for purposes other than the research question at hand.

One drawback is that we could not tell whether a long-stay patient was hospitalized appropriately or not. Some long-stay patients need to be in a hospital because their care needs are complex, and cannot be met in an alternative setting. Concurrent utilization review

would be more useful for obtaining this kind of information. However, previous research at MCHPE documented that after 30 days of stay, 80% of medical patients were not receiving acute care services (DeCoster, Peterson and Kasian, 1996). Therefore, most of the patients in our study were likely to be non-acute.

There were several potential coding problems in the hospital abstract. For instance, it is known that hospitals vary in their use of the subservice code "77": alternate level of care. This code applies to hospitals that submit abstract data to the Canadian Institute for Health Information (CIHI)—which includes all Winnipeg hospitals. CIHI has not defined the code, leading to inconsistencies in use: some hospitals use the code more often than others, and the reasons for applying the code differ from facility to facility. While the code is not used consistently, where it is used, we assumed that it did reflect a non-acute level of care and we therefore used it for analysis in all patients where it appears.

Other areas where there are potential coding problems were codes for destination at discharge, rehabilitation therapy (probably under-coded), geriatric unit (defined differently at different hospitals), and cognitive impairment (diagnosis may be variable). The effect of undercoding is that we would not capture all patients in these categories, and would likely understate the magnitude, but not the direction, of the effect of these characteristics.

Last, the data do not permit temporal sequencing of events: did the event cause an increased length of stay, or did it occur at the end of a lengthy stay? For instance, was rehabilitation therapy initiated early in a patient's stay or was it provided at the end of a long hospital stay in a patient with complex treatment requirements? The finding that an injurious fall was associated with an increased length of stay is not very surprising. What we do not know is if the fall caused the lengthy hospitalization, or if the lengthy hospitalization put the patient at higher risk of falling. Therefore, we cannot attribute causality or directionality in the association between various characteristics and length of stay.

4.0 DISCUSSION

For this study on long-stay patients in Winnipeg acute care hospitals, data were analyzed up to the end of fiscal 1997/98. We defined long-stays as being more than 30 days, and restricted the analyses to adult patients with a medical or surgical diagnosis.

The single largest determinant of length of stay, independent of other factors, was discharge destination. The shortest length of stay, approximately 60 days, was observed in patients who were discharged home. Patients who died were hospitalized for 77 to 95 days, patients awaiting transfer to another hospital were hospitalized for 81 days, and those *awaiting placement in a PCH* were hospitalized for as long as 158 to 208 days. Are there ways to shorten these long stays that would be beneficial to patients and hospitals?

Long-stay patients who were discharged home used between 30% and 40% of long-stay days. Although these patients had the shortest mean length of stay, at about 60 days, "short" is a relative term here: even a stay of 60 days in an acute care hospital setting is quite long. Exploration of the kinds of supports that are needed by long-stay patients who return home might be useful in planning for community-based services. Our discussion of disease and treatment factors associated with long length of stay provided some guidance on the type of support services needed, but this area requires further study.

Dying patients used about 20% of long-stay days. We know that many health care resources are devoted to patients in their last year of life, and this makes sense. However, sometimes patients are subjected to aggressive, unpleasant, but essentially futile therapies. Distinguishing between efforts that prolong life and efforts that prolong dying is often difficult for patients, families and health care providers; however it is an important first step if we are to have a health care system that provides care, compassion and comfort at different stages of life. Also, patients who are dying might be more appropriately cared for by home care if they wish to die at home, or in a hospice, assuming that their medical care needs are not beyond the scope of these services (Grande, Addington-Hall and Todd, 1998).

Patients who were discharged to PCH or another hospital used between 40% and 50% of long-stay days. Our data showed that nearly 50% of their stay was spent post-panelling, an average of 80 days in medical patients and 105 days in surgical patients. For the patients in whom non-acute codes were found, as much as 85% of their stay was post-acute. Patients awaiting transfer to another facility are not likely to be active users of acute hospital services (Hochstein,1985) and are susceptible to the detrimental effects of hospitalization, such as iatrogenesis and loss of independence (Rudberg, Sager and Zhang, 1996; Potts et al., 1993). Therefore, transfer as soon as possible is in their best interests.

The Winnipeg Regional Health Authority (WRHA) has implemented a number of changes to enhance the efficiency of the nursing home assessment and placement process. Between December 1998 and March 1999, 36 permanent PCH beds and 241 interim PCH beds were opened, 194 of these as a result of the conversion of Misericordia from acute to long term care. By 2001, there will be an additional 550 PCH beds in Winnipeg. Changes to the nursing home application process include a review of the multiple-page assessment form by one of the four Access Co-ordinators in Winnipeg, reducing the number of patients for whom the panel must defer a decision because of missing information. The panel now meets every 72 hours, rather than the previous once per month. Following acceptance of the application, patients are now urged to move to the first available interim or PCH bed. These changes have been reported to reduce the panelling process and nursing home placement time in Winnipeg hospitals.

Our analyses suggest that the addition of PCH beds may only temporarily reduce the excess utilization of hospital resources for long-stay patients. Over 500 hospital beds were closed in Winnipeg in 1992/93 and 1993/94, and 236 PCH beds were added. These changes occasioned a small drop in the proportion of hospital days devoted to long-stay patients, from 38% to 35%. However, the proportion soon returned to its previous level, staying at approximately 39% from 1995/96 to 1997/98. The long-stay separation rate followed a similar pattern. Therefore, the big changes in the bed supply did not lead to a lasting reduction in the use of hospital resources for long-stay patients. Nevertheless, the impact of long-stay patients may be greater now, since hospital resources have been reduced.

Given the remarkable stability in the level of long-stay use in the hospital system, and given the ongoing and planned changes to improve resource use in the Winnipeg Regional Health Authority, these analyses should be regarded as baseline data, and repeated again after the 2001/02 fiscal year.

Mean LOS for long-stay patients dropped by about one-sixth between 1991/92 and 1995/96, and then stayed at about 80 days for the latter three years of the study period. Yet the median length of stay did not change since 1991/92, but stayed at around 53 days. There are a number of potential explanations for these findings. Hospitals might have focussed on the outliers, the patients with stays in terms of months or even years, rather than days. Alternatively, hospital staff likely know quite quickly when a patient will require complex discharge planning, but it takes a certain amount of time to stabilize and treat the patient, assess and arrange for support services for patients who are going home, or come to the serious decision about nursing-home placement. Furthermore, it is recognized that going to a nursing home represents a major life decision, and one with resource implications from the point of view of building and operating nursing homes, and so it should not be rushed if there is any chance that the patient can return home.

Given these complexities, there may be a limit on how quickly hospitals can discharge these patients; the question is, has that limit been reached, or could hospitals be more efficient? The considerable variation between hospitals in length of stay gives reason to believe that there is room for improved efficiency. For patients who were discharged to a nursing home, the difference in length of stay between the shortest- and longest-stay hospitals was 35% for medical and 40% for surgical patients. For patients discharged home, the difference between hospitals was 11% for medical and 35% for surgical. None of the hospitals consistently had the shortest or longest average length of stay. The reasons for these inter-hospital differences should be explored further.

4.1 Characteristics of long-stay patients

What characteristics predict how long-stay patients used hospital days? Our descriptions were focused on the years 1993/94 to 1997/98, following major bed changes in the Winnipeg system. The characteristics explored were obtained from the literature and the Working Group, and were divided into four categories: sociodemographic, disease, treatment, and system factors. In the five-year evaluation period, 15,000 medical and surgical patients stayed more than 30 days in acute Winnipeg hospitals. On average, these patients were hospitalized for 84 days, and there was substantial variation in length-of-stay among patients. Factors associated with an extended length-of-stay were compatible with the research of others and the experience of the Working Group. Two findings should be emphasized. Adjusting for disease, treatment and system factors, sociodemographic characteristics of the patients contributed very little to extended long-stay days. Further, our findings did not support the perception that non-Winnipeg residents are more difficult to discharge or transfer.

In the following paragraphs, we highlight factors which were associated with the longest length of stay in patients hospitalized for more than 30 days. Discharge destination, the largest determinant on length of stay, has been discussed previously. Not surprisingly, several specific disease conditions were associated with extended lengths of stay. Nervous system (including stroke diagnoses), mental disorder, circulatory, musculoskeletal, and respiratory or digestive system conditions accounted for three-fourths of the medical long-stay days, and two-thirds of the surgical long-stay days.

Stroke: The LOS of patients with stroke diagnoses was significantly increased over those with other diagnoses, although the extent to which this occurred was dependent on whether patients received rehabilitation care or were hospitalized on a geriatric unit. A stroke diagnosis increased length of stay by 17% in medical patients not hospitalized on a geriatric unit, and by 31% if they stayed on a geriatric unit. Geriatric units offer rehabilitation services to stroke patients, so a longer LOS is expected in patients hospitalized on a geriatric unit.

The effect of stroke on surgical patients was more complicated. Among non-geriatric unit, surgical patients with a stroke diagnosis, but no rehabilitation therapy—suggestive of a less severe stroke—LOS was increased by 5% compared to patients without stroke. Stroke diagnoses in combination with rehabilitation therapy, or a stay on a geriatric unit and no rehabilitation care increased the length of stay by 20% and 92%, respectively. Generally, geriatric units do not accept stroke patients who are not rehabilitation candidates. Therefore, the absence of rehabilitation care among surgical, geriatric unit patients with stroke diagnoses may indicate a number of things: these may be severely disabled stroke patients, who were not candidates for rehabilitation, a result of undercoding of rehabilitation therapy, and/or a misapplied geriatric unit code.

WRHA intends to develop a stroke unit that would specialize in the prevention, early treatment and rehabilitation of these patients. Given the impact of this disorder, this initiative should be supported.

Falls: Independent of disease factors, an inhospital fall was associated with an extended length of stay of 26% and 45% for medical and surgical patients, respectively. Fall-related injuries often result in marked functional deterioration in the patient. Risk factors for falls in elderly patients which have been identified in the literature include: history of falls, poor nutrition, stroke, history of incontinence, environmental risks (e.g., lighting), balance and gait problems, poor vision, postural hypotension, and use of certain drugs like antidepressants and anxiolytics (ICES 1998; Mustard and Mayer, 1997; Mayo, Gloutney and Levy, 1994). In some geriatric rehabilitation units, intervention programs have been implemented to manage patients at risk for falling. Although not evaluated, an Ontario program individualized the intervention according to six levels of risk for falling and mobility status. In this program, high-risk areas—not patients—were marked, and the environment was also modified by for example, maintaining beds in the low position (Patrick et al., 1999).

Cognitive impairment: Cognitive impairment may be undercoded in the hospital abstract. Nevertheless, when it was identified, cognitive impairment increased length of stay

by 16% for both medical and surgical patients. With the aging of the population, we can expect the number of people afflicted with cognitive impairment to increase. An acute care hospital is a less than ideal setting for these individuals who require special surroundings to reduce anxiety, minimize confusion and permit them free movement without harming or intruding on other patients. Furthermore, cognitive impairment is a risk factor for delirium, a complication that can further lengthen a patient's stay. Other risk factors for delirium include vision impairment, severe illness, metabolic and electrolyte imbalance, the use of psychoactive medications and infections. Programs to recognize and manage risk factors for delirium can help to reduce its incidence or duration (Inouye, Bogardus and Charpentier, 1999). Some reduction in length of stay for cognitively impaired patients may be achieved by developing more comprehensive and accessible support programs for patients and their caregivers in both the community and nursing homes.

Both cognitive impairment and having an injurious fall increased the length of stay; these may be interrelated. They are associated with some of the same risk factors, for example, visual impairment and being on psychoactive medications. Furthermore, somebody who suffers from a cognitive deficit may not be aware of their own physical deficits and therefore be at higher risk of falling. Or, patients who suffered an injurious fall may be in hospital longer and consequently exposed to more of the factors associated with cognitive disturbances. Therefore, interventions aimed at reducing the incidence of one may help to reduce the incidence of the other as well.

The Working Group identified certain treatment characteristics as being associated with prolonged hospital care: rehabilitation therapy, dialysis, PEG tube insertion or ventilatory support. The majority of long-stay bed-days were not consumed by patients requiring these services, yet patients needing these therapies had significantly longer lengths of stay than those who did not. Long-stay medical patients requiring dialysis stayed 6% longer, rehabilitation 12% longer, and PEG tube 32% longer. For surgical patients, if they required ventilatory support, they could be expected to stay 5% longer, rehabilitation 13% longer, and PEG tube 25% longer.

Rehabilitation: It is not surprising that patients who require rehabilitation therapy would stay in hospital longer. In some cases, rehabilitation should be available while the patient is still in the acute phase of treatment, for example in stroke. But is an acute care hospital environment always the optimum place for rehabilitation? Related to that, anecdotal accounts suggest that there are insufficient rehabilitation services available in Winnipeg. The availability of more rehabilitation services offered sooner and in an appropriate environment may help patients to be discharged sooner at a higher functional level.

PEG tubes: 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). Most nursing homes will not accept patients with PEG tubes. This is not only because of issues related to the care of the PEG tube *per se*, but also because these patients often have multiple health problems. Should PCHs accept patients with these and other treatment needs that they do not accept now? If so, thought must be given to the number and qualifications of staff. Or do we need more chronic care beds for patients like these with complex, long term health problems? As the range of therapeutic measures continues to advance permitting more people to live longer but with complex health care needs, these questions are likely to arise again and again.

Post-panel length of stay: Factors associated with longer post-panel hospital stays were not identical to those associated with longer lengths of stay overall. As documented by others, patient's choice of an ethnoreligious nursing home had an impact on nursing home waiting time (Shapiro, Tate and Tabisz, 1992), leading to a 75% longer post-panel stay; this was true of both surgical and medical patients. Since panelled patients are now urged to accept the first available placement, with the option of moving to their first-choice home later, the effect of choosing an ethnoreligious home may decrease in the future.

For medical patients, hospitalization at Health Sciences Centre was associated with the shortest post-panel wait. Members of the Working Group and WRHA attribute that finding to the higher priority given to panelled patients at HSC. A noteworthy finding was that an

inhospital fall extended post-panel waiting time by 64%, indicating that this iatrogenic event interfered with earlier placement of the patient. Patients with cognitive impairment stayed 23% longer post-panelling, and those with an increased level of care stayed 68% to 87% longer than those needing minimal care. Medical patients who suffered a stroke and required chronic care waited for nursing home placement almost 2½ times as long as patients needing minimal care.

Among surgical patients awaiting PCH/chronic care, those receiving dialysis waited 365% longer than patients not receiving dialysis. Patients with these treatment needs may be accepted in one of the chronic care units that are at Deer Lodge or Riverview, if their condition is stable enough to permit this. However, there are only 120 beds in these units and in the fall of 1999, there were 35 patients waiting for one of these 120 beds.[15] At the same time there were 240 patients waiting for placement in one of 5,000 PCH beds. A re-evaluation of the need for chronic care beds in Winnipeg may be necessary; possibly some resources for acute or personal care home beds should be redirected to chronic care.

[15] Personal conversation with Jo-Ann Mackenzie, Nursing Director of the Geriatrics/Rehabilitation Program Team of the WHA.

5.0 CONCLUSIONS

1. Not all long-stay patients are candidates for PCH placement—a large number of them return home. Patients who went home had an average length of stay of about 60 days, and one wonders if this could be shortened. Exploration of the kinds of supports that are needed by long-stay patients who return home might be useful in planning for community-based services. Our findings on patient disease and treatment characteristics associated with long lengths of stay provide some guidance on the type of support services needed, but this is an area requiring further study.

2. The single largest determinant of length of stay, independent of other factors, was discharge destination. The shortest length of stay, approximately 60 days, was observed in patients who were discharged home. Patients who died in hospital were hospitalized for 77 and 95 days for medical and surgical respectively. Patients awaiting transfer to another hospital, (usually Deer Lodge or Riverview) were hospitalized for 81 days. And those awaiting placement in a PCH were hospitalized for 159 and 208 days for medical and surgical, respectively. WRHA has adopted a variety of tactics to shorten the application and panelling process and to improve the use of hospital resources. This study should be repeated at the end of 2001/02 to assess the effect of these changes.

3. The considerable variation in length of stay between hospitals suggests that there is still room for improved efficiency. For patients discharged home, the spread between hospitals was quite narrow, with a difference between shortest- and longest-stay hospital of 11% and 15% for medical and surgical patients, respectively. However, the spread between hospitals was much wider for patients discharged to PCH, 35% for medical patients and 43% for surgical. WRHA might want to investigate these differences further.

4. Given the impact of stroke on length of stay, WRHA's plans to develop a stroke unit that would specialize in the prevention, early treatment and rehabilitation of these patients should be supported.

5. Both cognitive impairment and having an injurious fall increased the length of stay; these may be interrelated. They are associated with some of the same risk factors, for example, visual impairment and being on psychoactive medications. Furthermore, somebody who suffers from a cognitive deficit may not be aware of their own physical deficits and therefore be at higher risk of falling. Or, patients who suffered an injurious fall may be in hospital longer and consequently exposed to more of the factors associated with cognitive disturbances. Therefore, interventions aimed at reducing the incidence of one may help to reduce the incidence of the other as well.

   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; however, incorporating them into general medical units that treat elderly patients with acute care needs may improve outcomes in the elderly without incurring additional costs to the hospital. Winnipeg hospitals have been incorporating such changes bit-by-bit, and should continue.

6. Therapies like PEG tube insertion and dialysis were found to contribute significantly to a longer hospital stay. Both of these therapies may indicate individuals who are too unstable to be discharged from an acute care hospital. Invasive therapies like these may prolong life but compromise any opportunity for independence. Patients, families and health care providers should consider these implications in deciding whether to undergo these therapies.

7. It is not surprising that patients who require rehabilitation therapy would stay in hospital longer. The availability of more rehabilitation services offered sooner and in an appropriate environment may help patients to be discharged sooner at a higher functional level.

8. The need for chronic care was associated with a longer post-panel length of stay. In the fall of 1999, there were 35 patients waiting for one of 120 chronic care beds in Winnipeg. At the same time there were 240 patients waiting for placement in one of 5,000 PCH beds. A re-evaluation of the need for chronic care beds in Winnipeg may be necessary; possibly some resources for acute or personal care home beds should be redirected to chronic care.

9. Sociodemographic characteristics were not significant factors in lengthening the hospital stay for long-stay patients.

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APPENDIX A

Table A1: How variables were defined for the regression equation

Variable type and description		How defined
Sociodemographic Factors		
Age	Less than 75 / 75+	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".
Neighbourhood Income	Low/High	Average household income data by enumeration area, as provided by the 1996 Canadian census, were used to rank neighbourhoods into five income quintiles. Patients whose postal code was in a neighbourhood that was in the two lowest income quintiles were classified as low income; all others were classified as high income.
Disease Factors		
Stroke	Yes/no	Patients with a stroke diagnosis in the first position, indicating most responsible[16]
Cognitive Impairment	Yes/no	Patients with diagnoses for dementia and other cognitive impairment in any of the 16 diagnosis fields on hospital abstract record
Comorbidity	None/any	Comorbidity was classified using the Charlson index. The index 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.
In-hospital fall	Yes/no	Presence of an injurious fall diagnosis in any of the 16 diagnosis fields, and accident location recorded as "hospital."
Level of care on admission to PCH	Level 1, 2, 3, 4, 6	For patients discharged to PCH, level of care at admission as recorded in the PCH file. There were six levels of care. Level 1 (minimal care) and Level 5 (respite care) were combined to form Level 1. Level 2, 3, and 4 are increasing levels of PCH care.

[16] 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.

Variable type and description		How defined
		Level 6 is Chronic Care.
Treatment factors		
Rehabilitation care	yes/no	Presence of rehabilitation care in any of the 16 diagnosis fields16 or the 12 procedure fields[17] in hospital abstract record
Ventilatory Support	yes/no	Presence of ventilation (e.g., CMV, CPAP, IPPB), tracheostomy or machine dependence recorded in any of 16 diagnosis fields or 12 procedure fields 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
System factors		
Residence type prior to admission	PCH or hospital / home	The hospital abstract indicates if patients are transferred from another hospital or from a PCH. Patients transferred from one of these facilities were grouped together and all others classified as admitted from home.
Residence location prior to admission	Winnipeg/non-Winnipeg	Classified according to postal code address
Hospital of stay	Grace, Misericordia, St. Boniface, Victoria, Concordia, Seven Oaks, Health Sciences	From hospital identifier in hospital abstract record
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
Destination at separation	PCH / hospital / died / home	Used separation and transfer codes from hospital abstract record to classify

[17] 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

Regression models for long-stay patients

Table B1: Regression model for long-stay medical patients; r^2 = 36.9%

variable	b coefficient	b coefficient Home-interaction	b coefficient column 2&3	Odds ratio (anti-log)	b coefficient PCH-interaction	b coefficient column 2&6	Odds ratio (anti-log)
intercept	3.939		3.939	51.3672		3.939	51.3672
adm PCH/hospital	-0.116		-0.116	0.8905		-0.116	0.8905
Wpg	0.053		0.053	1.0544		0.053	1.0544
rehab	0.117		0.117	1.1241		0.117	1.1241
fall	0.233		0.233	1.2624		0.233	1.2624
d/c home	-0.155		-0.155	0.8564		-0.155	0.8564
d/c PCH	0.85		0.85	2.3396		0.85	2.3396
Living alone	0.064	-0.03	0.034	1.0346	-0.16	-0.096	0.9085
female	0.019	-0.023	-0.004	0.9960	-0.081	-0.062	0.9399
Age 75+ yrs	0.072	-0.088	-0.016	0.9841	-0.05	0.022	1.0222
Low income	-0.071	0.057	-0.014	0.9861	-0.08	-0.151	0.8598
Geriatric unit	0.271	-0.093	0.178	1.1948	0.082	0.353	1.4233
dementia	0.495	-0.349	0.146	1.1572	-0.358	0.137	1.1468
PEG tube	0.39	-0.109	0.281	1.3244	-0.212	0.178	1.1948
dialysis	0.097	-0.035	0.062	1.0640	0.44	0.537	1.7109
stroke	-0.027	0.181	0.154	1.1665	0.32	0.293	1.3404
geriatric-stroke	0.17	-0.236	0.266	1.3047	-0.239	0.577	1.7807
Comorbidity	-0.005	0.01	0.005	1.0050	0.031	0.026	1.0263
comorbid-stroke	0.157	-0.167	0.149	1.1607	-0.122	0.354	1.4248
Grace	-0.027	0.059	0.032	1.0325	0.122	0.095	1.0997
St.Boniface	-0.028	-0.041	-0.069	0.9333	-0.155	-0.183	0.8328
Victoria	0.082	-0.042	0.04	1.0408	-0.257	-0.175	0.8395
7 Oaks	0.014	0.014	0.028	1.0284	-0.282	-0.268	0.7649
HSC	-0.036	0.047	0.011	1.0111	-0.258	-0.294	0.7453

Table B2: Regression model for long-stay surgical patients; r^2 = 35.4%

Variable	b coefficient	b coefficient home-interaction	b coefficient column 2&3	Odds ratio (anti-log)	b coefficient PCH-interaction	b coefficient column 2&6	Odds ratio (anti-log)
intercept	4.038		4.038	56.7128		4.038	56.7128
adm PCH/hospital	-0.061		-0.061	0.9408		-0.061	0.9408
Living alone	0.029		0.029	1.0294		0.029	1.0294
fall	0.37		0.37	1.4477		0.37	1.4477
Ventilation	0.046		0.046	1.0471		0.046	1.0471
d/c home	-0.132		-0.132	0.8763		-0.132	0.8763
d/c PCH	0.502		0.502	1.6520		0.502	1.6520
7 Oaks	-0.163		-0.163	0.8450		-0.163	0.8450
Wpg	0.136	-0.072	0.064	1.0661	0.297	0.433	1.5419
female	0.021	-0.015	0.006	1.0060	-0.116	-0.095	0.9094
Age 75+ yrs	-0.034	-0.001	-0.035	0.9656	-0.225	-0.259	0.7718
Geriatric unit	0.583	-0.249	0.334	1.3965	-0.164	0.419	1.5204
dementia	0.596	-0.444	0.152	1.1642	-0.36	0.236	1.2662
PEG tube	0.489	-0.263	0.226	1.2536	-0.345	0.144	1.1549
dialysis	0.154	0.055	0.209	1.2324	0.312	0.466	1.5937
stroke	-0.003	0.05	0.047	1.0481	0.51	0.507	1.6603
geriatric-stroke	-0.314	0.585	0.652	1.9194	0.461	1.073	2.9241
rehab	0.225	-0.105	0.12	1.1275	-0.065	0.16	1.1735
Rehab-stroke	0.234	-0.168	0.183	1.2008	-0.901	0.006	1.0060
Grace	-0.13	0.011	-0.119	0.8878	0.359	0.229	1.2573
St.Boniface	-0.128	0.007	-0.121	0.8860	0.338	0.21	1.2337
Victoria	-0.154	0.037	-0.117	0.8896	0.358	0.204	1.2263
Concordia	-0.124	0.07	-0.054	0.9474	0.373	0.249	1.2827
HSC	-0.116	0.09	-0.026	0.9743	0.142	0.026	1.0263

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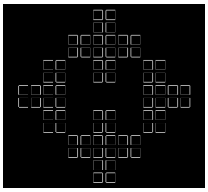

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