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network

Advancing the Ontario Stroke System

THE IMPACT OF MOVING TO STROKE REHABILITATION BEST PRACTICES IN ONTARIO

FINAL REPORT

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^a See Appendix 7

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Executive Summary

Background

Ontario's Ministry of Health and Long-Term Care is actively seeking strategies to reduce the burden of "ER/ALC" on Ontario's healthcare system. As part of this initiative, the Rehabilitation and Complex Continuing Care Expert Panel (RCCCEP) was established in 2010 to explore the potential impact of rehabilitation on system efficiency and reducing hospitalization. The RCCCEP focused on four rehabilitation sub-groups: stroke, hip fracture, hip and knee replacement, and acquired brain injury. Of these four groups, stroke patients are the main cause of Alternate Level of Care (ALC) days and consume the largest number of rehabilitation resources annually. As the provincial agency responsible for stroke prevention and care, [the Ontario Stroke Network](#) (OSN) was engaged to support the RCCCEP in recommending stroke rehabilitation best practices and established the Stroke Reference Group (SRG) consisting of rehabilitation experts and stakeholders from across the province. The SRG recommended stroke rehabilitation^c and patient-flow best practices in support of the mandate of the RCCCEP. In November 2011, the RCCCEP, in accordance with the Ontario Stroke Network's SRG, accepted the following recommendations pertaining to stroke rehabilitation in Ontario:

- ✓ Timely transfer of appropriate patients from acute facilities to rehabilitation
 - Ischemic strokes to rehabilitation by day 5 on average
 - Hemorrhagic strokes to rehabilitation by day 7 on average
- ✓ Provision of greater intensity therapy in inpatient rehabilitation
 - 3 hours of therapy per day
 - 7-day a week therapy
- ✓ Timely access to outpatient/community-based rehabilitation for appropriate patients
 - Early Supported Discharge with engagement of CCAC allied health professionals
 - Mechanisms to support and sustain funding for outpatient and/or community-based rehabilitation
 - 2-3 outpatient or Community-based allied health professional visits/ week (per required discipline) for 8-12 weeks
 - In-home rehabilitation provided as necessary
- ✓ Ensure that all rehabilitation candidates have equitable access to the rehabilitation they need

Objective

The purpose of this report is to estimate the potential economic impact of adopting the proposed stroke rehabilitation best-practice recommendations in Ontario. The report is designed to build a high-level, and conservative, case for promotion of best-practice and to broadly demonstrate the potential economic impact from an Ontario-wide perspective.

^c Based on the [Canadian Best Practice Recommendations for Stroke Care](#)

Chapter 1 – Acute Care

The OSN's Stroke Reference Group (SRG) recommends that patients in need of post-stroke rehabilitation (or with sufficient independence to return home) be transferred to the appropriate setting by day 5 if they have experienced an ischemic stroke (or TIA) and day 7 if a hemorrhagic stroke. In 2010, 9591 patients with ischemic stroke (or TIA) and 1072 patients with hemorrhagic stroke were discharged from acute care to inpatient rehabilitation or home. Collectively, these 10,663 patients occupied 90,590 acute bed days, 43% of which (18,605 ALC bed days and 20,256 additional bed days) are in excess of the recommended target day for transfer. Had these patients been transferred from acute care by day 5 or 7 (as recommended), approximately \$22M of acute care costs could be avoided. These savings could then be applied to support stroke rehabilitation best practices and other facets of recovery (e.g. prevention, community reintegration, caregiver support, transportation).

The OSN's SRG also recommends that patients currently admitted to "slow-stream" rehabilitation (in Complex Continuing Care (CCC) or other programs) be transferred to inpatient rehabilitation, where the appropriate intensity of service can be provided. In 2010, 355 patients with stroke were discharged from acute care to CCC and ultimately home. Assuming that these patients could have been discharged to inpatient rehabilitation by day 7 on average, an additional 6,000 acute bed days and \$3.5M could have been made available.

Summary

Estimates suggest that better application of stroke best-practice related to earlier transfer to rehabilitation holds the potential to make nearly 45,000 acute bed days available annually and free up nearly \$26M annually to support stroke patients to reintegrate into the community and improve chronic disease management.

Chapter 2 – Inpatient Rehabilitation

According to best practice, the SRG recommends that inpatient rehabilitation facilities intensify rehabilitation to provide 3 hours of therapy per day, 7-days a week with the goal of improving patient outcomes and reducing time spent in rehabilitation.

To evaluate the potential economic impact of better application of best practice in the inpatient rehabilitation sector, the following factors were accounted for (based on best-evidence when possible and expert opinion otherwise):

- Earlier transfer from acute care (by day 5 or 7) could lead to patients requiring a longer Length of Stay (LOS) in inpatient rehabilitation
- Admitting patients to inpatient rehabilitation in lieu of CCC would contribute to more severely disabled patients in inpatient rehabilitation, but the LOS of patients in inpatient rehabilitation would be less than what is currently experienced in CCC

- Many patients with milder impairment could have their inpatient rehabilitation LOS reduced or eliminated altogether through better access to outpatient and community-based rehabilitation
- Greater therapy intensity (3-hours daily and weekend therapy) would lead to more rapid recovery during rehabilitation and reduced LOS
- Additional therapy staff (PT, OT, SLP) would need to be hired to facilitate greater therapy intensity

Based on 2010 data from the [National Rehabilitation Reporting System](#) (NRS), it is estimated that 16,927 inpatient rehabilitation bed days could be made available by eliminating or reducing LOS through enhancing outpatient/community rehabilitation and greater therapy intensity. However, these bed day savings will be offset by admitting severe stroke patients currently served in CCC to inpatient rehabilitation. This would require 17,998 inpatient rehabilitation bed days, but allow for the elimination of approximately 29,962 CCC bed days annually. The net economic impact of this shift in patient flow is estimated to lead to ~\$16M in annual savings.

In order to accommodate the need for greater therapy intensity in inpatient rehabilitation, estimates suggest that 123 additional therapy staff members would need to be hired across the province (including PT, OT, SLP and assistants). Estimates suggest that this would require an investment of approximately \$11M annually.

Summary

Application of best-practice in Ontario's inpatient rehabilitation sector would result in essentially no change in the number of inpatient rehabilitation beds required annually; however, approximately 30,000 CCC bed days would be eliminated. This would lead to a net annual savings of approximately \$5M.

Chapter 3 - The Impact of Inpatient Rehabilitation on CCC and LTC admissions, mortality and costs 2-years post stroke

The purpose of this chapter was to estimate the potential impact of providing inpatient rehabilitation to eligible stroke patients who are currently not admitted to inpatient rehabilitation. Estimates were derived by comparing the outcomes of patients admitted to inpatient rehabilitation with those of clinically similar patients who were not admitted to inpatient rehabilitation.

Among the mildest patients with a [Modified Rankin Scale](#) (mRS) of 0-2, inpatient rehabilitation had no beneficial effect on any of the outcomes explored and was demonstrated to cost the system significantly more money over the 2-year period (an average of \$33,056 more over the 2 years in total and \$63 more per day survived). These findings support the SRG recommendation that mildly disabled stroke patients should be cared for in outpatient/community settings. Among patients with mRS scores of 3, significantly fewer deaths

were noted in the rehabilitation group, but total healthcare costs were significantly greater (an average of \$22,394 more over the two years in total and \$5 more per day in those that survived). However, among patients with mRS 4 or 5 (the most severely impaired patients) mortality and CCC/LTC admission were significantly lower in patients admitted to rehabilitation and no statistically significant difference in health system cost was noted between groups (rehabilitation costs an average of \$6,607 less over the 2-years and \$29 less per day in those that survived). In fact, these results suggest a trend towards lower costs among patients admitted to rehabilitation.

Summary

Analyses suggest that in Ontario, provision of post-stroke inpatient rehabilitation to appropriate patients can have a meaningful impact on patient outcomes and resource utilization. Results of this section support the SRG recommendation that moderate-to-severely impaired patients benefit the most from inpatient rehabilitation and can actually reduce healthcare spending. Results also support the recommendation that mild stroke patients should be cared for in outpatient or community-based programs that are more cost-effective than inpatient rehabilitation.

Chapter 4 - Outpatient and Community-Based Rehabilitation

This sector offers the greatest opportunity for improving patient flow and requires the largest investment through re-allocation of existing resources. It is also the sector with the least information available. The SRG recommends that patients requiring outpatient or community-based rehabilitation have timely access to early supported discharge with engagement of Community Care Access Centers (CCAC). It is recommended that appropriate patients receive a rehabilitation program that usually includes 2-3 Physiotherapy (PT), Occupational Therapy (OT), and Speech Language Pathology (SLP) visits per week for 8-12 weeks. These rehabilitation programs could be through outpatient rehabilitation, CCAC, or other community-based rehabilitation providers as appropriate. These resources are not currently widely available in the province.

The estimated investment required in outpatient and community-based rehabilitation programs was based on the following information and SRG expert opinion when data was not available:

- Based on Canadian research^{d,e} it is estimated that approximately 13% of patients discharged directly home from acute care require some form of rehabilitation.

^d Mayo NE, Wood-Dauphinee S, Cote R, Gayton D, Carlton J, Buttery J, Tamblyn R. There's no place like home : an evaluation of early supported discharge for stroke. *Stroke* 2000 May;31(5):1016-23.

^e Willems D, Bryant D, O'Callaghan C. Are stroke survivors getting the rehabilitation services they need? *Stroke* 42[3], e337. 2011.

- All patients discharged home from inpatient rehabilitation require outpatient or community-based rehabilitation
- Among patients in need of outpatient or community-based rehabilitation, 100% will require PT and OT, and 50% will require SLP
- Current outpatient rehabilitation resources are sufficient to meet the needs of 50% of patients being discharged home from inpatient rehabilitation
- Currently, most CCAC services would not qualify as home-based rehabilitation programs as recommended by the SRG.
- A thirty-minute driving distance is reasonable for accessing an outpatient rehabilitation program. Patients with a travel distances beyond this should receive other community-based rehabilitation services.

Data from the Canadian Institute for Health Information's [Discharge Abstract Database](#) (DAD) and NRS suggest that approximately 88% of Ontario patients discharged home from hospital after stroke live within a 30 minute drive of an outpatient rehabilitation program. Assuming the same is true for patients requiring post-discharge rehabilitation, resources to provide outpatient rehabilitation to an additional 1502 patients annually and community-based rehabilitation to an additional 204 patients annually would need to be established. In addition, investment in transportation will be necessary to ensure patients have access to these services in a timely manner.

Summary

Estimates suggest 1,706 additional stroke patients will need outpatient and community-based rehabilitation across Ontario annually, requiring a resource re-investment of approximately \$11M annually.

Chapter 5 – Bringing it all together

Evaluation of the potential impact of best-practice on Ontario's stroke system suggests the following:

- ❖ ~45,000 acute bed days (123 beds) could be made available annually freeing up ~\$26M for re-investment annually
- ❖ ~30,000 CCC bed days (82 beds) could be eliminated annually freeing up ~\$17M annually
- ❖ ~1100 additional inpatient rehabilitation bed days would be required annually (~3 beds) with staffing sufficient to meet best-practice recommendations (~\$12M net re-investment)
- ❖ ~1700 additional outpatient or community-based rehabilitation patients should be cared for annually requiring ~\$11M in re-investment

Full attainment of the OSN Stroke Reference Group recommendations would result in:

- ❖ Improved patient outcomes for Ontario residents who experience stroke

and
- ❖ ~\$20M made available annually which could be used to help stroke patients and their families remain in their homes and become re-engaged in their communities

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Foreword

The goal for Ontario's stroke rehabilitation system is one that is seamless, integrated and patient centered. *This is not the current reality.* This report is structured to evaluate the potential impact of adopting best-practice stroke rehabilitation recommendations in the acute care, inpatient rehabilitation, and community-based rehabilitation sectors; however, this is only for ease of interpretation. It should be noted that in an ideal future state, these sectors should work collaboratively with an integrated systems approach.

This report represents work performed to date. The methods described here represent an overview of the best information available. Where estimates or assumptions were necessary, these were derived based on best-evidence or clinical consensus and the most conservative option was applied. Work is ongoing to validate these assumptions and the results presented here may change accordingly. It is our intention to be forthcoming and open about all assumptions as they currently stand, to note additional considerations, and to outline the need for future research.

Introduction

Ontario's healthcare system is faced with incredible challenges. Under the burden of an aging population, diverse geography, rising healthcare costs and a challenging economic climate, Ontario's Ministry of Health and Long-Term Care (MOHLTC) is charged with trying to promote a system of care that is not only efficient and equitable, but also affordable and based on best practices. These struggles are perhaps best exemplified by the current challenges in managing Emergency Room (ER) and Alternate Level of Care (ALC) issues. Due in part to inefficient flow of patients through the system, the number of patients remaining in an ER or acute care bed waiting for transfer to an appropriate care setting remains unacceptably high; to the detriment of all patients in the system.

In an attempt to manage the growing challenge of ER/ALC, the MOHLTC is actively seeking solutions¹. In December 2010, the Rehabilitation and CCC Expert Panel (RCCCEP) was formed to explore the potential role of rehabilitation and Complex Continuing Care (CCC) in alleviating pressure on ER/ALC by promoting evidence-based approaches to care that would help to improve patient flow². The RCCCEP focused its recommendations on four rehabilitation sub-groups: stroke, hip fracture, hip and knee replacement, and acquired brain injury. Of these four groups, stroke is the main cause of ALC days and consumes the largest number of rehabilitation resources annually.

As the provincial agency responsible for stroke prevention and care the Ontario Stroke Network (OSN) was engaged to support the RCCCEP in recommending stroke rehabilitation best practices and standards of care. The OSN established a Stroke Reference Group (SRG) consisting of rehabilitation experts and stakeholders from across the province ([Appendix 7](#)) to provide advice and expertise in the development of the stroke rehabilitation RCCCEP

recommendations (based on the [Canadian Best Practices Recommendations for Stroke Care](#)). These recommendations were incorporated into the report “[Caring for our Aging Population and Addressing Alternate Level of Care](#)” noting the importance of an “Assess and Restore” philosophy to improve patient flow across the system³.

For the purposes of economic evaluation, this report will focus on OSN SRG best-practice recommendations pertaining to getting the right patient into the right care at the right time. Four areas have been identified for evaluation. The first three are specific practice recommendations made by the OSN SRG, while the fourth represents their expressed intention of ensuring equitable access to rehabilitation services².

- ✓ Timely transfer of appropriate patients from acute facilities to rehabilitation
 - Ischemic strokes to rehabilitation by day 5 on average
 - Hemorrhagic strokes to rehabilitation by day 7 on average
- ✓ Provision of greater intensity therapy in inpatient rehabilitation
 - 3 hours of therapy per day
 - 7-day a week therapy
- ✓ Timely access to outpatient/community-based rehabilitation for appropriate patients
 - Early Supported Discharge with engagement of CCAC
 - Mechanisms to support and sustain funding for outpatient and/or community based rehabilitation
 - 2-3 outpatient or CCAC allied health visits/ week for 8-12 weeks
 - In-home rehabilitation provided as necessary
- ✓ Ensuring that all rehabilitation candidates have equitable access to the rehabilitation they need

Background

In 2010/11, 19,703 people presented to an ER with stroke or TIA in Ontario, 15,524 were admitted to an acute care bed and 13,641 were discharged alive⁴. Collectively, these patients consumed 187,840 acute bed days, 32.6% of which were spent in ALC. Evidently, stroke and TIA represent a meaningful burden to Ontario’s healthcare system and require significant resources.

Research performed in Canada, and internationally, suggests the opportunity for better application of stroke rehabilitation best-practices in Ontario. Ontario data suggest that patients frequently wait for transfer between care settings throughout their journey. On average, a stroke patient in Ontario can expect to experience four days in acute ALC, two days in rehabilitation ALC and 20.5 days waiting for rehabilitation services from CCAC (if referred at all)⁴. In addition, most inpatient rehabilitation facilities do not provide weekend therapy meaning that the average patient will spend nine weekend days in a rehabilitation bed not receiving the recommended levels of rehabilitation. Each of these waits amount to a missed opportunity for recovery and the potential to lose functional gains already achieved. They also represent significant healthcare expenditure and patient flow inefficiencies that could be avoided.

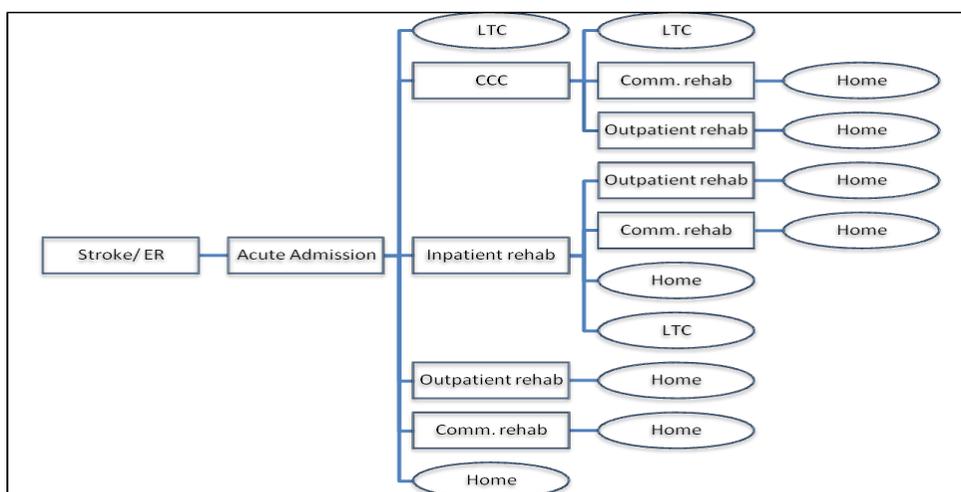
In addition to the challenges faced by patients currently accessing stroke rehabilitation, data suggest that a large number of patients are unable to access the rehabilitation services they need. The best available estimates suggest that approximately 40% of stroke patients are candidates for inpatient rehabilitation at discharge from acute care, yet only 24% were discharged to inpatient rehabilitation in 2010/11⁴. In addition, a substantial evidence base suggests that stroke patients benefit from a timely access to rehabilitation in the community⁵; yet 2010/11 Ontario data suggest that only 13.8% of patients were discharged home to follow-up services. Furthermore, patients referred to CCAC for in-home rehabilitation receive an average of only 3.9 rehabilitation visits total⁴.

The stroke care community is fortunate to have a significant evidence base with which to make recommendations for best-practice⁶. Under the guidance of organizations like the Heart and Stroke Foundation, the Canadian Stroke Network, and Ontario Stroke Network, large research syntheses have been performed⁶ and stroke care recommendations have been established⁷. The challenge facing Ontario is implementing them.

An Overview of the Current State and Proposed Changes

The objective of this report was to evaluate the potential impact of adopting best-practice recommendations related to rehabilitation, and it therefore focused solely on patients whose pathways lead them through government-funded rehabilitation programs. Patients who died, were discharged to LTC, or were admitted to CCC for long-term medical management or palliative care were not included in analyses. A schematic depiction of the *major* pathways stroke patients took after emergency department and acute care admission is presented in Figure 1. These major pathways were used to guide the analyses around improved patient flow under a best-practice rehabilitation system. The evaluation focused on the transitions most commonly seen in real practice, or those that should be occurring more frequently according to best-practice.

Figure 1. Schematic depiction of major pathways through Ontario’s post-stroke rehabilitation system.



A Comment on Cost-Effectiveness

In this report it was assumed that implementing all of the OSN Stroke Reference Panel recommendations into a single model would result in a system of care that leads to improved or equal patient outcomes relative to those achieved by patients in the current system. Based on this assumption, the majority of analyses carried out in this report focused solely on a cost-comparison between the current system and the proposed system. Future research will need to be performed to validate these assumptions.

Report Overview

Analyses focused primarily on the management of patients discharged alive from an ER or acute hospital with rehabilitation needs. The strategy was to first identify the current state of practice using the most accurate available information. Patient trajectories were identified based on 2010/11 data when available and the most recent information available when it wasn't. When assumptions were necessary, every effort was made to be realistic and conservative in estimating the potential impact of best practice. The "best-practice system" was compared to current practice for areas where:

- Potential cost savings might be realized
- ER/ALC bed day consumption may be reduced or eliminated
- Healthcare resources need to be re-allocated to other programs
- Start-up investments may be necessary

For the purposes of economic evaluation, this report focuses specifically on rehabilitation and the potential role that efficient application of the OSN best-practice recommendations could have on Ontario's current healthcare system. Costs and cost savings were evaluated from the perspective of the MoHLTC and were assessed separately within each of the following sectors:

1. Acute hospitals
2. Inpatient rehabilitation facilities
3. Outpatient or community-based rehabilitation settings.

All cost estimates, whether savings or proposed investment, were generated based on the best available information and adjusted as necessary to 2010/11 values. Cost estimates for individual services are presented as incremental costs/savings (per day or per session) and can be found in Appendices [1](#) & [2](#). Potential annual costs and/or savings (assuming 100% adherence to recommendations) are presented by sector and then summarized. The cost values presented here were intended to be a demonstration of potential economic impact, not an exact estimate.

Chapter 1- Acute Care

Applicable recommendation:

- ✓ Timely transfer of appropriate patients from acute facilities to rehabilitation with a mean target of:
 - Day 5 - Ischemic stroke (TIA)
 - Day 7 - Hemorrhagic stroke

Methods

Cost evaluations within the acute care sector are based on the potential for reductions in acute LOS that could be achieved by timely transfer to rehabilitation (inpatient, outpatient or community). These reductions in LOS were divided into several sub-sections for ease of understanding and for cost assessment. The OSN recommendations suggest different mean targets for day of transfer to rehabilitation for ischemic stroke patients (day 5) and hemorrhagic patients (day 7); therefore all analyses were performed separately for these groups. Transient Ischemic Attack (TIA) patients were included in all analyses and were considered under the ischemic stroke target. Patients who experience a TIA have, by definition, symptoms that resolve within the first 24hrs, yet data suggest that many of these patients remain in acute care for an extended period of time and may even be admitted for inpatient rehabilitation⁴. In a best-practice system, it is anticipated that no TIA patients would remain in hospital beyond the day 5 target and none would be admitted for rehabilitation. The recommended discharge day represents a *mean* target for all patients currently discharged to inpatient rehabilitation or directly home and analyses were performed accordingly. Patients discharged to LTC, to CCC for long-term medical management or back to acute care were not considered in estimates of potential reduction in acute LOS.

Complex Continuing Care (CCC) in Ontario serves several functions. A 2009/10 survey found that in addition to dealing with long-term medical issues, CCC beds are frequently used to provide stroke patients with “slow-stream” rehabilitation with the goal of returning them to the community⁸. Current recommendations made by the stroke reference group (SRG) suggest that these patients should be cared for on a standard inpatient rehabilitation unit in accordance with best practice. For the purpose of this report, all patients admitted to CCC who were ultimately discharged home were assumed to have been receiving “slow-stream” rehabilitation and, therefore, to have been candidates for standard inpatient rehabilitation. Due to limitations in the availability of data, these CCC patients were assumed to have been candidates for transfer to rehabilitation by day 7 on average and the hemorrhagic *per diem* acute cost estimate was used to infer potential acute cost impact.

Data from the 2010/11 [Discharge Abstract Database](#) (DAD) and the 2009/10 [Continuing Care Reporting System](#) were used to identify the number of ischemic and hemorrhagic stroke

patients discharged from an acute hospital to home, inpatient rehabilitation, or to CCC^f (and then home)⁴. Collectively, mean LOS in acute care and the total number of acute ALC days consumed were retrieved.

An “avoidable” acute bed day was defined as either an ALC bed day or an acute bed day beyond the recommended day of transfer to rehabilitation. To avoid overestimating the potential for reduced spending, mean *per diem* costs for “avoidable” acute LOS did not include costs allocated to functional centers responsible for acute medical management such as surgical, diagnostic, and laboratory costs. Data from the [Ontario Case Costing Initiative](#) (OCCI) Costing Analysis Tool (CAT) was used to estimate the *per diem* cost of acute care for each patient subgroup based on International Classification of Disease (ICD-10) codes for ischemic stroke (I63), hemorrhagic stroke (I60 & I61), and TIA (G45.9). Reports were generated for each group based on the “typical” patient option available in the OCCI CAT tool. A detailed description of acute care costs is presented in [Appendix 1](#). All costing information is presented in [Appendix 2](#).

Results

Acute care sector results are presented in Table 1. In fiscal year 2010, 10,663 patients with stroke or TIA were discharged home or to inpatient rehabilitation from an acute hospital. In fiscal year 2009 (the most recent year for which information is available) 355 patients were discharged from acute care to CCC and ultimately home.

Table 1. FY 2010 data used in cost evaluation of the impact of OSN recommendations on acute management of stroke patients in Ontario

Ischemic Stroke Data (including TIA)		
Patients discharged home*		
Ischemic (N)		4134
Mean acute LOS		7.9 days
Potentially “avoidable” acute bed days		5391 days
Total acute ALC		6598 days
TIA		
Mean acute LOS		3.7days
Potentially “avoidable” acute bed days		0
Total acute ALC		578 days
Patients discharged to Inpatient Rehabilitation*†		
Ischemic (N)		2964
Mean acute LOS		11.3 days
Potentially “avoidable” acute bed days		10568
Total acute ALC		8105 days
TIA (N)		
Mean acute LOS		8.1 days
Potentially “avoidable” acute bed days		82 days
Total acute ALC		129 days

^f The most recent year for which CCC information was available was 2009/10 and this was assumed to be a reasonable estimate for 2010/11.

Hemorrhagic Stroke Data	
Patients Discharged Home*	
N	696
Mean acute LOS	12.3 days
Potentially “avoidable” acute bed days	2057 days
Total acute ALC	1631 days
Patients discharged to inpatient rehabilitation*†	
N	376
Mean acute LOS	16.9 days
Potentially “avoidable” acute bed days	2158 days
Total acute ALC	1564 days
CCC Rehabilitation Data	
Patients Ultimately Discharged Home‡	
N	355
Mean acute LOS	23.9 days
Potentially “avoidable” acute bed days	2698 days
Total acute ALC	3302 days

*Source: Discharge Abstract Database (FY 2010)

†Source: National Rehabilitation Reporting System (FY2010)

‡Source: Continuing Care Database (FY 2009)⁴

Ischemic Stroke and TIA

Ischemic stroke and TIA patients discharged home or to inpatient rehabilitation were combined for analysis based on a targeted mean transfer to rehabilitation by day 5. In fiscal year 2010, this combined group consumed 15,410 acute ALC bed days and 16,041 additional bed days beyond day 5. Data from the Ontario Case Costing Initiative suggest that each “avoidable” bed day for this group cost approximately \$591.52 ([Appendix 1](#)). Among this group of patients, 100% attainment of the OSN recommendations would result in 31,451 bed days (or 86 bed equivalents) and ~\$18.7M in acute dollars made available annually.

<p>Ischemic Stroke</p> <ul style="list-style-type: none"> ❖ 14,703 ALC bed days x \$591.52/day = \$8,697,118.56 ❖ 15,959 “avoidable” acute bed days x \$591.52/day = \$9,440,067.68 <p>TIA</p> <ul style="list-style-type: none"> ❖ 707 ALC bed days x \$656.58/day = \$464,202.06 ❖ 82 “avoidable” acute bed days x \$656.58/day = \$53,839.56 <p>Total Potential Impact</p> <ul style="list-style-type: none"> ❖ 31,451 acute bed days made available ❖ \$18,655,228 acute healthcare dollars made available

Hemorrhagic Stroke

In fiscal year 2010, hemorrhagic stroke patients consumed 3195 acute ALC bed days and remained in an active acute care bed for a total of 4215 days beyond the targeted discharge date of day 7. Data from the OCCI suggest each “avoidable” day costs \$576.64 ([Appendix 1](#)). Therefore, 100% attainment of the RCCCEP recommendations in this group would lead to 7410 acute bed days (or 20 bed equivalents) made available, and approximately \$4M acute healthcare dollars freed up.

Hemorrhagic Stroke
<ul style="list-style-type: none">❖ 3195 ALC bed days x \$576.64/bed day = \$1,842,364.80❖ 4215 “avoidable” acute bed days x \$576.64 = \$2,430,537.60
Total Potential Impact
<ul style="list-style-type: none">❖ 7410 acute bed days made available❖ \$4,272,902 acute healthcare dollars made available

CCC Rehabilitation Patients

In fiscal year 2009, 1227 patients were admitted to CCC. Of these, 355 patients were ultimately discharged home and were therefore assumed to have been candidates for inpatient rehabilitation in accordance with best-practice recommendations. These 355 patients occupied 3302 acute ALC bed days and 2698 additional “avoidable” bed days. Therefore, 100% attainment of OSN recommendations in this group would have resulted in 6000 acute bed days and approximately \$3.4M made available.

CCC Stroke Rehabilitation Patients
<ul style="list-style-type: none">❖ 3302 ALC bed days x \$576.64/bed day = \$1,904,065.28❖ 2698 “avoidable” acute bed days x \$576.64 = \$1,555,774.72
Total Potential Impact
<ul style="list-style-type: none">❖ 6000 acute bed days made available❖ \$3,459,840 acute healthcare dollars made available

Discussion

Ontario data suggest that movement towards earlier transfer of patients from acute care to rehabilitation holds tremendous potential for impacting ALC and overall acute LOS and for freeing up healthcare resources that could be used to care for patients with stroke in other areas. Conservative estimates of acute care costs were used for all analyses and suggest that a single day reduction in acute LOS amounts to approximately \$600 that could be made available for re-investment. More importantly, efficient transfer of patients to rehabilitation will result in earlier initiation of rehabilitation in accordance with best-practice and opens up a much needed acute care bed.

The overall estimates of nearly 45,000 bed days and \$26M savings represent potential, not anticipated outcomes. In many instances, these reductions in LOS will require substantial re-design of the current system and re-allocation of resources. Focus group participants and stroke experts from across the province noted continually that reductions in acute LOS are not possible without meaningful investment in some acute medical resources (ie. imaging technologies, medical and nursing staff) and down-stream rehabilitation services to accept these patients. It is likely that reductions in acute LOS will be achieved only by way of start-up investment in some of these services and, as such, will require regional commitment to change.

Despite many challenges, the potential for change in the acute management of patients with stroke is substantial. Not only will these changes benefit patients (by providing care in accordance with best-practice), but can serve to reduce acute care spending and open up beds that can help to alleviate some of Ontario's ER/ALC issue.

Acute Summary

Estimates suggest that every single day reduction in acute LOS allows nearly \$600 to be made available for re-investment elsewhere. Patients ready to be discharged home or to rehabilitation (inpatient, CCC, outpatient, or community) currently occupy a large number of bed days beyond the best-practice mean target of day 5 for ischemic strokes (and TIA) and day 7 for hemorrhagic. Attaining these targets represents a significant opportunity to make dollars available for re-investment and to relieve much of the stress on acute bed availability.

Estimates suggest that 100% attainment of the OSN SRG targets for acute LOS could result in:

- ❖ ~45,000 acute bed days made available annually
- ❖ ~\$26M acute healthcare dollars made available annually

Chapter 2 - Inpatient Rehabilitation

Applicable recommendations:

- ✓ Provision of greater intensity therapy in inpatient rehabilitation:
 - 3 hours of therapy per day
 - 7-day a week therapy

Methods

Evaluation of the proposed changes to Ontario's inpatient rehabilitation system was the most complicated step in this analysis and required the most assumptions. Analysis of the potential economic impact of these changes fell under three areas of consideration:

1. Potential reduction in current inpatient rehabilitation utilization through provision of more intensive therapy and smoother transitions through the continuum
2. Potential reduction in CCC utilization by admitting inpatient rehabilitation candidates currently receiving care in CCC to an inpatient rehabilitation unit
3. The cost of hiring additional therapy staff to be able to provide the recommended level of therapy in inpatient rehabilitation

These three considerations were addressed in turn and then summarized into a final estimate of potential economic impact.

1. Potential reduction in current inpatient rehabilitation utilization

The OSN's SRG concluded that improvements in therapy intensity and better patient triage could result in changes to inpatient rehabilitation utilization in two ways:

- Some patients admitted to inpatient rehabilitation could have their rehabilitation needs met by an outpatient or community-based rehabilitation program instead
- Current lengths of stay in inpatient rehabilitation could be reduced by improved efficiency and greater therapy intensity.

Members of the OSN's SRG agreed that a [Functional Independence Measure \(FIM®\)](#) score of 100 was a conservative estimate for the level of function beyond which patients could be discharged to the community to receive outpatient or community-based rehabilitation. It was assumed that under a best-practice model of care, no patient would remain in inpatient rehabilitation beyond a FIM® of 100.

Based on the Rehabilitation Patient Group (RPG) methodology⁹ ([Appendix 3](#)), patients in RPG 1160 on admission to inpatient rehabilitation have, by definition, an admission FIM® score >100 and therefore rehabilitation should occur on an outpatient basis. Data from the 2010/11 NRS

was used to identify the number of RPG 1160 patients admitted to inpatient rehabilitation in Ontario and their average LOS. This value was used to estimate the number of potential rehabilitation bed days that could be made available annually through avoiding admission of these patients to inpatient rehabilitation.

Among patients admitted to inpatient rehabilitation in RPGs 1100 to 1150 in 2010/11, the SRP felt increased therapy intensity and early supported discharge to outpatient or community-based rehabilitation could allow for reductions in their inpatient rehabilitation LOS, in spite of greater acuity resulting from earlier transfer from acute care. Estimation of the potential impact was calculated in 3 steps:

I. Estimate current LOS in inpatient rehabilitation before achieving FIM® of 100

Data from the 2010/11 NRS was used to retrospectively divide all patients into RPG group. Patients with a negative FIM® gain (ie. patients who lost function during their rehabilitation stay) were excluded. Among the remaining patients, those with a discharge FIM® > 100 were identified. The number of excess days spent in inpatient rehabilitation among these patients was estimated using the following 2 formulas:

- If admission FIM < 100 then:
 - # Excess days = (Discharge FIM® score – 100)/Mean FIM® Efficiency for their RPG
- If admission FIM > 100 then:
 - # Excess days = LOS

Within each RPG, a revised LOS was calculated by removing the estimated number of excess bed days in 2010/11 and re-calculating the mean LOS. These revised values were assumed to represent the current LOS for each RPG in accordance with the best practice recommendation of early supported discharge (ie. no patient remaining in inpatient rehabilitation with a FIM®>100).

II. Adjust for greater patient acuity on arrival to inpatient rehabilitation

NRS data from the patients admitted to inpatient rehabilitation in 2010/11 were again accessed. It was assumed that with earlier transfer to inpatient rehabilitation (as per OSN SRG recommendation), patients would have arrived at inpatient rehabilitation sooner and would have a longer anticipated LOS. To adjust for this, it was assumed that patients would experience the LOS of the next most severe RPG (i.e. RPG 1150s would experience the LOS of patients in RPG 1140, RPG 1140 that of RPG 1130 etc.). Therefore, the revised LOS target for the next most severe RPG group was used as an “acuity-adjusted LOS target” for each RPG.

Patients in RPG 1100 represent the most severe category and, therefore, do not have a next most severe RPG group. To estimate the acuity-adjusted LOS target for this group, it was assumed that their proportional increase in LOS would be similar to that experienced by RPG 1110. The difference between the revised LOS target in RPG 1110 and their acuity-adjusted LOS target (the RPG 1100 revised target) was calculated. The proportional change in these two values was then used to generate an acuity-adjusted LOS target for RPG 1100.

III. *Estimate the impact of greater therapy intensity (3-hours per day, 7 days a week) on inpatient rehabilitation LOS*

The SRG agreed that a conservative estimate of the impact of greater therapy intensity would be a single day reduction in LOS for every week of greater therapy intensity (ie. a 14% reduction in LOS for every week of 3-hour per day therapy 7-days a week). Therefore, the acuity-adjusted LOS targets for each group were reduced by 1/7 (14%) to reflect the expected LOS under the best practice system.

The overall economic impact of the best practice system for inpatient rehabilitation was estimated by totaling the estimated impact on rehabilitation LOS across all patients admitted to inpatient rehabilitation in 2010/11 and multiplying this estimate by the *per diem* inpatient rehabilitation cost estimate. The *per diem* cost estimate is presented in [Appendix 2](#) and was calculated based on a 2008 estimated *per diem* cost of rehabilitation in Ontario, inflation adjusted to 2010 values.

2. Improved access to inpatient rehabilitation for rehabilitation candidates currently admitted to CCC

The OSN SRG recommend that patients currently admitted to CCC for “slow-stream” rehabilitation would be better served by admission to an inpatient rehabilitation bed. It is not possible to identify which patients were admitted to CCC for “slow-stream” rehabilitation, so for evaluation purposes, all patients admitted to CCC who eventually returned home were considered to have been candidates for a more intensive inpatient rehabilitation program.

Data from the [2012 Ontario Stroke Evaluation Report](#) were used to identify the number of patients admitted to CCC in 2009/10 who were ultimately discharged home and their mean LOS in CCC⁴. Patients cared for in CCC were assumed to have severe deficits and, as a result, to have arrived with an RPG of 1100 had they been admitted to inpatient rehabilitation instead of CCC. The difference between their CCC LOS in 2009/10 and the target LOS for RPG 1100 was used to estimate the potential CCC bed day reduction that could have been achieved through admission to inpatient rehabilitation.

The potential economic impact of caring for eligible CCC patients in inpatient rehabilitation was estimated based on the difference between the estimated cost of their CCC hospitalization and

the cost of the targeted inpatient rehabilitation LOS. The estimated cost of each patient's stay in CCC was calculated by multiplying their LOS by the estimated *per diem* cost of CCC ([Appendix 2](#)). The anticipated cost of their inpatient rehabilitation was estimated by multiplying the *per diem* cost estimate for rehabilitation by the target LOS for a patient in RPG 1100.

3. Additional inpatient rehabilitation staff

A 2009 survey of inpatient rehabilitation facility managers from across Ontario was used to estimate the number of province-wide full-time equivalents (FTEs) for physiotherapy (PT), occupational therapy (OT), speech language pathology (SLP) and their associated assistants (PTa, OTa, CDA) available to provide care to stroke patients in 2009/10⁸. Facilities were assumed to be running at 80% occupancy and province-wide staffing values were calculated⁹. Using the NRS value for admissions and mean LOS, the total number of bed days occupied by a stroke patient in 2009/10 was calculated (144,750 days). The difference between this total bed day value and the number of available bed days in stroke-dedicated units (assuming 80% occupancy) was used to estimate the number of bed days in general rehabilitation units occupied by stroke patients. This calculation resulted in an estimate of 51,310 general unit bed days occupied by stroke patients or 21% of the available bed days in these units. This value (21%) was assumed to represent the proportion of therapist time available to stroke patients and was used to estimate the number of FTEs for each discipline available to care for stroke patients in general rehabilitation units across Ontario.

The OSN SRG developed recommendations for appropriate staffing ratios. Based on the assumption that each patient should receive 1 hour of direct PT and OT (if necessary) per day, and that a typical therapist can be expected to provide direct therapy for 6 hours in a typical 7.5 hour day, a bed to FTE ratio of 6:1 was assumed to represent the best-practice minimum standard for PT and OT. A search of the peer-reviewed literature was unable to identify a verified estimate for the need for SLP services among stroke patients in inpatient rehabilitation. The stroke reference group agreed that an assumption of 50% of patients requiring SLP services was reasonable resulting in a bed to FTE ratio of 12:1 for SLP. Further research is needed to confirm this assumption.

It is accepted practice that while registered therapists need to oversee all rehabilitation activities, treatments can be supplemented with care provided by certified rehabilitation assistants (at lower cost). No consensus was reached regarding the appropriate ratio of therapist to assistant time, but most SRG and focus group respondents felt comfortable with a minimum 1: 1/2 therapist to assistant FTE ratio. All staffing estimates were calculated using this ratio.

Data from the 2012 Ontario Stroke Evaluation Report and the Canadian Institute of Health Information's (CIHI) National Rehabilitation Reporting System (NRS) were used to estimate the

⁸For stroke-dedicated units, beds were assumed to be occupied by stroke patients at all times. In general rehabilitation units with some stroke-dedicated beds, the stroke-dedicated beds were assumed to be occupied by stroke patients only and the remaining beds were assumed to never be occupied by a stroke patient.

number of inpatient rehabilitation beds days that would have been occupied by patients with stroke in 2010/11 under a best-practice system and the equivalent number of rehabilitation beds required to accommodate these needs (assuming 80% occupancy of stroke beds)⁴. Staffing calculations were performed in 3 steps:

- I. The need for additional weekday therapy staff was calculated by subtracting the number of staff available in each rehabilitation facility (as identified by the survey⁸) from the recommended minimum number of staff based on the best-practice staffing ratio. Since the recommended ratios represent minimum standards, facilities already exceeding these standards were ignored. The total number of additional staff needed at facilities not currently meeting the best-practice standard was calculated.
- II. Assuming that the best-practice staffing compliment would also be required to care for patients on weekends, a minimum best-practice weekday staffing estimate was derived based on 2010/11 expected LOS. This total bed day estimate was adjusted for the assumption of 80% occupancy and then multiplied by 2/7 to generate an estimate for the number of weekend bed days patients would occupy. Recommended staffing ratios were then used to estimate the number of staff that would need to be hired on weekends assuming none are currently employed (an incorrect but conservative assumption).
- III. Focus group and SRG members both noted the importance of funding vacation and sick-day coverage of therapists to ensure continuity of care. Therapy staff members were assumed to require coverage for 6 weeks annually on average (accounting for both vacation and sick time). Therefore, the minimum therapist staffing compliment (including both weekdays and weekends) was multiplied by 6/52 to estimate the annual cost of full vacation and sick time coverage across Ontario.

An estimate for the necessary increase in annual investment in inpatient rehabilitation staff was generated separately for each profession (PT, OT, SLP, and assistants). The number of additional staff in each profession was multiplied by the best available estimate of annual salary as presented in [Appendix 2](#). All staff salary estimates included 25% benefit and vacation coverage. Weekend staff calculations included a \$1.55 weekend premium added to their hourly rate and 25% benefits and vacation coverage were calculated based on this value.

Results

1. Potential for reductions in current inpatient rehabilitation utilization

Results of deriving revised LOS targets for each RPG, acuity-adjusted LOS target and best-practice expected LOS (assuming greater therapy intensity) are presented in Table 2. All best-practice expected LOS values were smaller than those currently being experienced except for patients admitted in RPG 1120 currently.

Table 2. Derivation of revised inpatient rehabilitation LOS targets by RPG based on 2010/11 NRS data, assuming no patient should have remained in rehabilitation with a FIM® > 100 and that increased therapy intensity (3-hours/day 7-days/week) would reduce acuity-adjusted LOS by 14%.

RPG	N (2010/11)*	2010/11 LOS (days)	Estimated Bed Days Consumed with FIM®>100 (2010/11)	Revised LOS Target (no FIM® >100) (days)	Acuity-Adjusted LOS Target (days)	Best-Practice Expected LOS (days)
1160	229	15.0	3441	0	0	0
1150	441	21.3	6015	7.7	9.0	7.7
1140	358	23.8	5287	9.0	16.8	14.4
1130	568	29.4	7155	16.8	29.4	25.2
1120	782	34.9	4280	29.4	41.8	35.8
1110	689	43.4	1130	41.8	48.8	41.8
1100	354	52.7	1367	48.8	57.1	48.9

*excludes patients with –ve FIM® gains during inpatient rehabilitation

Based on the best-practice expected LOS for each RPG, 2010/11 NRS data (excluding patients who made negative FIM® gains) were used to infer the impact of best-practice recommendations on bed day consumption in inpatient rehabilitation. Results are presented in Table 3.

Table 3: Potential impact of RCCCEP best-practice recommendations on bed day consumption in inpatient rehabilitation: difference between the 2010/11 total LOS and the best-practice expected LOS

Rehabilitation Patient Data		
RPG 1160		
Admissions		229
2010/11 LOS		15.0 days
Best-practice expected LOS		0 days
Impact on rehabilitation bed days		-3435 days
RPG 1150		
Admissions		441
2010/11 LOS		21.3 days
Best-practice expected LOS		7.7 days
Impact on rehabilitation bed days		-5998 days
RPG 1140		
Admissions		358
2010/11 LOS		23.8 days
Best-practice expected LOS		14.4 days
Impact on rehabilitation bed days		-3365 days
RPG 1130		
Admissions		568
2010/11 LOS		29.4 days
Best-practice expected LOS		25.2 days
Impact on rehabilitation bed days		-2386 days
RPG 1120		
Admissions		782
2010/11 LOS		34.9 days
Best-practice expected LOS		35.8 days
Impact on rehabilitation bed days		704 days
RPG 1110		
Admissions		689
2010/11 LOS		43.4 days
Best-practice expected LOS		41.8 days
Impact on rehabilitation bed days		-1102 days
RPG 1100		
Admissions		354
2010/11 LOS		52.7 days
Best-practice expected LOS		48.9 days
Impact on rehabilitation bed days		-1345 days

Estimates suggests that application of best-practice recommendations for inpatient rehabilitation in Ontario could result in 16,927 inpatient rehabilitation bed days made available to care for patients not able to access rehabilitation currently. At an estimated cost of \$603 per day, this would amount to approximately \$10,206,981 made available annually for re-investment in health services.

Total Estimated Impact of Best-Practice on Care of Patients Currently Admitted to Inpatient Rehabilitation

- ❖ 17,000 rehabilitation bed days made available
- ❖ \$10M healthcare dollars made available

2. Improved access to inpatient rehabilitation for rehabilitation candidates currently receiving care in CCC

Data from the 2012 Ontario Stroke Evaluation Report on patients admitted to CCC in 2010/11 are presented in Table 4⁴. In 2010/11, 1227 patients were admitted to CCC, 28.9% of who were ultimately discharged home with or without services.

Table 4: Data from the 2012 Ontario Stroke Evaluation Report on patients admitted to CCC in 2010/11

N	N Discharged Home	Mean LOS in CCC (days)	Expected LOS in Inpatient Rehabilitation (days)	Expected Reduction in LOS (days)
1227	355	84.4	50.7	11,964

Based on the assumption that CCC patients admitted to inpatient rehabilitation would experience shorter lengths of stay in hospital if admitted to inpatient rehabilitation, estimates suggest that approximately 11,964 hospital bed days could be made available annually. This would represent 29,962 CCC bed days being eliminated freeing up \$16,808,682 healthcare dollars for re-investment. Shifting these patients to inpatient rehabilitation would amount to 17,998 additional inpatient rehabilitation bed days occupied by these patients at an estimated cost of \$10,852,794 annually. In total, this amounts to an estimated annual cost reduction of \$5,955,888 in healthcare spending annually for these patients.

Estimated Impact of Best-Practice on Care of Patients Currently Admitted to CCC for Rehabilitation

- ❖ ~30,000 CCC bed days eliminated annually
- ❖ ~18,000 additional inpatient rehabilitation bed days required
- ❖ ~\$6M healthcare dollars made available annually

3. The cost of hiring additional inpatient rehabilitation staff to be able to provide the recommended level of therapy

I. The need for additional weekday therapy staff

Best practice expected LOS suggests that in 2010/11, patients with stroke would have required 441 equivalent beds for inpatient rehabilitation. The rehabilitation units contacted in the survey largely functioned Monday to Friday. Of the 50 rehabilitation units surveyed, only 9 met the recommended best practice staffing ratios for each of PT, OT and SLP. In total, estimates suggest the need to hire an additional 7 PTs, 13.9 OTs, 12 SLPs, 3.5 PT assistants, 6.9 OT assistants, and 5.9 CDAs to meet minimum recommendations for staffing levels in all rehabilitation units caring for patients with stroke Monday to Friday (Table 5).

Table 5: Estimated need for additional rehabilitation staff across Ontario by therapy discipline

Discipline	Facility type	Additional Therapy Needs (FTE)	
		Registered Therapists	Assistants
Physiotherapy	Stroke-Dedicated	4.7	2.3
	General	2.3	1.2
	Total	7	3.5
Occupational Therapy	Stroke-Dedicated	8	4
	General	5.9	2.9
	Total	13.9	6.9
Speech Language Pathology	Stroke-Dedicated	7.7	3.8
	General	4.3	2.1
	Total	12	5.9

II. The need for additional weekend therapy staff

Assuming that all facilities would be operating 7 days a week in accordance with best practice, 126 equivalent beds (46,023 bed days) would be occupied on weekends. Minimum staffing requirements for PT, OT, and SLP for these units were calculated based on the assumption of a 1: 6 FTE to bed ratio for PT and OT and a 1: 12 FTE to bed ratio for SLP. The minimum staffing requirements account for the need for registered therapists and assistants. Results are presented in Table 6.

Table 6: Minimum staffing requirements for PT, OT and SLP based on the assumption of a 1 FTE: 6 bed PT and OT ratio and a 1 FTE: 12 bed ratio for SLP

Discipline	Additional Weekend Therapy Needs (FTE)	
	Registered Therapists	Assistants
Physiotherapy	14	7
Occupational Therapy	14	7
Speech Language Pathology	7	3.5

III. Additional staff to cover vacation and sick time

Assuming that patients with stroke would occupy 441 equivalent beds in Ontario, minimum best practice standards would require a staffing compliment of 73.5 FTEs for PT and PTa, 73.5 FTEs for OT and OTa, and 36.8 FTEs for SLP and CDA across Ontario. Estimates for the number of staff required for full coverage of vacation and sick time was based on the minimum province-wide staffing compliment assuming that a therapist (or assistant) is away on vacation or sick 6 weeks a year on average (Table 7).

Table 7: Estimates of the number of FTEs required to cover PT, PTa, OT, Ota, SLP and CDA for vacation and sick time annually in Ontario

Discipline	Additional Therapy Needs to Cover Vacation and Sick Time (FTE)	
	Registered Therapists	Assistants
Physiotherapy (PT & PTa)	5.7	2.8
Occupational Therapy (OT & OTa)	5.7	2.8
Speech Language Pathology (SLP & CDA)	2.8	1.4

Cost Estimate

Combined estimates of the need for additional therapy staff and their associated costs are presented in Table 8. Additional therapy needs include the estimated weekday and weekend needs as presented in Tables 5 and 6 plus the estimated additional need for vacation and sick time coverage.

Table 8: Combined estimates of the need for additional therapy staff and their associated costs

Discipline	Additional Therapy Needs (FTE)		Estimated Cost per FTE	Estimated Annual Cost
Physiotherapy	Weekday	11.1	\$104,057	\$1,155,033
	Weekend	15.6	\$107,835	\$1,682,226
Occupational Therapy	Weekday	18	\$104,057	\$1,873,026
	Weekend	15.6	\$107,835	\$1,682,226
Speech Language Pathology	Weekday	14	\$110,004	\$1,540,056
	Weekend	7.8	\$113,782	\$887,500
PT Assistant	Weekday	5.5	\$52,080	\$286,440
	Weekend	7.8	\$55,858	\$435,692
OT Assistant	Weekday	8.9	\$52,080	\$463,512
	Weekend	7.8	\$55,858	\$435,692
CDA	Weekday	6.9	\$53,688	\$370,447
	Weekend	3.9	\$57,466	\$224,117
Total				\$11,035,967

Discussion

Evaluation of the potential impact of best practice on Ontario's inpatient rehabilitation sector was the most challenging evaluation in this report. Using the best information available, results suggest tremendous potential for improved efficiency relative to current care practices. However, this sector would experience dramatic changes under the proposed best practice system that need to be considered.

In general, inpatient rehabilitation units would experience a shift towards rehabilitation of more severely impaired stroke patients under the best-practice system. This change would arise as a result of several factors. Firstly, many patients with milder impairments would be transferred directly to outpatient or community-based rehabilitation programs without entering inpatient rehabilitation. Secondly, patients would be arriving to inpatient rehabilitation sooner from acute care and could require more medical management. Finally, system re-organization would mean that many patients currently admitted to CCC for "slow-stream" rehabilitation would now be admitted to inpatient rehabilitation.

Inpatient Rehabilitation Summary

Adoption of the best-practice recommendations for stroke care are expected to result in fewer mild patients admitted to inpatient rehabilitation, patients arriving from acute care earlier and with greater acuity, and admission of many patients currently receiving care in CCC. As a result of these changes, a slightly greater demand for inpatient rehabilitation beds is expected and greater patient acuity is anticipated. The net change on the system is estimated to require approximately 1071 additional inpatient rehabilitation bed days annually to accommodate the needs of these patients and more than 120 additional therapist/ assistant FTEs to meet best-practice standards of care. In addition, significant investment will be required to achieve rehabilitation staffing ratios in line with the best-practice recommendations for therapy intensity. However, results suggest that this investment will be completely offset by savings achieved by reducing the need for many CCC beds.

100% adoption of the OSN SRG best-practice recommendations for inpatient rehabilitation is estimated to result in:

- ❖ *~30,000 bed days (82 beds) eliminated annually*
- ❖ *~1071 additional inpatient rehabilitation bed days required (2.9 beds)*
- ❖ *A net savings of ~\$5M annually*

Chapter 3 - The Impact of Rehabilitation on CCC and LTC admissions, mortality and costs 2-years post stroke

Applicable recommendation:

- ✓ Ensuring that all rehabilitation candidates have equitable access to the rehabilitation they need

The purpose of this section is to evaluate the potential impact of a best-practice based stroke rehabilitation system in Ontario on the care of patients unable to access care currently. Ontario-based estimates suggest that approximately 40% of patients discharged alive from an acute care hospital after stroke are candidates for inpatient rehabilitation; yet, only 23% were discharged to inpatient rehabilitation in 2010/11⁴. Previous sections of this report suggest that better application of best-practice principles in Ontario could free up healthcare resources. The objective of this section was to generate discussion about where those resources should be re-invested to further improve patient care in Ontario.

The analyses presented in this section were designed to assess the impact of better access to rehabilitation on patient outcomes and system costs. The goal was to use the best information available to identify patients who were not admitted to inpatient rehabilitation, but were clinically similar to patients who were and to then compare 2-year outcomes. Propensity-score matching has been well validated as a way to utilize observational information to simulate the results that might be seen in a randomized controlled trial¹⁰. By matching patients with similar propensity scores who did and did not receive rehabilitation in Ontario, it is possible to compare them for differences in mortality, admission to Long-Term Care (LTC) or Complex Continuing Care (CCC), and on their cost to Ontario's healthcare system up to 2-years after their stroke.

Methods

The 2004/05 and 2008/09 Ontario Stroke Audits (OSA)^h were used to identify patients who experienced an ischemic stroke in Ontario and were alive at time of acute discharge. Patients were linked by encrypted health card number to the National Reporting System (NRS) to identify patients who received inpatient rehabilitation following an acute ischemic stroke. A patient was considered to have accessed inpatient rehabilitation if an NRS record was located within 90 days after acute stroke discharge (Rehab). If a patient's OSA discharge was not inpatient rehabilitation and no NRS record was located within 90 days after acute discharge, the patient was considered to have not received inpatient rehabilitation (No-Rehab). If the OSA discharge

^h **Ontario Stroke Audit (OSA)** is a population-based retrospective chart abstraction project which is currently performed every two years using a laptop-based application. The OSA samples a proportion of patients with stroke or TIA seen in the emergency department or admitted to an acute care institution in Ontario and collects the same data elements that are collected as part of RCSN SPIRIT Acute Care. Patients are identified by ICD-10 diagnostic codes for acute stroke and TIA from the Canadian Institute of Health Information (CIHI) Discharge Abstract Database (DAD) and National Ambulatory Care Reporting System (NACRS) database.

destination indicated inpatient rehabilitation, but no NRS record was found within 90 days of acute stroke discharge, these patients were excluded from further analysis, as their receipt of rehabilitation could not reliably be confirmed or refuted.

Patients were retrospectively assigned a propensity score based on their likelihood of being admitted to inpatient rehabilitation and of incurring 2-year health system cost (the primary outcome of interest) via logistic regression. Variables included in the model were chosen broadly to capture as much clinical and contextual information as possible (Appendix 5). Once propensity scores had been assigned, Rehab patients individually were matched to a No-Rehab patient with a similar propensity score and identical modified Rankin Scale (mRS) score at time of discharge from acute hospitalⁱ. Based on the availability of data, mRS scores were collapsed into 3 groups (0-2, 3 and 4-5).

Outcomes were compared between the two groups (Rehab and No-Rehab) overall and within the 3 mRS groups (0-2, 3, and 4-5). Outcomes compared were 2-year mortality, LTC admissions, CCC admissions, and costs from the perspective of the MOHLTC. Statistical analysis of differences in CCC admission, LTC admissions, and mortality were performed using a χ^2 test in Openepi v. 2.3.1¹¹. Costing information included OHIP billings, acute hospitalizations, ER visits, same-day surgery, inpatient rehabilitation, LTC, CCC, home care, and Ontario Drug Benefit (ODB) costs as recorded in appropriate databases¹². Costs between groups were compared based on mean total cost up to 2 years and the mean cost per day survived (in order to adjust for varied rates of mortality). Cost estimates were transformed as appropriate (square root or logarithm) based on the distribution of estimates in each group. Statistical comparisons were performed on the transformed data using a paired T-Test in SAS version 9.2.

Results

The 2004/05 and 2008/09 OSAs included a sample of 3493 ischemic stroke patients alive at discharge from acute care. One hundred and ninety-seven patients were excluded because they had been deemed palliative at some point during their acute stay or had incorrect information on discharge date (eg. acute discharge date later than rehabilitation admission date) and 147 patients were excluded because the OSA discharge destination indicated inpatient rehabilitation, but no corresponding NRS record was found.

In total, 612 Rehab patients and 612 non-Rehab patients (1224 patients total) were successfully matched based on propensity score and discharge mRS. Excellent balance (Standardized Mean Difference < 10%) was achieved for all variables included in the propensity score. Analysis of outcomes and costs are presented separately for the complete cohort and then each mRS sub-division.

ⁱ Discharge mRS score is an indicator of patient function and is a commonly used indicator of rehabilitation need

Rehabilitation vs. No-Rehabilitation

There was no statistically significant difference noted between the Rehab and No-Rehab groups in admission to CCC within 2-years of the acute stroke discharge. However, a nearly significant trend towards reduced LTC admissions and a significant reduction in 2 year mortality were noted among Rehab patients compared with their No-Rehab counterparts (Table 9).

Table 9. Whole group comparison of 612 rehabilitation patients and 612 similar no-rehabilitation patients for 2-year CCC admissions, LTC admissions, mortality.

Variable	Rehab	No-Rehab	(p-value)
	N=612	N=612	
CCC Admission	74 (12.1%)	87 (14.2%)	0.27
LTC Admission	68 (11.1%)	91 (14.9%)	0.05
Death within 2 years following acute stroke	94 (15.4%)	146 (23.9%)	<0.001

In terms of health care costs, on average, patients who received inpatient rehabilitation cost \$13,500 more over the 2-year period of observation than the No-Rehab group ($p < 0.001$, Table 10). However, this crude analysis did not account for the varied rates of mortality between groups. The cost per day survived (which does account for disparate mortality) demonstrates patients who received inpatient rehabilitation cost \$12 a day less than their no-rehabilitation counterparts on average ($p < 0.0001$).

Table 10. 2-year cost comparison between the complete cohort of propensity-matched patients with stroke who did and did not receive inpatient rehabilitation in Ontario. Cost estimates are presented as overall group means and cost per day survived.

Value	Cost Estimate		Difference	(p-value)
	Rehab	No-Rehab		
Total Cost	\$60,902	\$47,413	\$13,489	<0.001
Cost/Survival Day	\$135	\$147	-\$12	<0.0001

Rehabilitation vs. No-Rehabilitation - mRS 0-2

Among stroke patients with the mildest disability as measured by mRS (groups 0-2), Rehab patients were significantly more likely to be admitted to CCC within the first 2 years post stroke (8.6% vs 0.9%, $p = 0.005$), with non-statistically significant differences in LTC admissions or mortality (Table 11).

Table 11. Sub-group comparison of 116 mRS 0-2 rehabilitation patients and 116 mRS 0-2 controls for 2-year CCC admissions, LTC admissions, and mortality.

Variable	Rehab	No-Rehab	(p-value)
	N=116	N=116	
CCC Admission	10 (8.6%)	<5*	0.005
LTC Admission	7 (6.0%)	<5*	0.35
Death	14 (12.1%)	10 (8.6%)	0.39

*Results with <5 patients cannot be presented in accordance with the patient privacy policy at ICES

Table 12 shows that patients with mild functional disability (mRS 0-2) admitted to inpatient rehabilitation cost Ontario's healthcare system an average of \$33,056 more over the 2-year period and approximately \$63 more per day survived ($p < 0.001$ and $p < 0.0001$ respectively). The difference in cost between groups was accounted for almost entirely by the additional cost of inpatient rehabilitation services.

Table 12. 2-year cost comparison between propensity-matched patients with stroke and discharge mRS scores of 0-2 who did and did not receive inpatient rehabilitation in Ontario. Cost estimates are presented as overall group means and cost per day survived.

Value	Cost Estimate		Difference	(p-value)
	Rehab	No-Rehab		
Total Cost	\$51,821	\$18,765	\$33,056	<0.001
Cost/Survival Day	\$104	\$41	\$63	<0.0001

Rehabilitation vs. No-Rehabilitation - mRS 3

Table 13 compares outcomes between Rehab and No-Rehab patients with moderate functional disability (mRS 3) at acute discharge. Patients with mRS 3 who were admitted to inpatient rehabilitation demonstrated a significantly lower 2-year mortality post stroke compared to similar No-Rehab patients (11.4% vs 23.2%, $p < 0.001$). No statistically significant differences in CCC or LTC admissions between Rehab and No-Rehab patients were noted (8.0% vs 6.5%, $p = 0.5$ and 11.0% vs 12.2%, $p = 0.68$ respectively).

Table 13. Sub-group comparison of 263 mRS 3 rehabilitation patients and 263 mRS 3 pair-matched controls for 2-year CCC admissions, LTC admissions, and mortality.

Variable	Rehab	No-Rehab	(p-value)
	N=263	N=263	
CCC Admission	21 (8.0%)	17 (6.5%)	0.5
LTC Admission	29 (11.0%)	32 (12.2%)	0.68
Death	30 (11.4%)	61 (23.2%)	<0.001

Rehab patients cost the system an average of \$22,394 more than non-Rehab patients over the 2-year period, and a nominal \$5 more per day survived when compared to similar No-Rehab patients ($p < 0.001$ and $p < 0.0001$ respectively).

Table 14. 2-year cost comparison between propensity-matched patients with stroke and discharge mRS scores of 3 who did and did not receive inpatient rehabilitation in Ontario. Cost estimates are presented as overall group means and cost per day survived.

Value	Cost Estimate		Difference	(p-value)
	Rehab	No-Rehab		
Total Cost	\$53,256	\$30,862	\$22,394	<0.001
Cost/Survival Day	\$103	\$98	\$5	<0.0001

Rehabilitation vs. No-Rehabilitation - mRS 4-5

Table 15 illustrates the outcomes among patients in mRS groups 4 and 5; the most severely impaired stroke patients. Those that received inpatient rehabilitation had lower rates of CCC and LTC admissions within two years of their stroke (17.2% vs 27.1%, $p = 0.02$ and 13.8% vs 24.1%, $p = 0.01$ respectively). Furthermore, the Rehab group displayed lower 2-year mortality, (21.7% vs 33.0%, $p = 0.01$).

Table 15. Sub-group comparison of 203 mRS 4-5 rehabilitation patients and 203 mRS 4-5 controls for 2-year CCC admissions, LTC admissions, and mortality.

Variable	Rehab	No-Rehab	(p-value)
	N=203	N=203	
CCC Admission	35 (17.2%)	55 (27.1%)	0.02
LTC Admission	28 (13.8%)	49 (24.1%)	0.01
Death	44 (21.7%)	67 (33.0%)	0.01

The 2-year costs associated with mRS 4&5 patients who received rehabilitation were, on average, \$6,607 less in total and \$29 less per day survived compared to patients in the No-rehab group (Table 16). While neither of these comparisons reached statistical significance, the cost per day survived estimate indicated a trend towards decreased costs among rehabilitation patients.

Table 16. 2-year cost comparison between propensity-matched patients with stroke and discharge mRS scores of 4-5 who did and did not receive inpatient rehabilitation in Ontario. Cost estimates are presented as overall group means and cost per day survived.

Value	Cost Estimate		Difference	(p-value)
	Rehab	No-Rehab		
Total Cost	\$68,514	\$75,121	-\$6607	0.24
Cost/Survival Day	\$179	\$208	-\$29	0.07

Discussion

The benefits of stroke rehabilitation are demonstrated from such a strong evidence base⁶ that it would be unethical to conduct a randomized control trial to determine the effectiveness of inpatient rehabilitation. A propensity score analysis is the best approach to mimic a randomized control trial using observational data¹⁰. In this study patients with similar propensity scores who differed in their exposure to inpatient rehabilitation were compared. The high number of patient matches achieved in this study are in accordance with previous suggestions that a large number of patients who could benefit from inpatient rehabilitation each year are unable to access services¹³. Furthermore, results of the analyses align with the recommendations for system reform included in the RCCCEP report. Comparison of the Rehab group to the non-Rehab group suggested patients who received rehabilitation had lower two-year CCC admission rates, LTC admission rates, mortality rates and costs per day survived when compared to similar patients who were not admitted to inpatient rehabilitation.

Further exploration dividing patients with similar propensity scores by mRS group (0-2, 3 and 4-5) demonstrated that among the mildly disabled ischemic stroke group (mRS 0-2), inpatient rehabilitation patients were significantly more likely to be admitted to CCC within 2 years, but demonstrated no difference in LTC admissions or mortality within 2 years following their stroke. Yet, they cost, on average, more than similar patients that did not receive inpatient rehabilitation. In fact the mRS 0-2 patients cost the system approximately \$33,000 more over the two years; a figure primarily accounted for by the cost of inpatient rehabilitation. This supports the OSN recommendation that milder stroke patients should not be admitted to inpatient rehabilitation and should have their rehabilitation needs met in less costly outpatient or community-based rehabilitation settings.

Among the moderately disabled ischemic stroke patient group (mRS 3) those that received inpatient rehabilitation had similar rates of CCC and LTC admissions and cost \$24,000 more on average than similar patients that did not receive inpatient rehabilitation. However, the rehab group had a statistically significantly lower mortality rate within two years of their stroke. Not unexpectedly, the improved outcome of 2-year mortality was achieved at a higher average 2-year cost (again mostly accounted for by the cost of inpatient rehabilitation). These patients represent the classic 'middle band' of stroke severity that is traditionally considered ideal for inpatient rehabilitation.

Among the most severely disabled ischemic stroke patients (mRS 4 or 5), the inpatient rehabilitation group demonstrated lower 2-year CCC and LTC admissions, mortality rate and average two-year costs compared to those that did not receive inpatient rehabilitation. These results are in line with the vast majority of stroke rehabilitation research that suggests patients with moderate-to-severe impairment derive the greatest benefits from inpatient rehabilitation⁶.

Key findings include:

- ❖ *On average, ischemic stroke patients admitted to inpatient rehabilitation are more likely to survive to 2-years post stroke and cost the system \$12 less per day-survived compared to similar patients not admitted to rehabilitation*
- ❖ *Patients considered to have mild functional impairments (mRS 0-2) who were admitted to inpatient rehabilitation demonstrated increased CCC admissions, no difference in LTC admissions or mortality and incurred more costs up to 2-years post stroke compared to the non-inpatient rehabilitation group*
- ❖ *Ischemic stroke patients with moderate functional impairment (mRS 3) who received inpatient rehabilitation demonstrated reduced mortality, but greater cost after 2 years*

Chapter - 4 Outpatient/ Community-Based Rehabilitation

Applicable recommendations:

- ✓ Timely access to outpatient/community-based rehabilitation for appropriate patients
 - Early Supported Discharge with engagement of CCAC
 - Mechanisms to support and sustain funding for outpatient and/or community based rehabilitation
 - 2-3 outpatient or CCAC visits/ week for 8-12 weeks
 - In-home rehabilitation provided as necessary

Methods

Outpatient and community-based rehabilitation are critical components of a “best-practice” system of stroke care. Consensus among the OSN’s SRG and focus group members consistently noted that the estimated economic impact of “best-practice” on acute and inpatient rehabilitation sectors cannot be achieved without the timely availability of rehabilitation resources after hospital discharge. Unfortunately, this is the sector for which the least information is available. A 2009 survey of rehabilitation facilities indicated that outpatient and community-based rehabilitation services were insufficient in nearly all regions of Ontario⁸.

In this section, an appropriately resourced outpatient or community-based rehabilitation program will be assumed to consist of 2-3 rehabilitation visits/week/discipline (PT, OT, SLP) for 8-12 weeks as necessary. Community-based rehabilitation may include services provided by CCAC or other community rehabilitation providers. In-home visits by any of these providers for the purpose of safety assessment will not be considered “rehabilitation”.

Estimates of the need for outpatient or community-based rehabilitation resources required assumptions for the purpose of calculation. To estimate the proportion of patients discharged directly home from acute care who require additional rehabilitation, two references were used. A study of an early supported discharge (ESD) program in Montreal screened all acute care patients and identified 12.6% as candidates for care at home⁵. Similarly, a study in Ontario’s South West LHIN identified 11% of patients as outpatient rehabilitation candidates at discharge from acute hospital¹⁴. For economic analysis, it was assumed that 13% of patients with stroke or TIA discharged directly to the community from acute care would require some additional rehabilitation. To estimate the proportion of patients discharged home from inpatient rehabilitation who required additional rehabilitation, SRG consensus was requested. It was felt that in order to provide care in accordance with “best-practice”, 100% of patients being discharged home from inpatient rehabilitation should be provided additional rehabilitation in an ESD program (outpatient or community-based).

Survey results from 2009 indicated that most outpatient rehabilitation facilities felt they lacked sufficient resources to meet the regional demand for services⁸. However, very few facilities were able to give information about how many patients with stroke were admitted in a given year or the number of visits they made. For the purposes of economic evaluation, it was assumed that sufficient outpatient rehabilitation resources were available to meet the needs of 50% of patients discharged from inpatient rehabilitation annually. This assumption was felt to be reasonable by the SRG, but clearly requires validation.

Government-funded community-based rehabilitation in Ontario is primarily provided by Community Care Access Centers (CCACs), although this does not need to be the case. However, in this report, evaluation of community-based rehabilitation availability was based on CCAC data as no centralized database for other community-based rehabilitation programs was available. Ontario's 2012 Stroke Evaluation Report indicated that in 2008/09-2009/10, patients with stroke who were admitted to CCAC for rehabilitation (PT, OT, SLP, SW) received an average of 3.9 in-home visits total⁴. For economic evaluation it was assumed that these services primarily consisted of home evaluations and assessments that, although important and necessary, did not qualify as "rehabilitation". Therefore, it was assumed that no true "rehabilitation" resources were available in the community. This assumption was presented to the SRG and was felt to be reasonable as an overly conservative estimate of rehabilitation availability in the community.

To differentiate between patients in need of outpatient rehabilitation from patients requiring ambulatory rehabilitation, data from the 2009 survey and the 2010/11 DAD and NRS were used to estimate the proximity of patient's primary residence to outpatient rehabilitation. Postal codes of the primary residence for each patient discharged alive from acute care in 2010/11 as well as the postal codes for all outpatient rehabilitation facilities caring for >5 stroke patients per year (identified by the 2009 survey⁸) were used to approximate driving distances from patient's primary residence to the nearest outpatient rehabilitation facility. Patients living within a 30 minute drive were identified as outpatient rehabilitation candidates and patients living beyond were identified as community-based rehabilitation candidates.

Based on these assumptions, estimates were derived for the annual investment in outpatient and community-based rehabilitation needed to meet patient demand. The number of patients for whom outpatient rehabilitation referrals were noted on acute discharge⁴, or for whom outpatient rehabilitation was assumed to be available (50% of current inpatient discharges) was subtracted from the annual estimate of patients needing outpatient or community-based rehabilitation to calculate the need for additional services annually. It was assumed that 100% of patients in need of post-acute rehabilitation would require 2.5 (the mean of 2-3) visits per week for 10 (the mean of 8-12) weeks from PT and OT, and 50% would require the same number of visits from SLP.

Per visit costs for outpatient and community-based rehabilitation services were estimated separately based on information provided by Ontario-based rehabilitation programs ([Appendix 2](#)). Estimates for the per-session cost of community-based rehabilitation included overhead and travel expenses in addition to therapist time. Outpatient rehabilitation costs included program

overhead estimates and therapist time. Estimates of the overall need for investment in outpatient or community-based rehabilitation programs were calculated on a per patient basis and then summed.

Results

Estimates of the additional annual need for outpatient and community-based rehabilitation in Ontario are presented in Table 9. Ontario patient data for 2010/11 indicate that 7448 patients with stroke or TIA were discharged home from an acute care hospital. Assuming that 13% of acute discharges require rehabilitation services and that 6.4% receive referrals to outpatient rehabilitation currently⁴, resources to provide outpatient or community-based rehabilitation to 491 additional patients annually would be necessary.

A total of 2431 patients were discharged home or to the community from inpatient rehabilitation with or without services in 2010/11. Assuming that sufficient resources exist to provide outpatient rehabilitation to 50% of these patients, resources to provide outpatient rehabilitation to an additional 1215 patients is required. In total, this amounts to the need for resources to provide outpatient or community-based rehabilitation to 1706 additional patients annually.

Table 17. Summary of 2010/11 patient data on discharges home from acute care and inpatient rehabilitation hospitals in Ontario and estimates of additional outpatient or community-based rehabilitation needs.

Outpatient or Community-based Rehabilitation Need Estimates	
Acute Discharges (2010/11)	
Patients discharged directly home from acute care [†]	7448
Patients requiring additional rehabilitation (estimate)	968
Patients referred to OP rehabilitation from acute care (estimate) [‡]	477
Additional acute patients requiring outpatient or community-based rehabilitation services annually (estimate)	491
Inpatient Rehabilitation Discharges	
Patients discharged home [†] from inpatient rehabilitation	2431
Current capacity for outpatient rehabilitation (estimate) [*]	1216
Additional inpatient rehabilitation patients requiring outpatient or community-based rehabilitation services annually (estimate)	1215
Total - Combined annual estimate of additional patients in need of outpatient or community-based rehabilitation	1706

[†] Includes patients discharged home with or without services and other community services

[‡] Based on the 2009/10 provincial average of 6.4%⁴

^{*} Based on the assumption that current resources are sufficient to care for 50% of patients discharged from inpatient rehabilitation

In an attempt to identify the proportion of patients in need of outpatient vs. community-based rehabilitation, data from the 2010/11 DAD and NRS were drawn by an analyst at ICES and combined with information from the 2009 survey of outpatient rehabilitation clinics⁸. Results are presented in Table 18 and indicate that of the 13,515 patients discharged alive from an acute

care hospital for whom postal code information was available, 88% lived within a 30-minute drive of one of the identified outpatient rehabilitation clinics.

Table 18. Ontario data from patients with stroke discharged alive from an acute care hospital in 2010/11 and the proximity of their nearest outpatient rehabilitation clinic.

Patient Pop'n	Total Number	30 min from OP	>30 min from OP
Acute Discharges	13,515	88%	12%

A 30-minute driving distance from hospital is an arbitrary determinate of suitability for outpatient versus community-based rehabilitation. Numerous other factors need to be taken into consideration including the patient's physical status and availability of transportation. For illustrative purposes, this cut off has been used to infer investment needs, but further research is necessary to refine this estimate and to determine the proportion of patients living within a 30 minute drive for whom other issues limit their ability to get to outpatient rehabilitation.

Per session therapy estimates (including overhead and travel as necessary) are presented in [Appendix 2](#). The estimated total costs of an outpatient or community-based rehabilitation program are provided in Table 19.

Table 19: Estimated total cost of an outpatient or community-based rehabilitation program

Rehabilitation Program	Services Included	Total cost estimate
Outpatient without SLP	PT & OT - 2.5 visits/week x 10 weeks	\$4716.50
Outpatient with SLP	PT, OT & SLP - 2.5 visits/week x 10 weeks	\$7161.50
Community without SLP	PT & OT - 2.5 visits /week x 10 wks	\$6427.75
Community with SLP	PT, OT & SLP - 2.5 visits/week x 10 weeks	\$9955.75

Based on a travel distance of 30 minutes as an indicator of outpatient rehabilitation suitability, 88% (1501) of the additional 1706 patients requiring post-discharge rehabilitation could be expected to receive this care in an outpatient setting. The remaining 204 patients would require care via CCAC or another community-based rehabilitation program. Assuming that half of all patients would require SLP services, the estimated annual investment in outpatient and community-based rehabilitation services are presented in Table 20.

Table 20. Calculation of the estimated annual investment in outpatient and community-based rehabilitation programs in Ontario to meet best practice standards.

<ul style="list-style-type: none">• 751 outpatients (PT & OT only) x \$4716.50 per patient = \$3,542,092• 751 outpatients (PT, OT, and SLP) x \$7161.50 per patient = \$5,378,287• 102 community rehab patients (PT & OT only) x \$6427.75 = \$655,631• 102 community rehab patients (PT, OT, and SLP) x \$9955.75 = \$1,015,487 <p style="text-align: center;">=</p> <p style="text-align: center;">\$10,591,497 annual increase in spending</p>
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Discussion

Outpatient and community-based rehabilitation are the most important components of a best-practice rehabilitation system in Ontario. The province-wide survey⁸ and each of the focus groups ([Appendix 4](#)) indicated that these resources are lacking and hinder their ability to provide best-practice rehabilitation currently. Unfortunately, this is also the sector for which the least information is available. Therefore, a number of assumptions needed to be made in order to demonstrate the need for investment. Every attempt was made to make reasonable but conservative assumptions. As an example, the assumption that no “rehabilitation” is currently provided by CCACs is clearly an underestimate. This was done to demonstrate the fact that the costs associated with meeting the need for community-based rehabilitation could easily be absorbed from dollars made available elsewhere in the system.

The estimated need for outpatient or community-based rehabilitation resources by patients discharged directly home from acute care were derived from two Canadian studies. One of these studies screened patients in acute care for inclusion in an early supported discharge trial⁵ while the other was an evaluation of a tool specifically designed to screen patients for rehabilitation need at time of acute discharge¹⁴. The fact that these two studies came to similar conclusions about the proportion of candidates for outpatient or community-based rehabilitation adds strength to the assumption made. Again, the 13% value was chosen in order to over-estimate the need for these services. Survey respondents often noted that in Ontario’s rehabilitation system, access to these services is limited and patients are often admitted to an inpatient rehabilitation bed simply so that they will be able to access the outpatient rehabilitation resources they need and otherwise would not have had access to⁸.

Use of the 30-minute drive time to outpatient rehabilitation was arbitrary, but one that has been used previously¹⁵. It was chosen to help differentiate between patients suitable for outpatient rehabilitation and community-based rehabilitation. As can be noted by the associated cost estimates, this is an important distinction. Outpatient rehabilitation is much cheaper than

community-based in-home rehabilitation primarily as a result of differences in travel times. Furthermore, travel time reduces the number of patients that a single therapist can see in a single day. This is an especially important concern in rural and remote areas where health human resources are limited.

When establishing a best-practice rehabilitation system, every effort should be made to utilize outpatient rehabilitation resources. However, this does not mean that community-based rehabilitation isn't important. In-home rehabilitation can offer the distinct benefits of practicing in the patient's natural environment with their day-to-day objects. Therefore, some in-home sessions may still be warranted for outpatient rehabilitation candidates. Similarly, creative strategies for providing remote group therapies for community-based rehabilitation may offer an opportunity to reduce community-based rehabilitation costs while allowing patients the opportunities to socialize and interact with others. In essence, division based on a 30-minute drive time should not be the sole determinate of the type of rehabilitation made available and rehabilitation providers should be encouraged to explore ways to provide cost-effective rehabilitation to patients living in the community.

Regardless of the mode of rehabilitation provision, two things are evident in these analyses: out of hospital rehabilitation (whether outpatient or community-based) is cheaper than in-hospital care, and resources to meet the needs of patients are insufficient. As was noted earlier regarding inpatient rehabilitation, the outpatient and community-based rehabilitation sector should be heavily invested in (even over-invested in at times) to ensure timely availability of services. The only way in which the proposed best-practice system will remain viable and be allowed to demonstrate the projected economic impact is if patients are discharged to rehabilitation programs early in their recovery. These programs must be available to "pull" patients out of acute or rehabilitation beds as soon as possible and this will require that services be available on demand and that service providers are in direct contact with hospital staff at all times.

Outpatient/Community-based Rehabilitation Summary

Information about Ontario's outpatient and community-based rehabilitation systems is scarce. Numerous assumptions were made in order to estimate the potential economic impact of adopting a best-practice stroke system in Ontario. Future research will be necessary to validate these assumptions. Estimates based on the best information available suggest that application of a best-practice stroke system would require outpatient and community-based rehabilitation services to care for an additional 1706 patients a year. Assuming that 88% of these patients could receive care in an outpatient rehabilitation setting and that only 50% of patients would require SLP services, the following impact was estimated:

- ❖ ~1706 additional patients would require outpatient or community-based rehabilitation per year
- ❖ ~\$11M would need to be re-invested in these services annually

Chapter 5 - Bringing it all together

The objective of this report was to evaluate the potential economic impact of adopting the OSN SRG best-practice recommendations for stroke rehabilitation across Ontario. These recommendations indicate the need for a shift towards a more unified and patient-centered system where patients receive the level of care appropriate to their needs in a timely fashion. In order for this system to exist, facilities must begin to provide care based on the patient's needs rather than the availability of services.

The recommendations put forward by the OSN require a shift in service provision from in-hospital care to care in the community whenever possible. Under this reformed system, patients with milder impairments will receive the majority of their care in outpatient rehabilitation clinics or in the community allowing in-hospital rehabilitation resources to be utilized by patients with more severe deficits. This will require that service providers in the community be in contact with patients earlier in their stay to facilitate the transition home, and will also require that inpatient rehabilitation units be better prepared to handle patients with potentially greater acuity. Both of these will require resource reallocation and, more importantly, will require buy-in from everyone involved. Without collaboration and coordination between settings, none of the potential economic benefits noted here will be realized.

The outpatient and community-based rehabilitation sectors are the areas where the least information is available and where the greatest change needs to take place. A large evidence base suggests that patients who receive early supported discharge to the community make more meaningful recoveries at less cost when compared to in-hospital care^{16, 17}. Evidence suggests that this sector has been neglected in Ontario and is insufficient to meet the needs of the majority of patients who experience a stroke⁸. This sector is also the keystone to improvement. Outpatient and community rehabilitation resources must be readily available to allow for patients to be transitioned through the system in a timelier manner. In most instances this will amount to an initial investment. However, this investment cannot be made before appropriate standards of care for these services and coordination between providers is established, and appropriate accountabilities are outlined. Investment in this sector will only have an impact if resources are used appropriately.

Inpatient rehabilitation is a vital component of Ontario's stroke system and must remain so. Results of this analysis suggest that even with transfer of milder stroke patients to outpatient or community-based rehabilitation, the inpatient rehabilitation resources in place currently are insufficient to meet the needs of patients in Ontario. Under a revised system, inpatient rehabilitation beds will be more frequently occupied by severe stroke patients who represent a greater medical burden. Not only will rehabilitation staff be required to carry a heavier load, but more nursing and medical support personnel will also be needed. This raises implementation challenges, many of which were raised by focus group respondents ([Appendix 4](#)). Creative thinking and coordination will be required to manage these challenges in a way that promotes the best possible patient outcomes, but also allows for the efficient use of resources. Solutions may include combining acute and rehabilitation resources within the same hospital and

potentially under the same roof. Other solutions including common referral forms, dedicated transportation and the ability to re-access acute care services when required. Regardless of the situation, coordination between providers will be the key to allowing for smoother transitions through the system and without it the economic benefits noted in this report will not be realized.

Perhaps the most troubling finding in this report was the extent to which patients with very high levels of function are admitted to, or remain, in inpatient rehabilitation in Ontario; although this is not a new phenomenon. In 2011, the Ontario Stroke Evaluation Report noted a trend towards milder patients being admitted to inpatient rehabilitation and suggested that this might be a result of fewer outpatient and community-based rehabilitation resources¹³. The SRG agreed that in most instances, patients with a FIM® score greater than 100 have sufficient functional ability to be discharged from inpatient rehabilitation. Evaluation of patient data from 2010/11 indicated that more than 60% of patients with stroke in Ontario were discharged with FIM® scores greater than 100.

It should be noted that a FIM® of 100 is not a perfect measure of suitability for discharge. The FIM® instrument is a measure of caregiver burden and is often not sensitive to cognitive and communicative issues that might warrant extended stays in inpatient rehabilitation. The FIM® also does not evaluate the safety of the home environment or other important contextual issues. Still, the extremely high FIM® scores noted on discharge from inpatient rehabilitation cannot be entirely accounted for by limitations with the FIM®. Rather, it is likely indicative of the fact that additional rehabilitation resources are scarce and inpatient rehabilitation clinicians are uncomfortable discharging patients to an environment in which no (or minimal) additional rehabilitation is available. This was a sentiment raised repeatedly by the focus groups ([Appendix 4](#)).

This evaluation was started with the goal of assessing the potential impact that Ontario's rehabilitation system might have on ER/ALC issues. Through this lens, it is obvious the provision of best-practice stroke rehabilitation holds tremendous opportunity to free up acute care beds and to help alleviate some of the ER/ALCe issues. However, this will only be achieved through better organization of the entire system. Tough decisions will need to be made as acute care beds and units are re-structured. There will need to be a consistent vision, but many regions of Ontario have already begun this work and will continue to push forward. It will not be easy, but the potential impact can be such that we not only free up much needed resources, but do so while providing better patient care.

Conclusion and Summary

Using the OSN SRG recommendations as a framework, incorporation of the best-practice recommendations into daily practice is expected to have a positive impact on patient outcomes while freeing up scarce resources that can be applied to support stroke rehabilitation best practices and other facets of patient recovery (e.g. prevention, community reintegration, caregiver support, transportation). This report was designed to provide a high-level overview of the potential for change across Ontario and a cost comparison between complete adoption of

the recommendations and the current system. Analysis of the best information available currently suggests tremendous opportunity for improvement and a corresponding reduction in healthcare spending if recommendations are applied properly.

The best information available currently suggests that if the OSN's SRG recommendations were adopted fully, the following impact could be expected:

Acute Care:

- ❖ ~45,000 acute bed days (~123 beds) made available annually
- ❖ ~\$26M acute healthcare dollars made available annually

Inpatient Rehabilitation:

- ❖ ~30,000 CCC bed days (82 beds) eliminated annually
- ❖ ~1071 additional inpatient rehabilitation bed days required (~3 beds)
- ❖ A net savings of \$5M annually

Outpatient and Community-Based Rehabilitation:

- ❖ ~1706 additional patients would require outpatient or community-based rehabilitation per year
- ❖ ~\$11M would need to be re-invested in these services annually

Net Economic Impact:

- ❖ Improved patient outcomes for Ontario residents who experience stroke
and
- ❖ ~\$20M healthcare dollars made available annually to help stroke patients and their families remain in their homes and become re-engaged in their communities

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Appendix 1 – Estimates of acute “avoidable” bed day costs

The following is a summary of the costs included in the calculation of the *per diem* estimates for an “avoidable” acute bed day. All data were drawn from the Ontario Case Costing Initiative (OCCI) website. Calculations were designed to be as conservative as possible.

Ischemic stroke *per diem* acute cost estimate (including strokes undefined)

Functional Centre	Mean <i>Per Diem</i> Cost
Food services	\$39.27
Food services tray assembly and distribution	\$42.23
Medical inpatient services	\$380.69
Clinical Nutrition	\$20.29
Physiotherapy	\$31.21
Occupational therapy	\$28.79
Speech/language Pathology	\$25.08
Social work	\$23.96
Total	\$591.52

Hemorrhagic stroke *per diem* acute cost estimate

Functional Centre	Mean <i>Per Diem</i> Cost
Food services	\$38.78
Food services tray assembly and distribution	\$32.18
Medical inpatient services	\$397.56
Clinical Nutrition	\$16.87
Physiotherapy	\$32.26
Occupational therapy	\$24.64
Speech/language Pathology	\$20.71
Social work	\$13.64
Total	\$576.64

TIA *per diem* acute cost estimate

Functional Centre	Mean <i>Per Diem</i> Cost
Food services	\$44.85
Food services tray assembly and distribution	\$43.42
Medical inpatient services	\$446.41
Clinical Nutrition	\$22.09
Physiotherapy	\$29.27
Occupational therapy	\$34.77
Speech/language Pathology	\$33.72
Social work	\$32.05
Total	\$656.58

‡Source: Ontario Case Costing Initiative (OCCI), Costing Analysis Tool (FY 2009), inflation adjusted to 2010 values using the Bank of Canada Inflation Calculator¹⁸

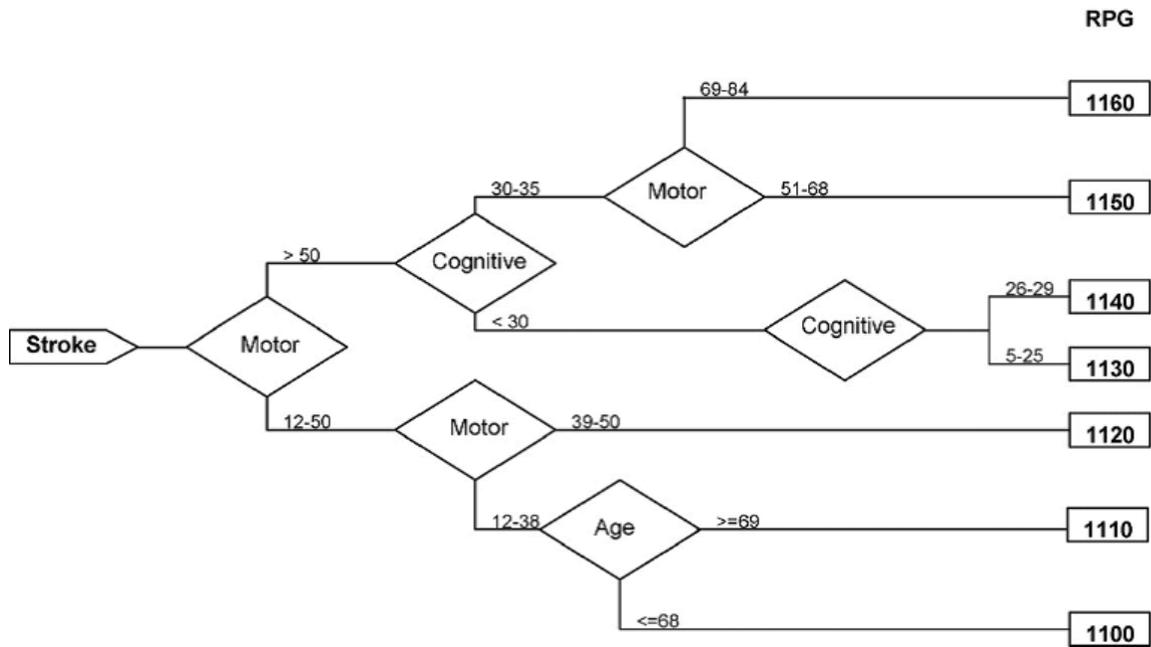
Appendix 2 – Cost Values Used in this Report

Data Point	Value	Source	Adjustments
Acute care bed day – Ischemic Stroke (ICD-10 codes I63,I64)	\$591.52	Ontario Case Costing Initiative CAT tool	Inflation [†]
Acute care bed day – Hemorrhagic Stroke (ICD-10 codes I61,I62)	\$576.64		
Acute care bed day – TIA (ICD-10 code G45.9)	\$656.58		
Inpatient rehabilitation bed day	\$603	RPG stroke values (2008)	Inflation [†]
Inpatient rehabilitation salary (PT)	\$104,057	2014 OPSEU central collective agreement wage grid	None
Inpatient rehabilitation salary (OT)	\$104,057		
Inpatient rehabilitation salary (SLP)	\$110,004		
Inpatient rehabilitation salary (PT/OTa)	\$52,080		
Inpatient rehabilitation salary (CDA)	\$53,688		
CCC rehabilitation bed day	\$561	Estimate provided by Elisabeth Bruyere Hospital, Ottawa	None
Outpatient rehabilitation visit (PT or OT)	\$94.33	Parkwood Hospital Outpatient Rehabilitation Program (2010)	None
Outpatient rehabilitation visit (SLP)	\$97.80		
CCAC in-home rehabilitation visit (PT)	\$117.13	CCAC MIS comparative reports 2011/12	None
CCAC in-home rehabilitation visit (OT)	\$139.98		
CCAC in-home rehabilitation visit (SLP)	\$141.12	SE LHIN CCAC cost estimate (2010)	None

[†] Inflation: Converted to 2008 values using the Bank of Canada's Consumer Price Index¹⁸

Appendix 3 - Rehabilitation Patient Groups

The Rehabilitation Patient Group (RPG) patient classification system was established by the Ontario Joint Policy and Planning Committee using Ontario patient data⁹. The algorithm for dividing patients into RPG groups is provided below.



Appendix 4 - Focus Group Results

Background

In August 2011, the Ontario Stroke Network (OSN) arranged focus group meetings across Ontario as part of the economic evaluation of the RCCCEP best-practice recommendations. Specifically, focus groups were held to discuss the recommendation for earlier transfer to rehabilitation post stroke (targets of day 5 for ischemic stroke and day 7 for hemorrhagic). Input from front-line healthcare providers and hospital administration was sought to inform the accuracy of assumptions being made during the economic evaluation and to gain insight into contextual details that might require further consideration.

Methods

Exploratory focus groups were held with key stakeholders from five regions of Ontario between September 2011 and January 2012. Focus group methodology was chosen because it has been suggested as an effective method for accumulating the individual knowledge of stakeholders, while also giving rise to insights and solutions that would not come about in the absence of group discussion¹⁹. Focus groups targeted involvement by stakeholders that provide direct patient care as well as management/administration from both acute care hospitals and hospital-based rehabilitation programs. The objective of these sessions was to identify existing barriers, and prospective solutions, to adopting RCCCEP best-practice recommendations for earlier transfer to rehabilitation.

Focus groups were held with representative groups from Thunder Bay, the North East LHIN, London, Hamilton and the Greater Toronto Area. These locations were chosen specifically for diversity with regards to current service delivery models and regional geography.

Invitations were sent out to one or two key contacts (hospital administration or OSN representatives) in each region and then forwarded on to potential participants as appropriate. Contacts were asked to invite a representative sample of administration, allied health, nurses, physicians, and others felt to be appropriate from both acute and rehabilitation hospitals. Stakeholders were chosen to provide varied perspectives from a group of individuals who work at several stages along the in-hospital stroke care continuum.

Focus groups were held in person at three sites (London, Hamilton and GTA), via videoconference in one (Thunder Bay) and via teleconference for the other (North East LHIN). At onset, focus group participants were informed about the work being performed by the OSN, the RCCCEP recommendations regarding transfer to rehabilitation, and the objectives of the sessions. Participants were then asked to begin by listing what they perceived to be barriers to meeting the targets for mean time to transfer from acute care to rehabilitation (day 5 for ischemic stroke, and day 7 for haemorrhagic). Once a list of barriers was completed, the facilitator then asked participants to discuss potential solutions to each barrier one at a time.

Technical difficulties precluded recording of the North East LHIN teleconference, so field notes were relied upon for subsequent analysis of this group. Each of the other focus groups was either audio or video recorded. Data analysis was carried out by two independent researchers and conflicts were settled by subsequent discussion and, when appropriate, by contacting focus group participants. In brief, the steps used for analysis followed those outlined by Miles and Huberman (1994) and included: 1. Coding of the field notes and transcribed data; 2. Sorting through the material to identify similar phrases, relationships, patterns, themes and distinct differences between subgroups; 3. Confronting these themes with a formalised body of knowledge (researcher's expertise and academic/grey literature)²⁰.

Results and discussion

The results below highlight the themes related to perceived barriers to the implementation of the best-practice recommendations for timely transfer to rehabilitation. Results are organised to reflect both the collective concerns of the stakeholders and their proposed solutions.

Data analysis revealed a large number of perceived barriers. Multiple groups noted the same barriers (or subtle variations) in several instances. However, the discussion around solutions to overcoming these barriers often indicated marked variation between sites in terms of their current team dynamic, regional system structure, or work being done to overcome the identified barriers.

Generally, all barriers were felt by the 2 analysts to fit within one of 3 overarching themes: patient-centred, clinician-focused, or resource and system-based. All noted barriers are presented and discussed under these 3 general headings. Within each heading, barriers are presented in descending order of importance (as indicated by the frequency or duration of discussion). In cases where a perceived barrier might fit within more than one of the above mentioned headings, it is included in the section under which the analysts collectively felt it was most appropriate.

1. Patient-Centred Barriers and Solutions

a) Patients not medically stable by target date of discharge leading to greater acuity in rehabilitation

Participants representing both the acute and rehabilitation centres expressed concern about patients' capacity to enter rehabilitation early in their recovery. Several members noted that in their experience, patients that have had more than 5 days in acute care are often still unable to attend full-length rehabilitation sessions, raising the question about whether a move to rehabilitation is in their best interest.

Across all focus groups, good discussion around solutions to this problem took place. Firstly, all groups agreed that there needs to be flexibility in the targets for day of discharge to rehabilitation. If the stated targets of day 5 and 7 are held as average targets, this would allow

for some patients to remain in acute care longer if need be, as long as others were transferred sooner. Nearly all focus group participants seemed comfortable with this.

As part of this discussion, it was regularly noted that earlier transfer to rehabilitation would require a shift in the current thinking around “medical stability” and this will depend in large part on the relationship between acute care and rehabilitation. Participants regularly noted that some patients would not be able to tolerate high intensity rehabilitation at this early stage. To this one of the panel members suggested:

“From a system perspective, it’s cheaper to have them in rehab where they can get as much as they can tolerate, even if its 20 minutes or an hour a day, than to keep them in acute care where they probably will deteriorate, if anything”

In response to this comment, an acute care physician noted:

“I would agree that, all things being equal, the patient is still going to get better treatment down at [rehabilitation] than they would up here even if they’re maybe too early for what you would consider ready for the full board of services you have to offer. My concern would be that if we’re shipping them too early, it’s all the other baggage that comes with that, that’s all the other medical problems and testing that needs to be done that they might need to stay here for an extra 2-3 days”

This comment speaks to a theme that arose in all focus groups. Participants continually noted concern that current rehabilitation staff are not equipped to handle patients with acute care needs in the rehabilitation setting. The absence of specialist consultants, allied health representatives and access to services on evenings, holidays and weekends is a barrier to bringing more acute patients into the rehabilitation sector. For instance, a rehabilitation physician noted:

“If you’ve got somebody that has SIADH that has unstable sodiums and you need to monitor them that much more closely, we would have to have, again, not only nursing, but we would have to have laboratory support to be able to get frequent blood work after hours”

Concerns about patient’s stability including medical and emotional co-morbidities were also raised by all groups. This point was emphasized by the Thunder Bay representatives who noted that in rural areas, the inclusion of family in helping to address stability issues may not be feasible given the distance family need to travel to be with patients. This makes managing unstable patients even more challenging for rehabilitation staff.

In all groups, participants felt that increased acuity in rehabilitation could be better managed if there was increased access to specialised staff, including those clinically trained to deal with acute medical problems, diagnostics, as well as staff for hospital upkeep and other pragmatic issues. This would mean significant changes to nursing ratios to incorporate more registered nurses and nurse practitioners. It was also noted that handling acute patients in rehab facilities is much more feasible for rehabilitation centres that are in the same geographic location as

acute services where the transfer back to acute services, and continuity of care, is more likely to occur smoothly.

In the absence of centralized services, alternative suggestions included the implementation of: 1. Mobile specialists to deal with co-morbidities and need for additional diagnostics; 2. Dedicated transportation for the transfer of patients between acute care and rehabilitation when necessary; 3 The enrolment of a case manager/system navigator that would follow patients from admission to acute care through to discharge into community. In essence, these solutions boil down to investment in resources for post-acute patient management.

Ultimately, all groups seemed to agree that earlier transfers to rehabilitation could be accommodated with appropriate planning. Several groups commented on the need for a system to ensure that patients are ready for rehabilitation by days 5 or 7. The major suggestion was to develop pathways that could help to identify where patients need to be starting on day 1 and planning ahead so they are in a position to be transferred by day 5 or 7 if appropriate.

b) Uncertainty around ultimate or optimal discharge destination

Another patient-centred concern with the day 5 or 7 transfer to rehabilitation was that some patients, if kept in acute care for a few more days, would be able to move to the community rather than into rehabilitation. This was raised as a concern that challenged the cost benefit of earlier transfer to rehabilitation as a way to decrease costs. It was suggested that if an admission to rehabilitation can be eliminated altogether, keeping patients in acute care for an extra day or two could be more financially viable.

This concern again highlighted the need for early assessment. It was noted that possible patient dispositions needed to be considered and discussed as early as possible before the patient is transferred to rehabilitation. There were also several other solutions that might help to alleviate this problem. First, if discharge targets were flexible, keeping a patient in acute care for an extra day or two would not be problematic. Second, if appropriate rehabilitation services were available in the community, plans could be made early on to send milder patients to the community instead of inpatient rehabilitation. Finally, if acute and inpatient rehabilitation facilities were in the same location, the transfer of a patient to rehabilitation, even if only for a day or two, would be much less burdensome and might still be cost saving.

c) Patients may not be emotionally prepared for transfer to rehabilitation

Although some patients may be physically ready for rehabilitation, they (and their family) may not be emotionally prepared for the transition. Along this line, there was concern that when day 5 or 7 transitions occurred, social work and counselling services might not be available in time to have assessed the patient's disposition prior to discharge. The suggested solutions to this issue were to ensure adequate social work staffing (especially on weekends and holidays) and to promote continuity of care between acute and rehabilitation units through consistent staffing (ie. The same social worker in both settings), or better communication between social workers in the two settings.

d) *Non-stroke medical issues*

The final patient-centred barrier raised at only a single site was the management of non-stroke medical issues or comorbidities. The concern here was that patients with numerous other issues might require longer acute care lengths of stay that would challenge a facilities ability to meet targets for discharge. Group discussion quickly identified that this was a rare occurrence and agreed that flexible targets for discharge date could likely accommodate the issue. It was also noted that proper screening in acute care would be necessary to ensure that these patients are not discharged to rehabilitation too soon, so that acute readmissions could be avoided.

2. Clinician-Focused Barriers and Solutions

a) *Procedural issues with getting tests, assessments, and medical procedures completed in time*

Perhaps the most commonly discussed barrier to earlier transfers from acute care was concern about getting the medical work-up completed in time. All groups noted that clinician shortages (often physicians, but also therapists and technologists) and poor coordination of services played a major role in keeping patients in acute care beyond the targets for discharge. In one group, administration noted that they lack “teeth” in getting consults to happen. To this another participant asked:

“Is it just the ordering of the tests, or is it that the test is ordered and we wait?”

The response agreed upon was that it was both. This led another respondent to note:

“I don’t think there is a key performance indicator for a wait time (for test ordering or completion) across the organization that we can be measured against.”

This was a sentiment echoed by most groups. The concern seems to be that there is little accountability when it comes to the timeliness with which assessments and tests are completed.

“I think you would have to look at the major key groups that provide our diagnostic services, so [here] it’s imaging and cardiology. If they could work out a system that would somehow streamline, expedite investigations for this group of patients so that we’re not keeping them in hospital an extra 2 or 3 days just to get an echo, but we [also] know that if we discharge them we’re not going to wait three months, we could get it within 2 weeks or some reasonable period of time. It would have to require some cooperation in the other diagnostic labs.”

Yet, despite this being a commonly cited barrier, the discussions around solutions took very different forms across groups. Several sites noted continued frustration in trying to deal with these issues.

“Is it realistic to think that a lot of these things could be arranged before the point of discharge?[It would require some]senior leadership....especially with regards to discharge workup, EEG or an echo or whatever...we’ve actually spoken with admin, management and

access and flow people to liaise with these departments, because often we will call and say 'this is.... and well we've got so and so and x number of patients' and it's not really helped us in expediting those tests... if there's not one person taking this on it falls through the cracks."

In several sites, it was noted that there are unique issues around getting diagnostic tests completed when rehabilitation and acute care are on different sites, as well as institutional hurdles when acute care and rehabilitation are held at separate institutions. A rehabilitation physician in a hospital where the rehabilitation unit is off-site and in a different institution noted:

"[It] makes it all the more important that tests are done before they come over... because otherwise we are left with trying to deal with it within our own institution."

While these frustrations were recognized as legitimate by most groups, one in particular had a unique perspective on solutions. One of the hospital groups has established a system where acute and rehabilitation services are centralized within the same organization and under the same roof. In this organization, diagnostic laboratories and the stroke unit had negotiated blocks of time to ensure timely completion of tests.

"You negotiate blocks because you know you've got 700 people coming through your unit in a year and you know that we have standard orders, so they're very specific tests and diagnostics that must be done and they will be done on everybody. So let's just cut to the chase.... So they're prepared."

"The utilization is happening anyway, it's just that it's being organized. This is not rocket science.... That's a manager to a manager, a director to a director... and it's possible."

When asked about the fear that the slots will be left empty, they responded:

"...we give them up closer to the time. If we haven't used them close to the time, then we call and give them up.....they will not go empty."

When asked about the concern that stroke patients become priority at the expense of other patients, one responded:

"There are 2 CMGs in our healthcare system that take up the biggest expenditure in hospital care, in length of stay... and that's MSK and stroke.... if you can get that world organized, everybody else is going to benefit. It is about patient flow, it's about access and it's not just for strokes, it's for everybody else, and if I come in with a trauma or with a heart attack, I want just as good access as the stroke patients and you know what, I'm gonna get it because I haven't got 50 million MSK and stroke patients sitting around for 25 days in hospital waiting for their ultrasound or CT....it's called slip-streaming, everyone else is going to come in then."

While this group clearly had strong opinions about the need to organize care, they also noted several advantages that allowed them to have success. First, being in the same organization at same site as their acute care made things much smoother. Second, the program is in a large urban area that draws from a significant catchment area. This allows them to have sufficiently

steady volumes to make blocks of diagnostic time feasible. The group openly discussed the fact that not having these advantages could represent challenges in other regions, but that these challenges can be overcome with some creativity.

b) Clinician comfort/ tradition

Clinician comfort was a theme that arose on several occasions in essentially 2 forms. In the first, clinicians would need to be flexible about their traditional roles and begin to think about ways they could be innovative. Beyond this there was also concern that in order for a clinician to discharge patients earlier, they need to feel comfortable about the fact that the patient will continue to receive adequate care in the next phase of their journey. Solutions to overcoming these barriers included shifts in culture, better communication, and improved access to resources.

It was noted on several occasions that clinicians would need to accept that fact that their roles will change. For instance, one acute clinician noted that if patients are being transferred to rehabilitation on day 5, the acute therapists simply will not have time to begin active therapy. Therefore, their role will shift more towards acute management and assessment.

“[clinicians] are used to going through the full gamut of tests and having the absolute of absolute pictures rather than handing off to their rehab counterpart. I think it’s a change in practice with regards to letting go a little bit earlier, handing the patient off and allowing some of these diagnostic tests that traditionally were done on the acute side of things to be done on the rehabilitation side.”

This in turn led to discussion about communication. In a system where patients are discharged earlier, all acute clinicians will need to be better at passing on information to their counterparts in rehabilitation, or be responsible for overseeing patient care in both settings if possible. There seemed to be a number of possible solutions, however, communication arose as a key to all of them. As an example, at one site a member of the rehabilitation group commented on the fact that patients admitted to rehabilitation were frequently re-assessed and that the results often led to different outcomes than were presented by the acute clinicians. Through discussion it was quickly noted that this issue could be addressed through better communication between clinicians, which would improve the process and eliminate some redundancy. As a further example of this, one centre had developed a system where staff rotate between acute and rehabilitation.

“Therapists are stroke specialized and have rehabilitation experience and [because] they rotate between [acute care] and [rehabilitation] they really have that understanding and appreciation about what the care looks like in those different settings.”

“It gives you a really unique perspective on both ends of the system and allows for an understanding of how it needs to work, so the fluidity and the speed of what’s happening is understood by everyone involved.”

The final suggestion was related to resources. It was noted, for instance, that the lack of outpatient and community-based rehabilitation often contributes to extended lengths of stay in acute care and rehabilitation. Several groups noted that clinicians essentially know that once a patient leaves their unit, the rehabilitation is finished and this was concerning to providers. It was noted that with investment in outpatient or community-based rehabilitation sectors, many patients could be discharged sooner and clinicians would feel more comfortable making these transfers.

3. Resource and System-Based Barriers and Solutions

a) *Resource and technological concerns inhibiting completion of tests, assessments, and medical procedures in time*

This concern shares significant overlap with the clinician-based barrier of procedure times discussed previously. However, this barrier was noted so frequently and garnered so much discussion that it was felt to be worth mentioning twice. The subtle distinction here is that on one hand (as discussed above) there are procedural concerns related to when assessments and tests are performed or ordered and who is held accountable for ensuring their completion. On the other hand, there are issues around resources (ie. sufficient clinical staff and technologies to carry out the necessary orders). Stakeholders in both the acute and rehabilitation sectors recognised that diagnostic services and staff are time poor, and that it is not always feasible to have all the diagnostics completed within the recommended 5 or 7 day period. One inpatient clinician noted:

“Part of the problem when you look at diagnostic tests on an inpatient versus and outpatient is the funding model... the technical fees that come with a diagnostic test, if it’s an inpatient test, come out of the hospital globe. If it’s an outpatient then the hospital gets a technical fee for that study. So, when you’re running a diagnostic lab, in a way there’s a disincentive to save slots for inpatients when, you know, you get the same professional fees and you also get an additional technical fee if it’s an outpatient.”

When asked if making off-site rehabilitation patients inpatients for diagnostic testing purposes would help, the answer was:

“No, it would actually make it worse because the tests would then come out of the acute hospitals global budget and would not attract any ‘new money’.”

From this discussion it is apparent that there are limitations in the availability of acute services. It was agreed upon by most groups that this stemmed largely from the current funding system and one rehabilitation physician noted that some type of financial incentive for accepting patients in a more timely fashion might help.

b) *Insufficient staffing (both acute and rehab)*

The largest concern for rehabilitation staff is that their resources are already strained.

There is currently a lack of staffing and resources in rehabilitation that are necessary to deal with patients with acute care needs as discussed previously. The solution identified by participants was increased services, which included more beds dedicated to stroke patients, more therapy staff and space, increased staffing for treatment and assessment of patients, and better availability of allied, pharmaceutical and clinical staff on weekends and holidays. It was repeatedly suggested that if patients are to be admitted on evenings and holidays, there will need to be staff to process and assess these patients in both the acute and rehabilitation sites.

“We’ve talked about the 7-day model, but... without additional resources that is very difficult to... that’s a dream for the future. So, we know that if we provide rehab for more days of the week that people are going to do better and do it sooner, but we’re not ready to go there yet.... If you could give me more therapists, that would impact on the system....ideally [the therapist] would like to have every patient in the gym twice a day, but they cannot do it [now].”

Some of the suggestions put forward to facilitate patients to be discharged by days 5 or 7 were to provide diagnostics and assessments during weekends and holidays. However, there was recognition by acute health care professionals that they are already overworked and that they cannot be expected to work additional hours. Rather than stretching current resources, it was identified that there would be a need for additional medical professionals (including specialists and consultants) as well as support staff to enable 7 day a week services in acute care.

c) Rehabilitation bed availability

Rehabilitation administration in several groups noted that there would have to be additional resources in place in rehabilitation facilities to be able to accept patients 7 days a week in a timely manner. The concern here is that in order to move patients through rehabilitation efficiently, they need to have adequate beds available to accept patients, as well as access to post-rehabilitation resources so patients don’t remain in a bed unnecessarily. When asked about the number of beds, one rehabilitation physician noted:

“Our bed structure is pretty good actually right now. We’re running at about 80-85% capacity [and] recently we’ve been much more full. However, if you think about it, you’re going to be moving more patients through more quickly. So, in essence, probably our current bed status is not going to be an impediment.”

However, concern about transitions was then raised by a rehabilitation administrator who added:

“Our ALC is creeping up slowly, so our risk of bed blocking is starting to get to the stages that are of great concern. I currently have 7 out of 30 blocked.”

When asked why, she noted:

“We don’t have as good of access to ‘home first’ [as acute care]. We’re at a disadvantage.”

It was also noted that patients on an ALC list in rehabilitation are at a lower priority than patients in ALC at an acute hospital for transfer to other destinations including LTC. Rehabilitation staff noted that this leads to “bottlenecks” that ultimately lead to difficulty with accepting patients who are acute ALC.

d) Transportation between acute care, inpatient rehabilitation and outpatient services

This issue was raised primarily by focus groups in regions where rehabilitation is held in a separate facility from acute care. In these instances, the cost of transportation between sites is troublesome. Concerns in these settings include the cost of transfer at the time of initial discharge, for follow-up appointments and tests, and in instances where complications arise and an emergency transfer to acute care is necessary. One site noted that the staffing required to send a patient back to acute care amounted to a “4-hour minimum” cost for staff. This assertion was challenged by another participant who suggested that not all patients would require staff escort, but agreed that it would often be the case. Perhaps more importantly, it was noted that patients often miss out on rehabilitation while waiting for transportation back and forth.

“We can have a client lose an entire day waiting for transportation from acute care back to rehab.”

One obvious solution to this concern is housing acute care and rehabilitation in the same facility or very nearby. In instances where this is not possible, dedicated transportation was offered as a possible solution.

“If we [rehabilitation] had our own dedicated transportation service that had the ability to get these patients back and forth in a more timely manner... then if they are having to be transferred back and forth to acute care for an appointment there [would be] fewer delays.”

e) Healthcare silos

An important issue that commonly arose was the concept of healthcare silos. There was concern raised in several groups about the division between acute care, inpatient rehabilitation and community rehabilitation that contributed to a fractured system with little continuity of care.

“We’re in a contradictory sort of environment whereby in the acute setting the pressures are to increase efficiencies through reduced length of stay, reduced ALC, however on the community end of our system delivery the cuts are actually going to do the opposite of what the acute, and probably the rehab sector, have been obliged to do..... In the community sector, by reducing the number of hours available to support strokes, or anybody else in the community, is going to have a negative impact on the front end.”

Solutions to this challenge generally amounted to better communication and better funding.

“We’re talking about the barriers to transition and trust, and I think that feedback loop [is important] .. because I think the community would be more receptive and open to taking individuals if they knew that person could come back if they were having difficulties and I think

there's a lack of trust with healthcare professionals and a feeling of 'I am the only one who can provide this service for this individual', or 'what will happen to them if I let go?'"

Interestingly, the suggestion was made that a different funding structure might also help to alleviate this concern.

"I think if we could look at the funding formula in terms of funding healthcare providers to do transition management and actually having that as a visit for CCAC, where OT, PT, SLP can come into an outpatient clinic[or inpatient rehab or acute care] and do their initial assessment at the same time that the outpatient therapist is doing their discharge assessment. It's the same amount of money being spent, just looking at doing it in a different way."

f) *Limited access to stroke-specific care/ Improved knowledge about stroke best-practices*

Many of the participants in these groups were intimately familiar with best-practice recommendations for stroke care and often spoke of the need for better adherence to these recommendations. This included the need for developing stroke expertise and increasing patient access to stroke services.

"One of the challenges that we have from a regional perspective is that, right now our stroke patients are being cared for in, and I'm going to use the term 'general rehab' programs throughout the region. The definition of a 'general program' if you say for all patients does not always include the best practice piece for stroke. So we're seeing patients go into rehab centers where they can't access the services they need from certain professionals... it's the levels and even just the professionals themselves are not available in some of these centers.... Speech [language pathology] is a big piece of that, neuro-psychology is a big piece of that, especially with the hemorrhagic strokes that tend to be younger and need to return back to work."

Solutions to this challenge essentially boiled down to improving awareness about the recommendations in facilities across the province, and holding facilities accountable for maintaining minimum standards of care.

Appendix 5 – Variables Included in the Propensity Score Matching

Propensity Score Variables		
Age	History of Dementia	Acute stroke unit care (Y or N)
Sex	History of Depression	Stroke Type
OSA year	Pre-Event Independence	Discharge mRS score
Facility Type (Regional or District Stroke Center vs. other)	Level of Consciousness on Arrival	Most responsible hospital physician
Previous living situation (alone, with others)	Acute Thrombolysis	History of Asthma

Appendix 6 - Additional Considerations

This report was designed to present a high-level evaluation of RCCCEP recommendations for an improved stroke rehabilitation system. As such, the potential impact of the 4 chosen recommendations was undertaken. However as work proceeded, a number of additional considerations were identified which were beyond the scope of this report, but merit further discussion. A few of the most important will be noted here and many of the others are outlined in the results of the focus groups ([Appendix 4](#)).

Acute and Rehabilitation Costs Not Accounted for in this Report

Focus group discussions continually noted that the proposed system built around earlier transfer to rehabilitation will generate costs beyond those noted in this report. Costs for acute medical interventions, acute staff, and rehabilitation resources beyond rehabilitation staff will arise. For instance, informal discussion with administration at one rehabilitation hospital noted that they had explored the potential cost of admitting patients 7-days a week and estimated the need for approximately \$100,000 annually beyond their current budget to make that possible.

The need for additional resources is highly variable from facility to facility and could not be reliably estimated for the purpose of this report. It is strongly recommended that further evaluation at a regional level be performed so that better understanding of these costs can be explored and factored into decisions about system re-design. Still, results of this economic evaluation suggest that most, if not all, of these additional costs could be accounted for by reductions in overall system spending.

Rehabilitation Nursing

The role of nurses has not been explored in this report, but is an integral part of patient recovery. Nurses are integral members of a rehabilitation health care team and act in a number of capacities to facilitate patient recovery. The role of a rehabilitation nurse includes that of an advocate, facilitator, coordinator, councillor, and liaison; all essential to fostering an effective and supportive rehabilitation environment²¹⁻²³.

Nurses play an important role in ensuring that barriers to effective rehabilitation are addressed including pain management, wound care and prevention, continence training and management. Research suggests that addressing these needs is an integral part of a rehabilitation program²² and providing a therapeutic environment that facilitates effective and consistent rehabilitative care²¹.

Although the role of nurses in rehabilitation is essential to patient recovery, its effect on patient outcomes has not been well examined. It has been demonstrated that FIM gains and FIM discharge scores are significantly correlated with total nursing hours per patient day, the percentage of Registered Nurse's (RN) certified in rehabilitation nursing, and the competence of

RN staff as rated by the nursing manager²⁴. Furthermore, these factors were found to have a significant effect on reducing patient length of stay on an inpatient rehabilitation unit. Another study by Poslawsky et. al. noted that nurses are proficient in the early detection of aphasia, and that the collaboration between speech language therapists and nurses is essential for maximizing the intensity of speech therapy, ultimately enhancing the quality of treatment²⁵.

Future work should be completed to further assess the role of nurses in improving patient flow through the system and improving patient outcomes. In the current report, there was insufficient evidence available to make recommendations about standards for nurse staffing ratios or the ratio of RNs to RPNs. This was raised as a concern on several occasions by the focus group participants and should be address in further research.

Social Work

The Canadian Best Practice Recommendations for Stroke Care specifically identify social workers as integral members of a multidisciplinary patient care team⁷. Yet, social workers were not specifically mentioned in the RCCCEP recommendations for therapy and, therefore, were not considered in this report. However, there is no doubt that they play an integral role in the rehabilitation process and their impact should be explored in more detail going forward. The Canadian Best Practice Recommendations state that patients should have an up-to-date care plan defining ongoing psychosocial needs and that '[p]atients, families and caregivers should be assessed to determine their needs and readiness for information and education, training, psychosocial support, and health and social services'. All of these responsibilities are congruent with the role of the social worker. Furthermore, the number of patients seen by a social worker is indicated as a performance measure for adherence to these recommendations.

Social workers are in the optimal position to identify the risk for depression and other mental health disorders in their patients. A 2006 study suggested that the rapid assessment and treatment of modifiable factors that affect stroke outcomes, such as depression, is essential for the best possible outcome²⁶. Social workers have frequent contact with patients, their spouses and their families, placing them in an ideal situation for identifying those at high risk for depression and are often trained in the use of valid screening tools for identifying patients in need of additional mental health services²⁷.

The maintenance of social supports is an essential component of quality of life for stroke patients, and may be facilitated and encouraged by social workers²⁸. Social workers help to reduce caregiver burden through support and education, as well as identification of those who are at risk for caregiver strain²⁹. A study by Evans et. al. (1988) found that individuals who received education sessions from a social worker had significantly improved caregiver knowledge and stabilized family functions after both six months and one year as compared to individuals who received standard services³⁰.

Social workers also play a unique role in the discharge planning process, and have been noted as the profession most well suited for this task³¹. Discharge planning is a complex and highly

skilled task that involves screening, thorough psychosocial assessment, counselling and education, coordination of interdisciplinary team, activation of community resources, follow up and evaluation, all tasks well suited to the social worker³¹.

Evidence suggests that the role of the social worker in stroke recovery and rehabilitation is essential. These individuals are indispensable members of the patient health care team. However, more research is needed exploring the impact that social workers have on patient flow through the system and the associated economic impact. This should be included in future evaluations.

Appendix 7 – OSN Stroke Reference Group

Mark Bayley	Medical Director	Toronto Rehabilitation Institute/University Health Network
Linda Dykes	Manager	Sarnia-Lambton District Stroke Centre
Jenn Fearn	Regional Rehabilitation Coordinator	Northeastern Ontario Stroke Network
Rebecca Fleck	Regional Stroke Educator and Research Coordinator	Central South Regional Stroke System
Paula Gilmore	Interim Regional Director	Southwestern Ontario Stroke Network
Ruth Hall	Evaluation Specialist	Institute for Clinical Evaluative Services, OSN
Sandi Homeniuk	Regional Director	Northwestern Ontario Stroke Network
Sharon Jankowski	Director, Rehabilitation Program	St. Joseph's Health Care - Parkwood Hospital
Linda Kelloway	Best Practice Leader	Ontario Stroke Network
Jennifer Kodis	Director of Rehabilitation/Seniors Health Program	Hamilton Health Sciences Centre
Charissa Levy	Executive Director	GTA Rehab Network / Toronto ABI Network
Anne-Marie Malek	President and Chief Executive Officer	West Park Healthcare Centre
Cally Martin	Regional Director	Southeastern Ontario Stroke Network
Rhona McGlasson	Executive Director	Bone and Joint Health Network
Matthew Meyer	Project Coordinator, Stroke Rehabilitation Best Practices	Ontario Stroke Network
Malcolm Moffat	Executive Vice President	Sunnybrook Health Sciences Centre
Donelda Moscrip	Regional Rehabilitation Coordinator	Central East Stroke Network
Trish Nelson	Manager, Physical Rehabilitation Programs	St. Joseph's Care Group
Chris O'Callaghan	Executive Director	Ontario Stroke Network
Robert Teasell	Chief/Chair Department of Physical Medicine and Rehabilitation	St. Joseph's Health Care
Deb Willems	Regional Rehabilitation Coordinator	Southwestern Ontario Stroke Network