

Ontario Stroke Network

# Regional Economic Overview – South West LHIN

Matthew Meyer, Andrew McClure, Christina O’Callaghan, Linda Kelloway, Paula  
Gilmore, Deb Willems, Dr. Robert Teasell  
9/19/2013

# Table of Contents

- Executive Summary..... 2
- Summary/ Recommendations ..... 5
- Background/ Rationale ..... 6
- Objective ..... 7
- Regional Context..... 8
- Methods..... 9
  - Potential Emergency Medical Service (EMS) impact ..... 10
  - Potential Acute Care impact ..... 10
  - Potential Inpatient Rehabilitation Impact ..... 12
  - Potential Outpatient/Community-based Rehabilitation Impact ..... 14
- Results..... 15
  - Potential EMS impact..... 15
  - Potential Acute Care impact ..... 16
  - Potential Inpatient Rehabilitation Impact ..... 18
  - Potential Outpatient/Community-based Rehabilitation Impact ..... 20
- Summary/ Recommendations ..... 22
- Appendix A..... 24
- Appendix B ..... 27
- Appendix C ..... 28
- Appendix D..... 30

## Executive Summary

### Background

Stroke is a significant contributor to mortality and morbidity in Ontario and represents an enormous economic burden to the healthcare system annually. Every year approximately 1,416 stroke or transient ischemic attack (TIA) patients are admitted to an acute care hospital for care in the South West Local Health Integration Network (LHIN). The Ontario Ministry of Health and Long-Term Care (MoHLTC) is actively seeking opportunities to improve the cost-effectiveness with which these patients receive their care.

In 2012, the [Ontario Stroke Network \(OSN\) released a report](#) that assessed the potential economic impact of achieving full adherence to the best-practice stroke rehabilitation recommendations across Ontario. This report noted that in addition to improving patient care, better application of best-practice principles could allow Ontario's healthcare system to make available up to \$20M annually for re-investment elsewhere in the system.

In parallel with this work, in 2012/13 the MoHLTC began implementation of the Health System Funding Reform strategy designed to promote more efficient and patient-centered healthcare spending. As part of this initiative, stroke was chosen to undergo funding reform beginning in 2013 through implementation of a Quality-Based Procedures (QBP) funding structure.

As part of its involvement with the MoHLTC's Rehabilitation and Complex Continuing Care Expert Panel the Ontario Stroke Network (OSN) established the Stroke Reference Group (SRG); a panel of regional experts in stroke care. The SRG was asked to make best-practice recommendations for stroke care that could help facilitate smoother flow of patients through the healthcare system. The SRG recommendations, informed largely by the [Canadian Best-Practice Recommendations for Stroke Care](#), were incorporated into the [Quality-Based Procedures \(QBP\) Clinical Handbook for Stroke](#), released in January 2013, by Health Quality Ontario (HQO) and the MoHLTC.

These recommendations included the following:

- 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 Community Care Access Centres (CCAC) and allied health professionals
  - Mechanisms to support and sustain funding for interprofessional 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

These recommendations for the acute and rehabilitation components of the system, formulate the standards by which healthcare providers will be measured under the QBP system. While the community standards will be addressed in Phase 2 of the QBP work.

### **Objective**

The purpose of this report is to estimate the potential economic impact of adopting the proposed stroke rehabilitation best-practice recommendations in the SW LHIN. 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 a LHIN-wide perspective.

### **Acute Care**

The estimated direct cost of acute stroke care in the SW LHIN is \$13,723,420 annually. At the over twenty hospital sites within the LHIN, stroke admissions range from 11 to 613. Two hospital sites in the SW LHIN have the recommended critical mass of >165 admits/year.

The current average length of stay (LOS) in acute care is 11.4 days. Based on the number of admissions, the mean LOS and the MoHLTC cost per weighted case, the average per diem direct acute care cost for stroke and TIA in the SW LHIN is \$847 per day. This means that across the region, a single day reduction in mean LOS could free up \$1,199,965 annually for re-investment elsewhere in the system. Were the ideal targets of 5 and 7 days met for all ischemic and hemorrhagic stroke patients across the region, 8972 fewer acute bed days would be occupied by stroke patients annually compared to current LOS. This would result in an estimated \$5,287,308 made available annually for reinvestment.

In addition, data also suggest opportunity for acute cost reductions associated with avoiding TIA admissions. Of the 1416 admissions for stroke or TIA 247 were for TIA. Every TIA admission avoided in the SW LHIN would make available approximately \$3,119 for spending elsewhere. Based on this incremental estimate, if half of the TIA admissions were avoided annually, \$384,518 could be made available to care for these patients elsewhere.

### **Summary**

**Estimates suggest that better application of stroke best-practice related to earlier transfer to rehabilitation holds the potential to make 8,972 acute bed days available annually. As well as freeing up over \$5.3M annually with an additional \$384K if half of all TIA admissions are avoided, to support stroke patients to reintegrate into the community and improve chronic disease management.**

### **Inpatient Rehabilitation**

The annual cost of inpatient rehabilitation in the SW LHIN is approximately \$7,380,660 representing 351 admissions to a designated inpatient rehabilitation bed. On average, these patients remained in inpatient rehabilitation for a mean of 34.8 days.

#### ***Estimate Need for Inpatient Rehabilitation:***

Based on best practice, approximately 435 patients from the SW LHIN would require inpatient rehabilitation annually after stroke. Assuming 90% bed occupancy, and mean 30 day LOS, management of these patients would require a total of 39.8 inpatient rehabilitation beds annually across the LHIN.

***Provide intensive rehabilitation in the community:***

Of the total cost for inpatient rehabilitation, approximately \$234,547 is spent on rehabilitation of patients in RPG 1160; a group that current best-practice recommendations suggest could be cared for in an outpatient or community-based rehabilitation setting to avoid an inpatient rehabilitation admission.

***Increase Access to Inpatient Rehabilitation for Persons with Severe Stroke:***

On average, 57 patients a year were discharged to CCC from acute care post stroke in the SW LHIN<sup>1</sup>. Assuming that 30% of these patients were rehabilitation candidates, approximately 17 patients a year were admitted to CCC for rehabilitation. Based on the provincial average LOS of 93.5 days<sup>1</sup> at \$561/day, these patients would cost \$891,710 to care for in this setting. Were these patients to have been admitted to inpatient rehabilitation and achieve a mean LOS of 55.3 days (that of the most severe RPG group, 1100), their care would have cost \$566,515; an annual cost reduction of \$325,195.

***Increase staffing to provide intensive rehabilitation (3 hours/day; 6-7 days/week) on inpatients***

In order to provide inpatient rehabilitation (Physical Therapy (PT), Occupational Therapy (OT) and Speech Language Pathology (SLP)) services at the level of intensity noted in the QBP Clinical Handbook for stroke (3-hours daily, 6-7 days a week), a combined regional therapy staffing complement of between 20.3 and 23.7 dedicated FTEs would be required at an estimated annual salary of \$1.8M to \$2.1M.

<b>Discipline</b>	<b>Number of FTEs 6-Day model</b>	<b>Estimated Annual Salary 6-Day model</b>	<b>Number of FTEs 7-Day model</b>	<b>Estimated Annual Salary 7-Day model</b>
PT	5.4	\$562,776	6.3	\$656,572
OT	5.4	\$562,776	6.3	\$565,572
SLP	2.7	\$297,470	3.2	\$347,048
PT/OT Assistant	5.4	\$281,667	6.3	\$328,611
CDA	1.4	\$72,591	1.6	\$84,689
<b>Total</b>	<b>20.3</b>	<b>\$1,777,280</b>	<b>23.7</b>	<b>\$2,073,493</b>

**Summary**

**Application of best-practice in the SW LHIN’s inpatient rehabilitation sector would consist of a total of 40 inpatient rehabilitation beds required annually. An investment in staffing would be required to achieve services at the level of intensity noted in the QBP Clinical Handbook. However, potential savings could be achieved by shortening LOS, reducing admissions to complex continuing care (CCC) and accessing early, intensive rehabilitation in the community.**

**Outpatient and Community Based Rehabilitation**

Research indicates that providing access to early, intensive rehabilitation after discharge from hospital for persons with stroke demonstrates improved patient functional outcomes and health-related quality of life, while reducing hospital length of stay, long term dependency and institutionalization.

It was assumed that 13% of patients with stroke discharged alive from acute care and all patients discharged from inpatient rehabilitation require rehabilitation services from OT and PT, and that half would require SLP. This is 509 clients in the SW LHIN per year. Each patient was assumed to require 2.5 rehabilitation sessions per week for 10 weeks. Based on these assumptions, patients in the SW LHIN are

anticipated to require 12718 sessions of both PT and OT, and 6359 sessions of SLP annually. The Community Stroke Rehabilitation Teams are working to use the funding in the most efficient and effective way possible through investigation of telemedicine and congregate services.

Provision of all rehabilitation sessions in an outpatient clinic would cost approximately \$3,021,341. Were all sessions provided by a community-based program, the cost of care would rise to \$4,167,379. **These estimates do not account for current programs and staff available in the region** and represent a high and low boundary for the estimate. Given that much of the SW LHIN geography is rural, it is likely that many patients would benefit from rehabilitation in the community setting rather than travelling to an outpatient rehabilitation hospital.

### **Summary**

**Estimates suggest 509 stroke patients will need access to early, intensive outpatient and/or community-based rehabilitation across the SW LHIN annually, requiring a resource investment of approximately \$3-4M annually.**

## **Summary/ Recommendations**

In order to improve efficiencies and patient flow across the SW LHIN, decrease ALC and ensure that more stroke survivors live at home the following is recommended:

1. Ensure all stroke survivors are treated at designated stroke centres for the duration of their care.
  - Create a regional plan for stroke care that consolidates acute stroke care into specialty units
2. Ensure all stroke survivors with moderate to severe stroke have timely access to inpatient rehabilitation.
  - Create a regional plan that consolidates stroke rehabilitation care into specialty units
  - Include recommended staffing adjustments
3. Ensure stroke survivors have the opportunity to continue their rehabilitation and recovery in the community using the most effective and efficient model.

# Regional Economic Overview – South West LHIN

## Background/ Rationale

Stroke is a significant contributor to mortality and morbidity in Ontario and represents an enormous economic burden to the healthcare system annually. Every year approximately 20,000 Ontarians arrive at an emergency department with stroke or transient ischemic attack (TIA) and ~13,000 are admitted to an acute hospital for care<sup>1</sup>. Upon discharge, ~3,200 go to inpatient rehabilitation and ~900 each to Complex Continuing Care (CCC) and Long-Term Care (LTC) to meet their ongoing needs. Under this burden, the Ontario Ministry of Health and Long-Term Care (MoHLTC) is actively seeking opportunities to improve the cost-effectiveness with which these patients receive their care.

In 2011, as part of its involvement with the MoHLTC's Rehabilitation and Complex Continuing Care Expert Panel (RCCCEP) the Ontario Stroke Network (OSN) established the Stroke Reference Group (SRG); a panel of regional experts in stroke care. The SRG was asked to make best-practice recommendations for stroke care that could help facilitate smoother flow of patients through the healthcare system. The SRG recommendations released in November 2011<sup>2</sup> included the following:

- 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 Community Care Access Centres (CCAC) and allied health professionals (contracted through their rehabilitation and nursing provider agencies)
  - Mechanisms to support and sustain funding for interprofessional outpatient ( e.g. day rehabilitation) 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

In 2012, the [OSN released a report](#) that assessed the potential economic impact of achieving full adherence to the best-practice stroke rehabilitation recommendations across Ontario<sup>3</sup>. This report noted that in addition to improving patient care, better application of best-practice principles could

allow Ontario's healthcare system to make available up to \$20M annually for re-investment elsewhere in the system. However, this report also included results from focus groups across the province identifying a number of important challenges that must be overcome before adoption of these recommendations will be possible.

In parallel with this work, in 2012/13 the MoHLTC began implementation of the Health System Funding Reform strategy designed to promote more efficient and patient-centered healthcare spending<sup>4</sup>. As part of this initiative, stroke was chosen to undergo funding reform beginning in 2013 through implementation of a Quality-Based Procedures (QBP) funding structure. The QBP payment system is designed to promote efficient, high quality care with smooth transitions between care settings by providing a "bundled payment" for patient care that is tied to quality indicators. Under this reformed system, the LHINs (and facilities within them) will be forced to re-evaluate their stroke care delivery model and those regions with coordinated stroke systems will be in the best position to manage the change.

In advance of the QBP funding reform implementation, Health Quality Ontario and the MoHLTC released the [Quality-Based Procedures Clinical Handbook for Stroke](#) in January 2013<sup>4</sup>. In this document, a summary of recommended practices developed in coordination with the stroke episode of care expert panel are reported. These recommendations, informed largely by the [Canadian Best-Practice Recommendations for Stroke Care](#), will formulate the standards by which healthcare providers will be measured under the QBP system. Notable recommendations include:

#### Acute Care

- access to stroke thrombolysis for eligible patients
- provision of acute stroke care on a specialized, geographically defined stroke unit with a suggested minimum annual volume of 165 ischemic stroke admissions
- 5 day LOS for ischemic stroke patients and 7 day for hemorrhagic

#### Inpatient Rehabilitation

- 7-day a week admissions to inpatient rehabilitation
- 1:6 therapist to bed ratios for PT and OT in inpatient rehabilitation and 1:12 for SLP
- 3-hours of direct task-specific therapy per day for at least six days a week

While the details of the QBP funding reform remain uncertain, the information contained in the clinical handbook provides insight into the direction in which the stroke system is heading and can serve to inform regional dialogue about stroke care.

## Objective

This report is designed to replicate portions of the provincial economic evaluation noted above from the perspective of the South West Local Health Integration Network (SW LHIN). It is not designed as a comprehensive economic evaluation, but rather to present contextual information in a way that will help guide regional discussion about local stroke care. It is our hope that this will support regional



representatives in assessing their stroke system, identifying areas where improvements are possible and informing discussions with local healthcare providers regarding system reform. Data and analyses performed here can (and should) be challenged and updated as appropriate.

## Regional Context

This section is designed to provide an overview of the current state of stroke care in the SW LHIN. The SW LHIN is made up of 7 counties; Grey and Bruce Counties in the north, Huron and Perth Counties in the middle and Oxford, Elgin and London Middlesex, in the south. The total population over the age of 18 in the SW LHIN is 763, 633. There are currently a total of 28 hospitals in the SW LHIN admitting stroke patients including:

- Grey County
  - Grey Bruce Health Services; Owen Sound Hospital with 153 beds
  - Grey Bruce Health Services; Meaford Hospital with 15 beds
  - Grey Bruce Health Services; Markdale Hospital with 14 beds
  - South Bruce Grey Health Centre; Durham Hospital with 10 beds
- Bruce County
  - South Bruce Grey Health Centre; Kincardine Hospital with 25 beds
  - South Bruce Grey Health Centre; Chesley Hospital with 9 acute beds/ 10 restorative care beds
  - South Bruce Grey Health Centre; Walkerton Hospital with 25 beds
  - Grey Bruce Health Services; Wiarton Hospital with 14 beds
  - Grey Bruce Health Services; Lions Head Hospital with 4 beds
  - Grey Bruce Health Services; Southampton Hospital with 16 beds
  - Hanover District Hospital with 28 beds
- Huron County
  - Alexandra Marine and General Hospital in Goderich, Ontario with 50 beds (20 are Mental Health)
  - Listowel Memorial and Wingham District Hospital Alliance; Wingham & District Hospital with 36 beds
  - Huron Perth Health Alliance; Clinton Public Hospital with 17 beds
  - South Huron Hospital in Exeter, Ontario with 19 beds
- Perth County
  - Huron Perth Health Alliance; Stratford General Hospital with 136 beds
  - Listowel Memorial and Wingham District Hospital Alliance; Listowel Memorial Hospital with 50 beds
  - Huron Perth Health Alliance; Seaforth Community Hospital with 18 beds
  - Huron Perth Health Alliance; St. Marys Memorial Hospital 20 beds
- Oxford County
  - Woodstock General Hospital; with 153 beds

- Alexandra Hospital in Ingersoll, Ontario with 35 of beds
- Tillsonburg District Memorial Hospital; with 51 beds
- Elgin County
  - St. Thomas-Elgin General Hospital; with 166 beds
- Middlesex County
  - Middlesex Health Alliance; Strathroy Middlesex General Hospital with 54 beds
  - Middlesex Health Alliance; Four Counties Health Services Corporation in Newbury, Ontario with 12 beds
- City of London
  - London Health Sciences Centre, University Hospital in London, Ontario with 380 of beds
  - London Health Sciences Centre, Victoria Hospital in London, Ontario with 508 of beds
  - St. Joseph’s Health Services in London, Ontario with 37 beds

The SW LHIN has 25 non-designated stroke centres that care for stroke patients. There is only one acute stroke unit in the SW LHIN which is located at LHSC. Only 60% of the LHSC patients are treated on this acute stroke unit because it is located at University Hospital. There is one stroke rehabilitation unit in the South West LHIN, at St. Joseph’s Health Care, Parkwood Hospital. Stroke survivors elsewhere in the LHIN, who require inpatient rehabilitation, are treated on general rehabilitation units; of which there are six. As well, allied health staffing at all sites is less than that identified in this report as needed to achieve best practice. For detailed Rehabilitation Staffing see Appendix C.

Presently, business proposals are being reviewed at London Health Sciences Centre, University Hospital to improve services provided to stroke survivors on Clinical Neurosciences as well as a proposal for an integrated stroke unit at HPHA, Stratford General Hospital. Grey Bruce Health Services is in the process of identifying a model for acute stroke care. Since 2009, the SW LHIN has funded 3 Community Stroke Rehabilitation Teams (CSRTs) servicing stroke survivors living in the community in Grey Bruce, Huron Perth and Thames Valley. The CSRTs have seen an 85% increase in average monthly referrals from 2010 to a current 37 referrals monthly, a reduction in average referral to first contact from 24.4 days in 2010 to a current 4.7 days, reduction in length of stay (LOS) from 151 days in 2010 to a current average of 75 days. The teams have also made an impact on decreasing Alternate Level of Care (ALC) days and LOS on inpatient rehabilitation thereby also decreasing days waiting for admission to rehabilitation<sup>5</sup>.

## Methods

In the spirit of providing a regional “economic overview”, current data were explored with the goal of identifying opportunities for improved care, potential for cost reductions relative to current expenditure and estimates of the need for re-investment or re-allocation of funding. The following areas were addressed:

## Potential Emergency Medical Service (EMS) impact

### **Estimate mean annual stroke/TIA incidence (based on Emergency Department (ED) arrivals) and the proportion of patients transferred to hospital by ambulance annually**

In order to estimate annual incidence, it was assumed that all patients with stroke or TIA would arrive at an emergency department. We acknowledge that this may not always be true, but felt that the resulting estimate was reasonable. Data were retrieved from the [2012 Stroke Evaluation Report](#) for ED arrivals and averaged over fiscal years 2008-2010<sup>1</sup>.

### **Estimate mean travel times and distances between regional hospitals**

Distances and travel times between hospitals were retrieved from Google maps. Times account only for estimated driving times and do not account for drop off or pick-up times, traffic, weather, nor any additional time staff require (eg. breaks).

## Potential Acute Care impact

### **Estimate annual admissions to acute care by hospital and stroke type (TIA, Isch, Hem, Not Specified)<sup>1</sup>**

Data were retrieved from IntelliHealth by a member of the North Simcoe Muskoka Decision support team for all LHINs. The initial data pull included information on all patients with most responsible diagnosis of stroke (ICD-10 codes H34.1, G45 (not G45.4), I60 (not I60.8), I61, I63 (not I63.6), or I64) who were 18 years or older and were either a resident of the SW LHIN or received some acute medical care in the LHIN in fiscal years 2007-2011. Patients were divided by stroke type using the following criteria:

Hemorrhagic (ICD-10 = I60 & I61)

Ischemic (ICD-10 = H34.1 & I63)

Stroke Not Specified (ICD-10 = I64)

TIA (ICD-10 = G45)

The number of discharges was summed for each hospital to infer the number of stroke admissions annually. For planning purposes, the following steps were used to ensure that patients were not double counted in the estimated number of annual admissions. Among LHIN residents, records of patients

transferred from another acute care hospital were eliminated and only the sentinel admission was used. Non-resident patients transferred from an acute site outside of the LHIN remained.

To generate the final table, resident and non-resident data were combined and summed. For calculation of LOS and resource intensity weight (RIW), the sum of all within-LHIN hospital stays was combined regardless of site or number of admissions. Five-year averages were generated by summing all data across all 5 years and then dividing each cell by five. Mean RIW per patient was generated by dividing the total RIW sum for each group by the number of total discharges.

### **Estimate current annual acute stroke budget**

Mean annual acute admissions and resource intensity weight (RIW) averaged over fiscal years 2007-11 were multiplied by the estimated 2013/14 mean cost per weighted case provided by the [MoHLTC \(\\$4380\)](#)<sup>a</sup>. This represents an estimate of the annual direct cost of acute hospital care for stroke patients across the entire LHIN.

### **Project mean LOS under best-practice model and estimate annual need for acute care beds regionally**

The current best-practice recommendation is for ischemic stroke patients to be transferred to the appropriate rehabilitation setting by day 5 on average and hemorrhagic patients by day 7<sup>2</sup>. However, using this information to project the need for acute beds is difficult. In order to achieve these aggressive LOS targets, substantial system change would be required including improved access to outpatient and community-based rehabilitation programs, greater acute care efficiency, and readily available access to long-term care beds when necessary. While we believe this ideal state to be possible, it is likely not imminent. Still, Ontario data suggest tremendous opportunity for improved efficiency even within the current structure of services.

Due to the challenging nature of projecting resource need, data were presented in this section in two ways to help inform planning discussion. First, a mean 10-day acute LOS was assumed for all stroke patients (ischemic, hemorrhagic and stroke type not specified (NS)). This estimate was felt to be a conservative target to allow for the fact that some patients being discharged to settings other than rehabilitation (palliative care or LTC) may require a longer acute stay than the 5 and 7 day targets under the constraints of the current system. These data are presented to represent a reasonable interim target. Second, estimates were generated based on the assumption of full achievement of the best-practice recommendations (mean 5 day and 7 day LOS for ischemic and hemorrhagic stroke patients respectively) in order to infer the impact of achieving an “ideal” scenario. Bed estimates were then derived assuming a 90% occupancy rate to allow for natural variation in stroke incidence.

Mean LOS for patients with TIA is generally shorter than 5 days and consensus opinion is that many of these patients do not require acute admission at all. However, no reliable estimate for the proportion of

---

<sup>a</sup> [Interim Quality-Based Procedure list for stakeholder consultation](#), MoHLTC 2012

TIA patients who require admission exists currently. Therefore, in all cases the current mean LOS occupied by TIA patients, or 5 days (whichever is lower) was considered sufficient in system modeling and separate estimates for the potential reduction in TIA admissions were calculated.

### **Estimate the opportunity for annual acute cost reduction**

As in the previous section, there are several ways in which cost reduction estimates could be generated. We chose to present three scenarios. First, *per diem* cost estimates (Appendix B) reported in a previous report<sup>3</sup> were used to generate an estimate of the impact that a single day reduction in mean LOS would have on direct stroke costs in the region. Second, the same *per diem* estimates were used to infer the potential cost savings that would accompany achievement of both the 10-day and the “ideal” LOS targets for ischemic and hemorrhagic patients compared to the current average LOS.

Expert opinion suggests that many of the TIA patients currently admitted to acute care could be better managed in a secondary prevention clinic. However, no reliable estimate of the proportion of TIA patients for whom an acute admission is appropriate exists currently. Regional data were used to estimate the incremental direct acute care cost savings that would accompany each TIA admission avoided. These were generated by multiplying the mean RIW of TIA patients admitted to acute care within the LHIN by the MoHLTC cost per weighted case (\$4,380).

### **Estimate staffing model required for proposed bed number**

Staffing ratios for each discipline included in the recommended interdisciplinary stroke team were drawn from the [Canadian Stroke Strategy \(CSS\) “Guide to the Implementation of Stroke Unit Care”](#)<sup>6</sup>. The ratios recommended in the CSS guide were used to estimate the total staffing requirement that would be needed to provide best-practice stroke care to all patients across the region under both the 10-day and “ideal” systems.

## **Potential Inpatient Rehabilitation Impact**

### **Identify LHIN-level annual admissions to rehabilitation by rehabilitation patient group (RPG) and mean LOS**

Data requested from the National Rehabilitation Reporting System (NRS) from fiscal years 2008-2010 were used to estimate the mean number of stroke patients (Rehabilitation Client Group-1) admitted to inpatient rehabilitation by RPG annually.

### **Estimate current annual rehabilitation stroke budget**

The mean number of rehabilitation admissions annually was multiplied by their mean LOS and then by the *per diem* cost estimate of \$603<sup>3</sup> (Appendix B) to generate a regional estimate of the cost of inpatient

rehabilitation annually. Similarly, the mean number of Complex Continuing Care (CCC) admissions for rehabilitation was inferred. Provincially, approximately 30% of patients who enter CCC post stroke are ultimately discharged home<sup>1</sup>. This value was used in combination with the number of annual acute discharges to CCC<sup>1</sup> to infer the number of patients discharged to CCC for rehabilitation purposes. This estimate was multiplied by the *per diem* cost estimate for CCC of \$561 (Appendix B) and the provincial mean LOS in CCC<sup>1</sup> (93.5 days) to estimate current expenditure on rehabilitation in CCC annually. It is recognized that use of CCC beds for rehabilitation varies significantly within and across LHINs due to a lack of standardized policy for rehabilitation in this setting. The inference made regarding rehabilitation in CCC is a methodology limitation that will benefit from local interpretation.

### **Anticipate number of inpatient rehabilitation admissions annually under best-practice model and number of rehabilitation beds needed**

Current data limitations make it difficult to identify the proportion of patients admitted to inpatient rehabilitation who could have been cared for in an outpatient setting or the number of patients currently admitted to complex continuing care beds who would have been more appropriately cared for in inpatient rehabilitation. Therefore, the Ontario benchmark for stroke patients alive at acute discharge who are candidates for inpatient rehabilitation (42.3%)<sup>1</sup> was used to estimate the number of patients who would require inpatient rehabilitation annually. A 30-day mean LOS was used to derive an estimate of the need for rehabilitation beds, assuming 90% occupancy.

### **Estimate rehabilitation staffing model for proposed bed number**

The estimate is based on provision of physiotherapy (PT), occupational therapy (OT) and speech and language pathology (SLP) services as indicated in the clinical handbook for Quality Based Procedures. Other rehabilitation disciplines were not included in the model due to the lack of recommendations around appropriate staffing ratios in rehabilitation.

The rehabilitation staffing model required to care for the expected number of rehabilitation admissions was based on the assumptions that 1) a single therapist was capable of providing 6 hours of direct therapy per day, 5 days a week, for 46 weeks a year (1380 hours total assuming 6 weeks for vacation and illness) and 2) a 2:1 registered therapist to assistant ratio was assumed to be appropriate.

Two estimates of staffing compliments were generated. Best-practice recommendations suggest therapy 7-days a week, while the Health Quality Ontario (HQO) and MoHLTC QBP clinical handbook for stroke made a more conservative recommendation of at least 6-days a week. Assuming that each patient would require 1 hour of direct therapy per day from PT and OT, the anticipated number of rehabilitation bed days occupied by stroke patients was assumed to equal the number of rehabilitation sessions required by each of these disciplines under the 7-day model. A 6-day model was then generated by multiplying the estimated number of bed days occupied by stroke patients by 6/7 to infer the total number of PT and OT rehabilitation sessions required annually. In both models, 1/2 as many sessions were assumed to be necessary for SLP based on the assumption that only 50% of patients require this care.

The total number of sessions in both models was then divided by 1380 (the number of direct therapy hours provided by 1 full time equivalent (FTE) annually) to infer the total number of FTEs needed to provide the appropriate number of sessions. The estimated FTEs were then adjusted for the therapist to assistant ratio (2:1) and multiplied by the estimated annual salaries used previously (Appendix B) to estimate the annual direct cost of best-practice rehabilitation in the region under both a 7-day and 6-day model of care.

## Potential Outpatient/Community-based Rehabilitation Impact

### Estimate “best-practice” annual need

As done in the [OSN report](#)<sup>3</sup>, it was assumed that 13% of stroke patients discharged alive from acute care, and all patients discharged from inpatient rehabilitation, require additional outpatient or community-based rehabilitation. Between 2008 and 2010, approximately 12% of stroke patients died in hospital<sup>1</sup>. To estimate the number of patients who require additional rehabilitation, 12% of the annual admissions were removed along with all TIAs and all patients discharged to inpatient rehabilitation. Of the remaining patients, 13% were assumed to require additional rehabilitation. This number was then added to the estimated number of admissions to inpatient rehabilitation to derive an estimate of the total number of patients requiring outpatient or community-based rehabilitation annually. Each patient was assumed to require a best-practice recommended 2.5 sessions per week (an average of 2-3 visits per patient) for 10 weeks (the average of 8-12 weeks duration)<sup>2</sup>.

### Estimate annual direct costs for outpatient and community-based rehabilitation programs

Results of the previous [OSN report](#) found that 88% of patients in Ontario live within a 30-minute drive of an outpatient rehabilitation program<sup>3</sup>. However, these analyses have not been performed for each LHIN individually. Cost estimates were generated by multiplying the per-session rehabilitation costs reported previously for outpatient and community-based rehabilitation (Appendix B) by the number of sessions required annually. This allowed for generation of an estimated direct cost for provision of ALL rehabilitation sessions by each of outpatient and community-based rehabilitation programs, separately. This was done for illustrative purposes and the true cost is anticipated to lie somewhere in between these estimates.

The estimates provided here require local interpretation given the high variance in rurality and population across LHINs. The balance of outpatient versus Community Care Access Centre (CCAC) service provision will vary by region based on a) the presence or absence of outpatient programs in various communities and on b) how rurality affects access. LHIN profiles providing information on the percent rural residency can be found at [Statistics Canada](#).

## Results

### Potential EMS impact

#### **Estimate mean annual stroke/TIA incidence (based on ED arrivals) and the proportion of patients transferred to hospital by ambulance annually**

The 2012 Ontario stroke evaluation report indicates that between fiscal years 2008 to 2010, an average of 1381 stroke or TIA patients arrived at an emergency department in the SW LHIN annually (range 813 - 882)<sup>1</sup>. Approximately 61% of these patients were transported to hospital by EMS<sup>1</sup>.

#### **Estimate mean travel times and distances between regional hospitals and the proposed stroke sites**

Patient transfer via EMS represents an important consideration when looking to determine the potential economic impact of stroke system reform. Limited data on the cost of transfers is available at this time. Therefore, tables were generated to allow for quick review of the potential time and distance impact of transferring patients between hospital sites (Appendix C). If and when decisions about stroke unit siting are made, these values can be used to estimate EMS impact. Additional considerations should include the number of patients already transferred by EMS both to and between hospitals as well as EMS staff time during pick-up and drop off. Verification and discussion with local EMS providers should be pursued.



## Potential Acute Care impact

### Identify mean annual admissions to acute care by hospital and stroke type (TIA, Isch, Hem, NS)

Detailed results for each hospital are presented in Appendix A. Regional summary of the total number of annual admissions is presented in table 1.

Table 1. Summary data for mean annual stroke admissions, LOS and resource intensity weight (RIW) among hospitals in the SW LHIN in fiscal years 2007 to 2011.

Stroke Type	Mean Annual Admissions (N)	Mean Annual LOS (days)	Mean Annual ALC LOS (days)	Mean Annual Total LOS (days)	Mean Patient RIW
Hemorrhagic	206.0	2471.0	586.6	3057.6	4.2774
Ischemic	629.8	6167.8	2440.2	8608.0	2.4549
Not Specified	333.8	2534.0	1032.6	3566.6	1.5892
TIA	246.6	854.2	110.0	964.2	0.7120
<b>Total</b>	<b>1416.2</b>	<b>12027.0</b>	<b>4169.4</b>	<b>16196.4</b>	<b>2.2124</b>

### Estimate current annual acute stroke budget

Using the 2013/14 [“Interim Quality-Based Procedures list for Stakeholder Consultation”](#) direct cost per weighted case of \$4380, the estimated *direct cost* of acute stroke care in the SW LHIN is \$13,723,420 annually.

### Anticipate mean LOS under best-practice model and estimate annual need for acute care beds regionally

Assuming a mean 10-day LOS for all stroke patients and no change in the LOS of TIA patients, a total of 12660 bed days can be anticipated to be occupied by stroke/TIA patients annually. Assuming 90% occupancy in acute stroke unit beds, this would require 38.5 acute beds to care for these stroke/TIA patients.

Were the best-practice recommendations of mean 5-day and 7-day LOS attained for ischemic and hemorrhagic stroke patients respectively (with no change in TIA), a total of 7224 bed days would be occupied by patients with stroke or TIA. Care of stroke/TIA patients under this “ideal” system would require 22 acute care beds.

## **Estimate the opportunity for annual acute cost reduction**

Based on the number of admission, the mean LOS and the MoHLTC cost per weighted case, the average *per diem* direct acute care cost for stroke and TIA in the SW LHIN is \$847 per day. This means that across the region, a single day reduction in mean LOS could free up \$1,199,965 annually for re-investment elsewhere in the system.

Attainment of a 10-day mean LOS for all ischemic, hemorrhagic and stroke not specified patients (with no change in TIA LOS) in the SW LHIN would result in the elimination of 3536 acute care bed days annually. Using the previously reported *per diem* alternate level of care (ALC) cost estimates of \$577 for hemorrhagic patients and \$592 for ischemic and stroke not specified patients (Appendix B), these 3536 days could result in \$2,078,466 made available annually. Interestingly, the proposed 3536 bed day reduction could entirely be achieved through elimination of ALC bed days in the region (see table 1).

Were the “ideal” targets of 5 and 7 days met for all ischemic and hemorrhagic stroke patients across the region, 8972 fewer acute bed days would be occupied by stroke patients annually compared to current LOS. This would result in an estimated \$5,287,308 made available annually; nearly halving current direct acute-care expenditure in the region.

In addition to the potential cost reductions among stroke patients, data also suggest tremendous opportunity for acute cost reductions associated with avoiding TIA admissions. Every TIA admission avoided in the SW LHIN would make available approximately \$3,119 for spending elsewhere. Based on this incremental estimate, if even half of the TIA admissions were avoided annually, \$384,518 could be made available to care for these patients elsewhere.

## **Estimate staffing model required for proposed acute bed number**

Based on the [CSS Stroke Unit guidelines](#)<sup>5</sup>, regional best-practice staffing compliments are presented in table 2 for a model with a 10-day acute stroke LOS and the “ideal” best-practice target model. Note that these estimates are only for acute care and do not account for care at multiple sites. The suggested acute staffing ratios would remain constant at each facility, but may result in different region-wide values. Estimates are provided to generate local discussion around staffing and to allow for regional estimates of staff costs to be performed.

Table 2. Estimate of the best-practice staffing compliments required to care for stroke patients in the SW LHIN for both the 10-day and “ideal” models.

<b>Team Member</b>	<b>SW 10-day Requirement For 38.5 acute beds</b>	<b>SW “ideal” Requirement For 22 acute beds</b>
RN**	36	20.5
RPN**	18	10.3
PT†	4.3	2.4
OT†	4.3	2.4
SLP††	2.1	1.2
PT/OT Assistants <sup>‡</sup>	4.3	2.4
CDA <sup>‡</sup>	1.1	0.6
SW‡	1.9	1.1
Dietician‡‡	3.1	1.8

\*\*Estimates based on assumed need of 1.4 nursing FTE/bed at a 2RN:1RPN ratio

†Estimates based on assumption of 1:6 therapist:bed ratio<sup>3</sup>

††Estimate based on assumption of 1:12 therapist:bed ratio<sup>3</sup>

<sup>‡</sup>Assistant calculations based on 1:2 assistant:registered therapist ratio.

‡Assuming 1 FTE/ 20 bed ratio

‡‡Assuming 0.8FTE/10 bed ratio

## Potential Inpatient Rehabilitation Impact

### Identify LHIN-level annual admissions to rehabilitation by functional level Rehabilitation Patient Group (RPG) and mean LOS

According to the National Reporting System (NRS), between 2008 and 2010 an average of 351 patients from the SW LHIN (range 337 - 363) were admitted to a designated inpatient rehabilitation bed annually. On average these patients remained in inpatient rehabilitation for a mean of 34.8 days. The distribution of patients by RPG and mean LOS are presented in table 3.

Table 3. Mean number of annual admissions to inpatient rehabilitation in the SW LHIN by RPG and their corresponding mean LOS from 2008-2010.

<b>RPG</b>	<b>Mean Annual Admissions</b>	<b>Mean LOS (days)</b>
1100	52	55.3
1110	87	43.5
1120	68	34.5
1130	40	28.1
1140	35	21.4
1150	45	21.3
1160	24	16.0
<b>Total</b>	<b>351</b>	<b>34.8</b>

### **Estimate current annual rehabilitation stroke budget**

Previous estimates suggest that, on average, a single day in inpatient rehabilitation costs \$603 (Appendix B). Based on this estimate, the annual cost of inpatient rehabilitation in the SW LHIN is approximately \$7,380,660. Of this total cost, approximately \$234,547 is spent on rehabilitation of patients in RPG 1160; a group that current best-practice recommendations suggest could be cared for in an outpatient or community-based rehabilitation setting to avoid an inpatient rehabilitation admission.

Between 2008 and 2010, on average, 57 patients a year were discharged to CCC from acute care post stroke in the SW LHIN<sup>1</sup>. Assuming that 30% of these patients were rehabilitation candidates, approximately 17 patients a year were admitted to CCC for rehabilitation. Based on the provincial average LOS of 93.5 days<sup>1</sup> at \$561/day (Appendix B), these patients would cost \$891,710 to care for in this setting. Were these patients to have been admitted to inpatient rehabilitation and achieve a mean LOS of 55.3 days (that of the most severe RPG group, 1100), their care would have cost \$566,515; an annual cost reduction of \$325,195.

### **Anticipate number of inpatient rehabilitation admissions annually under best-practice model and number of rehabilitation beds needed**

Using data currently available, it is difficult to estimate the proportion of patients currently in inpatient rehabilitation unnecessarily, as well as the proportion of patients currently admitted to “slow-stream” rehabilitation or CCC who instead should have been admitted to inpatient rehabilitation. Therefore, the current best-practice provincial benchmark of 42.3%<sup>1</sup> of acute stroke patients discharged alive requiring rehabilitation was felt to be a better approximation of regional rehabilitation need. Based on this estimate (42.3% x 1029), approximately 435 patients from the SW LHIN would require inpatient rehabilitation annually after stroke. Assuming 90% bed occupancy, management of these patients would require 39.8 inpatient rehabilitation beds annually.

### Estimate rehabilitation staffing model for proposed bed number

In order to provide inpatient rehabilitation (PT, OT and SLP) services at the level of intensity noted in the QBP clinical handbook for stroke (3-hours daily, at least 6 days a week), a combined regional therapy staffing complement of 20.3 dedicated FTEs would be required at an estimated annual salary of \$1,777,280. Were the best-practice recommended model of 7-day a week therapy for PT, OT, and SLP achieved, 23.7 FTEs would be required at an estimated \$2,073,493 (or an additional \$296,213). These are estimates of the entire PT, OT and SLP staffing compliment required, which would include staff currently employed in the region. Estimates of the need for FTEs and the corresponding cost for each rehabilitation discipline are presented in table 4.

Table 4. Estimates of the need for inpatient rehabilitation FTEs in the SW LHIN, under 6 and 7 day a week therapy models, and an estimate of the corresponding cost.

Discipline	Number of FTEs 6-Day model	Estimated Annual Salary 6-Day model	Number of FTEs 7-Day model	Estimated Annual Salary 7-Day model
PT*	5.4	\$562,776	6.3	\$656,572
OT*	5.4	\$562,776	6.3	\$565,572
SLP**	2.7	\$297,470	3.2	\$347,048
PT/OT Assistant†	5.4	\$281,667	6.3	\$328,611
CDA††	1.4	\$72,591	1.6	\$84,689
<b>Total</b>	<b>20.3</b>	<b>\$1,777,280</b>	<b>23.7</b>	<b>\$2,073,493</b>

\*PT/OT estimates based on an annual salary of \$104,057

\*\*SLP estimates based on an annual salary of \$110,004

†PT/OT assistant estimates based on an annual salary of \$52,080

††CDA estimates based on an annual salary of \$53,688

### Potential Outpatient/Community-based Rehabilitation Impact

#### Estimate “best-practice” annual need

It was assumed that 13% of patients with stroke discharged alive from acute care, and all patients discharged from inpatient rehabilitation, require additional rehabilitation services from OT and PT, and that half would require SLP. Each patient was assumed to require 2.5 rehabilitation sessions per week for 10 weeks (both averages of the current best-practice recommendations). Based on these assumptions, patients in the SW LHIN are anticipated to require 12,718 sessions of both PT and OT, and 6,359 sessions of SLP annually.

### **Estimate annual costs for outpatient and community-based rehabilitation programs**

Assuming an outpatient clinic cost of \$94.33 per session for PT and OT and \$97.80 for SLP (includes direct costs and a portion of overhead; Appendix B), provision of all rehabilitation sessions in an outpatient clinic would cost approximately \$3,021,341. Were all sessions provided by a community-based program (estimated costs of \$117.13 PT, \$139.98 OT and \$141.12 SLP including overhead and travel; Appendix B), the cost of care would rise to \$4,167,379. These estimates do not account for current programs and staff available in the region and represent a high and low boundary for the estimate. Given that much of the SW LHIN geography is rural, it is likely that many patients would benefit from rehabilitation in the community setting rather than travelling to an outpatient rehabilitation hospital. The actual proportion of candidates for each service cannot be estimated at this time and the potential unmet need cannot be estimated due to a lack of outpatient data. The Community Stroke Rehabilitation Teams are working to use the funding in the most efficient and effective way possible through investigation of telemedicine and congregate services.

## Summary/ Recommendations

In order to improve efficiencies and patient flow across the SW LHIN, decrease ALC and ensure that more stroke survivors live at home the following is recommended:

1. Ensure all stroke survivors are treated at designated stroke centres for the duration of their care in the SW LHIN. To achieve the critical mass of expertise and stroke unit admissions, the SW LHIN will need to consider consolidation of stroke care in a fewer number of hospitals in the region. Thus, stroke-related bed days will be moved from smaller centres to those with stroke units.
  - Create a regional plan for stroke care that consolidates acute stroke care into specialty units and includes these figures for bed numbers as 'stretch' targets in two stages
    - 10 day LOS: 38.5 acute beds to care for stroke/TIA patients across the SW LHIN
    - 5 & 7 day LOS: 22 acute beds for stroke/TIA across the SW LHIN
  - A reduction of LOS in acute care to 10 days would result in a savings of **\$2,078,466** being made available (eliminating 3536 bed days) to invest elsewhere in the system. A reduction to the "ideal" LOS of 5 and 7 days would be a savings of **\$5,287,308** and 8972 fewer acute bed days. These savings could then be invested elsewhere in the system including inpatient rehabilitation, and community supports including the Community Stroke Rehabilitation Teams.
2. Ensure all stroke survivors with moderate to severe stroke have timely access to inpatient rehabilitation. The SW LHIN remains significantly below the provincial benchmark of 42.6% of all stroke admissions accessing inpatient rehabilitation and is dropping (from 35.6% FY 10/11 to 33.5% FY 11/12). It is important to note that patients arriving at rehabilitation facilities will be more acute. This will be a particular challenge for "stand-alone" rehabilitation facilities that will need to collaborate with their referring sites to facilitate timely transfer and negotiate agreements to expedite acute care readmission if required.
  - a. Create a regional plan for stroke care that consolidates stroke rehabilitation care into specialty units and includes the bed number recommendation as an ultimate target
    - i. 39.8 inpatient rehabilitation beds for stroke annually
  - b. The annual cost of inpatient rehabilitation in the SW LHIN is approximately \$7,380,660, however a savings of \$234,547 would be made if patients with mild stroke (RPG 1160) received outpatient/community therapy and were not admitted to inpatient rehabilitation.
  - c. Include recommended staffing adjustments to meet best practice for 6 day/week therapy costing an estimated \$1,777,280; then consider expansion to 7 day/week therapy costing an estimated \$2,073,493.
3. Ensure stroke survivors have the opportunity to continue their rehabilitation and recovery in the community using the most effective and efficient model. This should include community re-engagement and chronic disease management.

## Reference List

- (1) Hall R, Khan F, O'Callaghan C, Kapral MK, Hodwitz K, Fang J, Bayley M. Ontario Stroke Evaluation Report 2012: Prescribing System Solutions to Improve Stroke Outcomes. Toronto: Institute for Clinical Evaluative Sciences; 2012. Available: [www.ices.on.ca](http://www.ices.on.ca)
- (2) Lowi-Young M, Nord P, Ontario's SRG. Rehabilitation and Complex Continuing Care Expert Panel: Phase I Report. 2011. Available: [www.nelhin.on.ca/WorkArea/downloadasset.aspx?id=11680](http://www.nelhin.on.ca/WorkArea/downloadasset.aspx?id=11680)
- (3) Meyer M, O'Callaghan C, Kelloway L, Hall R, Teasell R, Meyer S, Allen L, Leci E, in collaboration with Ontario's Stroke Reference Group. The Impact of Moving to Stroke Rehabilitation Best-Practices in Ontario: Final Report. 2012 Available: <http://ontariostrokenetwork.ca>
- (4) HQO, MoHLTC. Quality-Based Procedures: Clinical Handbook for Stroke. 2013.
- (5) Mulder C. & Ure, D. Stroke Rehab in the Community: Getting Better Quicker. Presentation at the Ontario Gerontology Association May 2, 2013 Available: <http://www.gerontario.org/files/File/32nd%20Annual%20Conference%20Program%202013.pdf>
- (6) Canadian Stroke Strategy. A Guide to the Implementation of Stroke Unit Care. 2009. Available: [http://strokebestpractices.ca/wp-content/uploads/2010/11/CSS-Stroke-Unit-Resource\\_EN-Final2-for-print.pdf](http://strokebestpractices.ca/wp-content/uploads/2010/11/CSS-Stroke-Unit-Resource_EN-Final2-for-print.pdf)



## Appendix A

Summary data for annual admissions, LOS and resource intensity weight (RIW) by stroke type for each hospital in the SW LHIN averaged across fiscal years 2007-2011.

Hospital	Stroke Type	Admit	ALOS	ALOS ALC	ALOS Tot	RIW
Four Counties Health Services Corporation	Total	10.8	97.6	53.0	150.6	1.9871
	Hem	0.6	1.8	1.6	3.4	1.4426
	Isch	5.6	52.8	40.4	93.2	2.3678
	NS	2.4	31.4	0.2	31.6	1.7964
	TIA	2.2	11.6	10.8	22.4	1.3745
Clinton Public Hospital	Total	12.2	64.8	14.0	78.8	1.1018
	Hem	0.2	0.6	0.0	0.6	1.2279
	Isch	3.0	24.0	6.4	30.4	1.4615
	NS	5.2	30.4	7.6	38.0	1.2915
	TIA	3.8	9.8	0.0	9.8	0.5517
South Huron Hospital	Total	19.4	126.6	25.2	151.8	1.3185
	Hem	0.6	3.6	0.0	3.6	1.4097
	Isch	7.4	64.6	16.6	81.2	1.8361
	NS	6.0	36.6	8.6	45.2	1.2243
	TIA	5.4	21.8	0.0	21.8	0.7039
Alexandra Marine And General Hospital	Total	30.2	166.0	72.4	238.4	1.2729
	Hem	3.4	25.2	13.2	38.4	1.7515
	Isch	9.6	62.8	29.0	91.8	1.5898
	NS	9.0	51.4	24.2	75.6	1.2386
	TIA	8.2	26.6	6.0	32.6	0.7411
Hanover And District Hospital	Total	20.6	125.0	15.2	140.2	1.5077
	Hem	1.6	12.8	5.6	18.4	2.5075
	Isch	8.6	48.4	4.2	52.6	1.6551
	NS	5.6	49.8	5.4	55.2	1.7221
	TIA	4.8	14.0	0.0	14.0	0.6602
Alexandra Hospital	Total	16.4	133.8	52.2	186.0	1.7031
	Hem	1.2	9.6	2.0	11.6	2.1563
	Isch	7.8	82.0	39.4	121.4	2.2955
	NS	2.4	20.0	10.2	30.2	1.6117
	TIA	5.0	22.2	0.6	22.8	0.7141
Listowel Memorial Hospital	Total	24.2	178.8	16.8	195.6	1.2211
	Hem	2.2	25.4	2.6	28.0	1.7420
	Isch	8.0	64.0	7.2	71.2	1.5674
	NS	7.4	63.0	7.0	70.0	1.2313
	TIA	6.6	26.4	0.0	26.4	0.6165
St Joseph's Health Care, London	Total	0.2	2.0	0.0	2.0	1.6499
	Hem	0.0	0.0	0.0	0.0	0.0000

	Isch	0.2	2.0	0.0	2.0	1.6499
	NS	0.0	0.0	0.0	0.0	0.0000
	TIA	0.0	0.0	0.0	0.0	0.0000
St Marys Memorial Hospital	Total	13.8	104.0	49.2	153.2	1.3357
	Hem	1.8	11.4	6.4	17.8	1.4155
	Isch	4.4	34.0	24.6	58.6	1.4399
	NS	3.6	34.6	14.2	48.8	1.6105
	TIA	4.0	24.0	4.0	28.0	0.9380
St Thomas-Elgin General Hospital	Total	88.8	665.0	172.4	837.4	1.7076
	Hem	3.8	48.0	15.2	63.2	2.3089
	Isch	39.2	377.6	125.8	503.4	2.3549
	NS	23.4	163.0	26.2	189.2	1.4747
	TIA	22.4	76.4	5.2	81.6	0.7160
Seaforth Community Hospital	Total	11.2	70.0	13.2	83.2	1.1821
	Hem	0.8	6.0	1.2	7.2	1.3624
	Isch	0.6	4.8	0.8	5.6	1.7467
	NS	7.8	48.6	9.0	57.6	1.1622
	TIA	2.0	10.6	2.2	12.8	1.0184
Stratford General Hospital	Total	110.0	532.6	151.4	684.0	1.3869
	Hem	11.6	52.8	20.4	73.2	1.3992
	Isch	48.8	277.8	77.4	355.2	1.7864
	NS	29.4	137.0	50.8	187.8	1.2077
	TIA	20.2	65.0	2.8	67.8	0.6757
Strathroy Middlesex General Hospital	Total	51.0	491.8	153.4	645.2	1.7828
	Hem	4.4	38.8	3.8	42.6	1.8575
	Isch	18.0	225.4	68.2	293.6	2.2931
	NS	20.8	199.4	80.0	279.4	1.7695
	TIA	7.8	28.2	1.4	29.6	0.5985
Tillsonburg District Memorial Hospital	Total	51.8	450.8	191.0	641.8	1.5611
	Hem	3.4	30.0	29.8	59.8	2.2669
	Isch	5.6	50.6	6.2	56.8	1.6455
	NS	26.2	294.8	119.8	414.6	1.8671
	TIA	16.6	75.4	35.2	110.6	0.9050
Wingham And District Hospital	Total	22.4	176.8	19.6	196.4	1.3331
	Hem	0.6	2.4	0.0	2.4	0.9836
	Isch	4.8	61.6	2.8	64.4	2.0191
	NS	10.2	91.2	15.0	106.2	1.4910
	TIA	6.8	21.6	1.8	23.4	0.6429
Woodstock General Hospital	Total	61.4	410.2	260.2	670.4	1.5973
	Hem	4.2	29.8	18.6	48.4	1.8521
	Isch	10.2	75.0	78.4	153.4	2.2447
	NS	32.4	240.4	155.6	396.0	1.7231
	TIA	14.6	65.0	7.6	72.6	0.7927
London Health Sciences Centre	Total	612.8	6545.0	2320.0	8865.0	3.1308
	Hem	148.2	2048.0	427.4	2475.4	5.2596

	Isch	338.8	3761.4	1597.2	5358.6	2.8725
	NS	58.4	531.8	285.6	817.4	2.0568
	TIA	67.4	203.8	9.8	213.6	0.6791
South Bruce Grey Health Centre	Total	76.4	504.0	217.6	721.6	1.5459
	Hem	4.0	42.4	37.4	79.8	2.8690
	Isch	35.0	298.4	120.6	419.0	1.9904
	NS	19.4	102.6	40.6	143.2	1.2085
	TIA	18.0	60.6	19.0	79.6	0.7512
Grey Bruce Health Services	Total	182.6	1182.2	372.6	1554.8	1.4960
	Hem	13.4	82.4	1.4	83.8	1.4155
	Isch	74.2	600.6	195.0	795.6	1.9102
	NS	64.2	408.0	172.6	580.6	1.4504
	TIA	30.8	91.2	3.6	94.8	0.6284
LHIN Total	Total	1416.2	12027.0	4169.4	16196.4	2.2124
	Hem	206.0	2471.0	586.6	3057.6	4.2774
	Isch	629.8	6167.8	2440.2	8608.0	2.4549
	NS	333.8	2534.0	1032.6	3566.6	1.5892
	TIA	246.6	854.2	110.0	964.2	0.7120

## Appendix B

Summary of cost estimates, sources and adjustments copied from the 2012 [OSN Impact of Moving to Stroke Rehabilitation Best-Practices in Ontario](#) 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		
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



Approximate drive times between facilities in the SW LHIN (in minutes)

Facility	Approx. Drive Times Between Facilities in Minutes																				
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
<b>1 Four Counties Health</b>	106	80	111	174	68	128	58	86	58	110	39	83	138	74	57	211	172	177	153	172	100
<b>2 Clinton Public</b>	--	28	19	82	88	59	67	56	100	15	73	104	35	88	63	127	94	96	61	69	47
<b>3 South Huron</b>	--	--	44	106	133	57	41	38	73	32	46	88	60	74	37	140	120	106	87	95	42
<b>4 Alexandra Marine and Gen.</b>	--	--	--	83	104	65	83	73	114	32	82	121	41	105	79	109	96	100	43	71	64
<b>5 Hanover and District</b>	--	--	--	--	135	49	128	105	163	90	141	149	50	125	126	56	21	20	52	14	97
<b>6 Alexandra Hospital</b>	--	--	--	--	--	88	36	41	43	73	51	25	114	17	41	161	155	126	146	135	42
<b>7 Listowel Memorial</b>	--	--	--	--	--	--	83	59	117	46	95	87	29	77	79	85	68	50	79	48	50
<b>8 St. Joseph's London</b>	--	--	--	--	--	--	--	40	38	64	37	53	99	43	6	167	148	132	125	128	56
<b>9 St. Mary's Memorial</b>	--	--	--	--	--	--	--	--	65	46	53	64	83	49	36	143	125	108	113	105	22
<b>10 St. Thomas Elgin General</b>	--	--	--	--	--	--	--	--	--	99	45	41	131	48	40	194	183	159	156	164	76
<b>11 Seaforth Community</b>	--	--	--	--	--	--	--	--	--	--	75	90	47	74	61	129	104	95	73	79	34
<b>12 Strathroy Middlesex Gen.</b>	--	--	--	--	--	--	--	--	--	--	--	68	104	57	33	179	161	144	123	139	68
<b>13 Tillsonburg District Mem.</b>	--	--	--	--	--	--	--	--	--	--	--	--	130	30	58	177	169	143	162	150	59
<b>14 Wingham and District</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	104	94	100	63	66	52	38	72
<b>15 Woodstock General</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	45	152	145	118	146	125	43
<b>16 London Health Sciences</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	162	146	128	123	126	51
<b>17 Grey Bruce Health</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	45	39	76	65	127
<b>18 Chesley and District</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	34	64	29	116
<b>19 Durham and Community</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	67	29	94
<b>20 Kincardine and Comm.</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	39	105
<b>21 Walkerton and District</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	116
<b>22 Stratford General</b>	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

## Appendix D

2012 Staffing for Inpatient Rehabilitation Programs in South West LHIN

Ratios represent FTE per beds covered (all fractions rounded); Nursing staffing refers to Day Shift

	Rehab Beds	PT	OT	SLP	Social Work	Rec Ther	Nursing (RN/RPN)	Physiatry
Parkwood	26	1:9	1:9	1:15	1:14	1:38	1:4 (3/4)	✓
Stratford	15	1:11	1:14	1:103	1:38	0	1:5 (1/2)	✗
Owen Sound	16	1:8	1:16	1:32	1:19	1:27	1:4 (1/1)	✗
St Thomas	10	1:13	1:16	1:33	1:20	1:55	1:5 (3/1)	✗
Woodstock	10	1:7	1:10	1:100	1:50	1:20	1:5 (1/1)	✓