Ontario Stroke Network

Regional Economic Overview – Champlain LHIN

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Table of Contents

Regional Economic Overview – Champlain 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[1]. 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[2] 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[3]. 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[4]. 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[4]. 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 Champlain Local Health Integration Network (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

Since establishing the Champlain Regional Stroke Network (CRSN) during the 03/04 fiscal year, dramatic improvements in stroke care performance have been achieved for the residents of the Champlain region.[a] The initial focus of the CRSN has been to improve the quality and access to stroke prevention, hyperacute, and acute stroke care services across our region. One of the primary goals of the CRSN is to bring high quality stroke care within 1.5 hours of all residents along the entire stroke care continuum.

Stroke system improvements have included establishing the Champlain Regional Stroke Centre at The Ottawa Hospital (2003), the Pembroke District Stroke Centre (2004), Hawkesbury Community Stroke Prevention Clinic (2005), Cornwall Telestroke Centre (2010), Hawkesbury Telestroke Centre (2011), the Champlain Regional Stroke Prevention System (2011), the Champlain Hyper-Acute Stroke Care System (2011), The Ottawa Hospital General Campus Stroke Unit (2012), Acute Stroke Walk-In Protocol (2013), and Champlain Regional Stroke Rehabilitation System v1.0 (2013).

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 EMS impact

Estimate mean annual stroke/TIA incidence (based on 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[1].

a 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.

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)[I]

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 Champlain 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 = 160 & I61)

Ischemic (ICD-10 = H341 & 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)[b]. 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 [2]. 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 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[3] 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

[a] Interim Quality-Based Procedure list for stakeholder consultation, MoHLTC 2012

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 CSS "Guide to the Implementation of Stroke Unit Care"[5]. 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[3] (Appendix B) to generate a regional estimate of the cost of inpatient rehabilitation annually. Similarly, the mean number of CCC admissions for rehabilitation was inferred. Provincially, approximately 30% of patients who enter CCC post stroke are ultimately discharged home[1]. This value was used in combination with the number of annual acute discharges to CCC[1] 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[1] (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%)[1] 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 PT, OT and 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 HQO clinical handbook 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 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[3], 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[1]. 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)[2].

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[3]. 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 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 and 2010, an average of 1958 stroke or TIA patients arrived at an emergency department in the Champlain LHIN

annually (range 1950 - 1970)[1]. Approximately 58% of these patients were transported to hospital by EMS[1].

Estimate mean travel times and distances between regional hospitals

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, the following tables were generated to allow for quick review of the potential time and distance impact of transferring patients between hospital sites. 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, traffic and weather conditions, as well as EMS staff time during pick-up and drop off. Verification and discussion with local EMS providers should be pursued.

Table 1. Estimated distance in kilometers between hospitals in the Champlain LHIN

Facility	Approx. Distances Between Facilities in KMs														
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Almonte General	34	14	169	83	59	123	166	43	62	145	153	103	56	48	152
2 Arnprior & District	--	44	131	99	75	85	127	58	33	161	169	119	72	64	168
3 Carleton Place & District	--	--	170	83	59	124	165	44	72	145	154	104	57	48	153
4 Deep River & District	--	--	--	225	201	52	111	186	105	288	296	246	199	190	295
5 Kemptville District	--	--	--	--	66	179	220	44	126	153	92	28	63	55	107
6 Montfort	--	--	--	--	--	155	196	21	102	90	100	53	8	12	99
7 Pembroke Regional	--	--	--	--	--	--	85	140	59	241	250	200	153	144	249
8 St. Francis	--	--	--	--	--	--	--	181	94	283	291	241	194	186	291
9 Queensway-Carleton	--	--	--	--	--	--	--	--	87	109	116	66	19	11	116
10 Renfrew Victoria	--	--	--	--	--	--	--	--	--	189	197	147	99	92	196
11 Hawkesbury & District	--	--	--	--	--	--	--	--	--	--	39	107	104	99	88
12 Glengarry	--	--	--	--	--	--	--	--	--	--	--	65	97	106	48
13 Winchester District	--	--	--	--	--	--	--	--	--	--	--	--	46	51	68
14 Ottawa	--	--	--	--	--	--	--	--	--	--	--	--	--	10	97
15 U of Ottawa Heart	--	--	--	--	--	--	--	--	--	--	--	--	--	--	107
16 Cornwall Community	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 2. Estimated travel times in minutes between hospitals in the Champlain LHIN

Facility	Approx. Travel Times Between Facilities in Minutes														
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Almonte General	35	15	117	58	46	87	126	33	50	104	102	73	44	34	104
2 Arnprior & District	--	40	99	65	53	68	102	40	28	110	109	81	50	43	113
3 Carleton Place & District	--	--	129	55	43	99	131	30	58	101	99	70	41	33	103
4 Deep River & District	--	--	--	152	140	39	92	127	81	198	196	167	138	130	201
5 Kemptville District	--	--	--	--	48	120	155	34	81	105	82	27	45	37	67
6 Montfort	--	--	--	--	--	109	143	21	69	70	68	51	14	16	73
7 Pembroke Regional	--	--	--	--	--	--	67	96	50	166	165	136	106	99	169
8 St. Francis	--	--	--	--	--	--	--	130	76	201	199	170	141	133	204
9 Queensway-Carleton	--	--	--	--	--	--	--	--	57	77	75	47	17	10	80
10 Renfrew Victoria	--	--	--	--	--	--	--	--	--	126	125	97	67	59	129
11 Hawkesbury & District	--	--	--	--	--	--	--	--	--	--	39	85	70	72	71
12 Glengarry	--	--	--	--	--	--	--	--	--	--	--	59	67	70	43
13 Winchester District	--	--	--	--	--	--	--	--	--	--	--	--	48	52	52
14 Ottawa	--	--	--	--	--	--	--	--	--	--	--	--	--	13	72
15 U of Ottawa Heart	--	--	--	--	--	--	--	--	--	--	--	--	--	--	76
16 Cornwall Community	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Potential Acute Care impact

Identify mean annual admissions to acute care by hospital and stroke type

Detailed results for each hospital are presented in Appendix A. Regional summary of the total number of annual admissions is presented in table 3.

Table 3. Summary data for mean annual stroke admissions, LOS and resource intensity weight among hospitals in the Champlain 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	217.4	3482.4	976.8	4459.2	5.4744
Ischemic	635.6	8431.6	4699.4	13131.0	3.2398
Not Specified	279.6	2796.2	1797.2	4593.4	2.2352
TIA	195.8	1088.4	245.4	1333.8	0.9997
Total	**1328.4**	**15798.6**	**7718.8**	**23517.4**	**3.0639**

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 Champlain LHIN is $17,826,971 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 12,660 bed days can be anticipated to be occupied by stroke/TIA patients annually in the Champlain LHIN. 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 7432 bed days would be occupied by patients with stroke or TIA. Care of stroke/TIA patients under this "ideal" system would require 22.6 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 Champlain LHIN is $758 per day. This means that across the region, a single day reduction in mean LOS could free up $1,006,971 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 Champlain LHIN would result in the elimination of 10,858 acute care bed days annually. Using the previously reported *per diem* ALC cost estimates of $577 for hemorrhagic patients and $592 for ischemic and stroke not specified patients (Appendix B), these 10,858 days could result in $6,393,421 made available annually. Interestingly, over 7700 of these bed days could be achieved through elimination of acute ALC bed days in the region (see table 3).

Were the "ideal" targets of 5 and 7 days met for all ischemic and hemorrhagic stroke patients across the region, 16,085 fewer acute bed days would be occupied by stroke patients annually compared to current LOS. This would result in an estimated $9,478,733 made available annually; more than 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 Champlain LHIN would make available approximately $4,379 for spending elsewhere. Based on this incremental estimate, if even half of the TIA admissions were avoided annually, $428,673 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[5], regional best-practice staffing compliments are presented in table 4 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 4. Estimate of the best-practice staffing compliments required to care for stroke patients in the Champlain LHIN for both the 10-day and "ideal" models.

Team Member	Champlain 10-day Requirement For 38.5 acute beds	Champlain "ideal" Requirement For 22.6 acute beds
RN**	36	21.1
RPN**	18	10.6
PT†	4.3	2.5
OT†	4.3	2.5
SLP††	2.1	1.3
PT/OT Assistants$^{\pi}$	4.3	2.5
CDA$^{\pi}$	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[3]

††Estimate based on assumption of 1:12 therapist:bed ratio[3]

$^{\pi}$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 (RPG) and mean LOS

According to the NRS, between 2008 and 2010 an average of 326 patients from the Champlain LHIN (range 301 - 341) were admitted to a designated inpatient rehabilitation bed annually. On average these patients remained in inpatient rehabilitation for a mean of 40.2 days. The distribution of patients by RPG and mean LOS are presented in table 5.

Table 5. Mean number of annual admissions to inpatient rehabilitation in the Champlain LHIN by RPG and their corresponding mean LOS from 2008-2010.

RPG	Mean Annual Admissions	Mean LOS (days)
1100	28	68.1
1110	58	53.6
1120	60	46.1
1130	62	36.2
1140	41	32.1
1150	37	26.2
1160	39	18.3
Total	**326**	**40.2**

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 Champlain LHIN is approximately $7,892,144. Of this total cost, approximately $434,964 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, 59 patients a year were discharged to CCC from acute care post stroke in the Champlain LHIN[1]. Assuming that 30% of these patients were rehabilitation candidates, approximately 18 patients a year were admitted to CCC for rehabilitation. Based on the provincial average LOS of 93.5 days[1] at $561/day (Appendix B), these patients would cost $944,163 to care for in this setting. Were these patients to have been admitted to inpatient rehabilitation and achieve a mean LOS of 68.1 days (that of the most severe RPG group, 1100), their care would have cost $687,674; an annual cost reduction of $256,489.

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 should instead should have been admitted to inpatient rehabilitation. Therefore, the current best-practice provincial benchmark of 42.3%[1] 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 997), approximately 422 patients from the Champlain LHIN would require inpatient rehabilitation annually after stroke. Assuming 90% bed occupancy, management of these patients would require 38.5 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 19.6 dedicated FTEs would be required at an estimated annual salary of $1,721,056. Were the best-practice recommended model of 7-day a week therapy for PT, OT, and SLP achieved, 22.9 FTEs would be required at an estimated $2,007,899 (or an additional $286,843). 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 6.

Table 6. Estimates of the need for inpatient rehabilitation FTEs in the Champlain 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*	5.2	$544,973	6.1	$635,802
OT*	5.2	$544,973	6.1	$635,802
SLP**	2.6	$288,059	3.1	$336,069
PT/OT Assistant†	5.2	$272,756	6.1	$318,216
CDA††	1.3	$70,294	1.5	$82,010
Total	**19.6**	**$1,721,056**	**22.9**	**$2,007,899**

*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 Champlain LHIN are anticipated to require 12,333 sessions of both PT and OT, and 6,166 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 $2,929,745. 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 $4,041,040. 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 Champlain 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.

Summary/ Recommendations

This section will be developed in collaboration with the RPD in each region to discuss the overall recommendations that arise from the assessment with regional context in mind (ie. where are the best opportunities for improvement, where are obvious solutions apparent).

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

(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

(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) 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

Appendix A

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

Hospital	Stroke Type	Admit	ALOS	ALOS ALC	ALOS Tot	RIW
ALMONTE GENERAL HOSPITAL	Total	10.0	114.2	17.0	131.2	1.8622
	Hem	0.6	5.8	0.0	5.8	1.7083
	Isch	3.2	65.6	15.2	80.8	3.4519
	NS	1.6	16.0	0.0	16.0	1.3924
	TIA	4.6	26.8	1.8	28.6	0.9399
ARNPRIOR AND DISTRICT MEMORIAL HOSPITAL	Total	15.6	143.6	110.8	254.4	2.1504
	Hem	0.2	7.8	3.6	11.4	9.5624
	Isch	4.4	57.4	57.8	115.2	3.4463
	NS	7.0	57.0	47.6	104.6	1.9275
	TIA	4.0	21.4	1.8	23.2	0.7444
CARLETON PLACE AND DISTRICT MEMORIAL HOSPITAL	Total	11.0	127.6	60.6	188.2	2.2200
	Hem	0.0	0.0	0.0	0.0	0.0000
	Isch	1.0	13.2	1.6	14.8	2.5718
	NS	8.0	103.4	59.0	162.4	2.5091
	TIA	2.0	11.0	0.0	11.0	0.8876
DEEP RIVER AND DISTRICT HOSPITAL	Total	6.2	59.2	325.0	384.2	7.1853
	Hem	0.2	2.4	0.0	2.4	2.7272
	Isch	0.2	0.6	0.0	0.6	1.2330
	NS	3.4	40.8	324.0	364.8	12.2266
	TIA	2.4	15.4	1.0	16.4	0.9111
KEMPTVILLE DISTRICT HOSPITAL	Total	7.2	41.2	33.4	74.6	1.6134
	Hem	0.4	2.6	0.0	2.6	1.3393
	Isch	0.4	2.6	0.0	2.6	1.5992
	NS	4.0	25.2	33.4	58.6	2.0827
	TIA	2.4	10.8	0.0	10.8	0.8793
HOSPITAL MONTFORT	Total	97.2	1024.4	643.8	1668.2	2.3975
	Hem	12.6	165.2	126.8	292.0	3.4773
	Isch	42.8	575.2	408.2	983.4	3.1877
	NS	22.8	191.6	86.8	278.4	1.6687
	TIA	19.0	92.4	22.0	114.4	0.7757
PEMBROKE REGIONAL HOSPITAL INC.	Total	138.6	1372.6	706.2	2078.8	2.0879
	Hem	10.8	81.6	49.0	130.6	2.0155
	Isch	37.6	557.6	190.8	748.4	2.8475
	NS	36.0	416.2	351.6	767.8	2.7719
	TIA	54.2	317.2	114.8	432.0	1.1209
ST FRANCIS MEMORIAL HOSPITAL	Total	7.2	71.4	31.0	102.4	1.9932
	Hem	0.4	9.4	0.0	9.4	3.3263
	Isch	0.8	8.6	12.6	21.2	3.1198
	NS	3.8	43.6	18.4	62.0	2.3285
	TIA	2.2	9.8	0.0	9.8	0.7619
QUEENSWAY-CARLETON HOSPITAL	Total	124.6	1153.2	727.6	1880.8	2.2944
	Hem	10.2	87.0	47.2	134.2	1.9888
	Isch	73.2	776.0	506.6	1282.6	2.6800

	NS	26.4	220.2	170.6	390.8	2.1943
	TIA	14.8	70.0	3.2	73.2	0.7766
RENFREW VICTORIA HOSPITAL	Total	19.4	140.2	79.6	219.8	1.6253
	Hem	1.0	5.8	0.0	5.8	1.3725
	Isch	4.8	49.4	45.4	94.8	2.7775
	NS	8.6	62.6	31.4	94.0	1.5062
	TIA	5.0	22.4	2.8	25.2	0.7745
HAWKESBURY AND DISTRICT GENERAL HOSPITAL	Total	49.4	523.4	91.2	614.6	1.8328
	Hem	4.2	32.8	2.8	35.6	1.6156
	Isch	3.0	29.8	0.0	29.8	1.8408
	NS	34.0	404.8	87.6	492.4	2.0776
	TIA	8.2	56.0	0.8	56.8	0.9264
GLENGARRY MEMORIAL HOSPITAL	Total	13.8	128.6	30.6	159.2	1.5845
	Hem	0.2	4.8	0.8	5.6	3.9543
	Isch	3.6	38.0	5.6	43.6	1.8714
	NS	7.6	70.8	24.2	95.0	1.6524
	TIA	2.4	15.0	0.0	15.0	0.7418
WINCHESTER DISTRICT MEMORIAL HOSPITAL	Total	24.6	277.0	222.0	499.0	2.6459
	Hem	1.0	38.4	47.4	85.8	11.9549
	Isch	5.6	76.4	24.2	100.6	2.2766
	NS	12.6	124.8	137.8	262.6	2.6868
	TIA	5.4	37.4	12.6	50.0	1.2095
THE OTTAWA HOSPITAL / L'HOPITAL D'OTTAWA	Total	696.4	9640.8	4008.6	13649.4	3.7957
	Hem	167.4	2966.6	663.6	3630.2	6.3285
	Isch	402.6	5574.2	2979.6	8553.8	3.4151
	NS	74.4	797.8	311.0	1108.8	2.0252
	TIA	52.0	302.2	54.4	356.6	1.1210
UNIVERSITY OF OTTAWA HEART INSTITUTE	Total	13.4	319.4	23.6	343.0	5.8867
	Hem	0.4	14.6	0.0	14.6	13.0817
	Isch	8.4	248.2	19.0	267.2	7.3286
	NS	2.4	46.4	4.6	51.0	4.2825
	TIA	2.2	10.2	0.0	10.2	0.8235
CORNWALL COMMUNITY HOSPITAL/HOPITALCOMMUNAUTAIRE DE CORNWALL	Total	93.8	661.8	607.8	1269.6	1.9559
	Hem	7.8	57.6	35.6	93.2	1.7161
	Isch	44.0	358.8	432.8	791.6	2.5580
	NS	27.0	175.0	109.2	284.2	1.6186
	TIA	15.0	70.4	30.2	100.6	0.9213
LHIN Total	Total	1328.4	15798.6	7718.8	23517.4	3.0639
	Hem	217.4	3482.4	976.8	4459.2	5.4744
	Isch	635.6	8431.6	4699.4	13131.0	3.2398
	NS	279.6	2796.2	1797.2	4593.4	2.2352
	TIA	195.8	1088.4	245.4	1333.8	0.9997

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	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