Integrated Stroke Model Accreditation Leading Best Practice Briefing Paper

Hamilton Health Sciences

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Until 2009, stroke care was provided at 4 of the 6 Hamilton Health Sciences sites, 3 acute care sites and 1 stand alone rehabilitation site. The Hamilton General Site (HGH) is an acute care hospital that provides regional specialized hyperacute, acute, rehabilitation and secondary prevention services for stroke patients. Although the HGH site is a designated Stroke Care Centre, stroke care was also provided at 2 other acute care sites at HHS on general medicine units. The Chedoke site of HHS was a specialized, stand alone regional rehabilitation hospital. This site provided inpatient, outpatient rehabilitation and follow up stroke care.

In 2009, the inpatient stroke care model consisted of 16 acute stroke beds and 30 specialized stroke rehabilitation beds. At HGH site, acute and rehabilitation care was provided on an integrated stroke unit consisting of 16 acute and 16 rehabilitation beds. At Chedoke site, stroke rehabilitation was provided on a stroke unit consisting of 14 stroke rehabilitation beds. Patients requiring rehabilitation following their acute care episode at HHS might access a rehabilitation bed on either unit. Patients from other acute hospitals in the region would be most likely to receive rehabilitation care at the Chedoke site. Each unit had a unique site based rehabilitation team with specialized stroke knowledge and expertise although they did participate in education and planning together. Although they worked closely together, the rehabilitation teams and acute team had separate staff.

Three major changes took place at HHS in 2009 that affected the provision of stroke care. HHS was well into the planning stages of realigning services through the Access to Best Care (ABC) vision to re-align clinical services to optimize scarce resources and provide sustainable patient care for the long-term. The Access to Best Care initiative would consolidate all acute stroke patients at HGH site for specialized stroke care. Other facilitators to the development of the model were the opening, in September 2009, of the new Regional Rehabilitation Centre in September 2009, located at the Hamilton General site and the amalgamation of St. Peter's Hospital, Complex Continuing Care facility that provides slow stream rehabilitation, with Hamilton Health Sciences.

As a result, the Stroke Program took steps to redesign stroke care at HHS and implemented the new ‘Integrated Stroke Model" The Integrated Stroke Model is unique and ensures that patients will be assessed and triaged into a stroke service stream which is appropriate for their care goals. This Integrated Stroke Model provides an opportunity to further enhance the clustering of stroke resources, providing a more comprehensive continuum of best practice stroke care for the stroke patient population. As well, the model aligns with the ABC goal of establishing centres of excellence, where HHS can leverage the strength of its teams by locating them together as much as possible so that patients have easy access to the expertise and services they require.

The Evidence

A 2009 Cochrane Collaborative Review of 31 trials,[1] involving 6936 participants, found that stroke unit care was consistently associated with improved outcomes. Compared with alternative services, patients receiving care on a stroke unit were more likely to be alive, independent and living at home at one year post stroke. Based on this conclusive evidence, the Canadian Best Practice Recommendations for Stroke Care (2008)[2] identified that stroke patients should receive care on acute and rehabilitation stroke units.

The 2007 Consensus Panel on the Stroke Rehabilitation System[3] (Ontario) defined a service provision model consisting of 3 steps: 1. Screen/Assess, 2. Define and 3. Refer/Transfer.

In the Consensus Report stroke is categorized into 3 groups: Severe (early total FIM™ <40) Moderate (early total FIM™ 40 -80) and Mild (early total FIM™ >80)[4]. The consensus panel maintained that all severity levels of stroke patients should have early assessment for rehabilitation as it is key to optimizing outcomes. [5] Assessment should be provided by staff who are skilled in performing stroke assessment. Early assessment should be available 7 days per week. Assessment should include the use of standardized tools that translate findings to the stroke team and guide patient goals of care early in the process. [6]Moreover, the consensus panel recommended that patients at all severity levels of stroke be provided rehabilitation as soon as possible as early, intensive therapy results in better patient outcomes.[7]

As well, patients with severe stroke who are not deemed suitable for rehabilitation after early assessment should be reassessed for rehabilitation goals at intervals regardless of the setting they are in. [8] Furthermore, patients should not be denied rehabilitation due to system capacity issues.

Early discharge planning and care coordination are required to improve access to service and maintain the flow of patients into inpatient beds.[9]

Review of the System

In 2010 the HHS inpatient stroke care model consisted of 16 acute stroke beds and 30 stroke rehabilitation beds. At HGH site, acute and rehabilitation care was provided on an integrated stroke unit consisting of 16 acute and 16 rehabilitation beds. At the Regional Rehabilitation Centre, stroke care was provided on a 28 bed unit. 14 of these beds were dedicated to stroke rehabilitation and 14 were unoccupied. Additionally, St Peter's Hospital provided slow stream rehabilitation on 1 restorative care unit.

Review of the system revealed that occupancy of acute stroke patients in the 16 beds on the Integrated Stroke Unit was 98. 4% in 2007/2008. Additionally at the Hamilton General Hospital Site there were, on average, 4.2 beds of acute stroke patients on units other than the specialized stroke unit during this time. Furthermore, based on the variation in stroke volumes over the year, there were 4 beds of off service[3] medicine patients on the specialized stroke unit

[3] Medical patients with other than stroke or stroke related diagnosis

in 2007/2008. 6.5 % of the acute stroke beds were occupied by patients with severe stroke who had been designated ALC[1] to LTC[2] or ALC to Complex Care for slow stream rehabilitation. Data analysis from 2006/07 and 2007/08 revealed that combined occupancy in the rehabilitation beds (n=30) was an average of 83.5 % 2006/07 and 77.8 % in 2007/08. St Peter's Hospital currently has, on average, 10 beds of stroke patients in its restorative care unit. Approximately 45% of patients with stroke, admitted to St Peter's Hospital come from the HHS acute care sites.

Based on the 2006/07 and 2007/08 data it was estimated that an average of 508 total cases of patients with a primary diagnosis of acute stroke are admitted at the HGH site annually. In the Phase 1 implementation plan of the new model at the HGH site, the HGH primary stroke case numbers (n=508) were used to determine the numbers of patients requiring different levels of care. The following assumptions were confirmed by analysis; 19% of cases would not require inpatient care after the acute intake and assessment period. Of these 19%, 7% would die and 12 % of patients would be discharged home from acute care following assessment with or without services. The remaining 411 patients would require inpatient care beyond 3-5 days. In addition, analysis was done on patients with Subarachnoid Hemorrhage who would benefit from access to rehabilitation care and an average of 16 local cases/year was identified. These cases were added to the bed calculations. Final bed calculations for the Phase 1 implementation of the new model were based on 427 cases per year.

Table 1

	Cases	Estimated LOS	Pt days	Occupancy Rate	Bed Equivalent
Band 1	508	7	3556	98%	9.9
Band 2	149	10	1490	95%	4.3
Band 3	231	41	9471	95%	27.3
Band 4a	26	14	364	98%	1.0
Band 4b	26	140	3640	98%	10.2
Band 5a	14	14	196	98%	0.5
Band 5b	7	76	530	98%	1.5
Total	**427**				**54.7**

Notes: Band 1 are all acute care patients. Bands 2, 3, 4a and b are patients from Band 1 admitted to a HHS rehabilitation program. Band 5a and b are patients deemed palliative or having no rehabilitation goals after Band 1 assessment.

[1] Alternate Level of care – not requiring acute or active rehabilitation care at the time
[2] Long Term Care Home

Development of the Integrated Stroke Model

The Access to Best Care (ABC) Stroke Planning Steering Committee guided the development and implementation of the new Integrated Stroke Model. A Project Manager, supported the planning and development phases of the new model. Several working groups were formed to facilitate the program development:

- Stroke Model Operations Committee
- Integrated Stroke Model Physician Model Working Group
- Stroke Care Planning Utilization Working Group
- Stroke Model Evaluation Framework Working Group
- Band Working Groups for Band 1, 2, 3, 4, 5
- Cross Band Discipline Specific Working Groups
- Neurosurgical Stroke Working Group
- Stroke Patient Passport (Patient Education) Working Group
- Stroke Staff Education Working Group
- Stroke Care Model Writing Group

The ABC Stroke Planning Steering Committee has become the Integrated Stroke Program Quality Council and will continue to monitor the implementation of the model and program performance and to plan ongoing program quality improvement initiatives. The Stroke Model Operations Committee monitors the ongoing implementation of the model and makes adaptations or resolves issues as required.

The Integrated Stroke Model

In the Integrated Stroke Model, all patients are part of Band 1 for 'Assessment and Triage' and based on the his/her 'Patient Band' (impairment) and his/her Patient Functional Level (disability) is classified into one of the following subsequent bands:

⇒ Band 2: High Tolerance - Short Duration

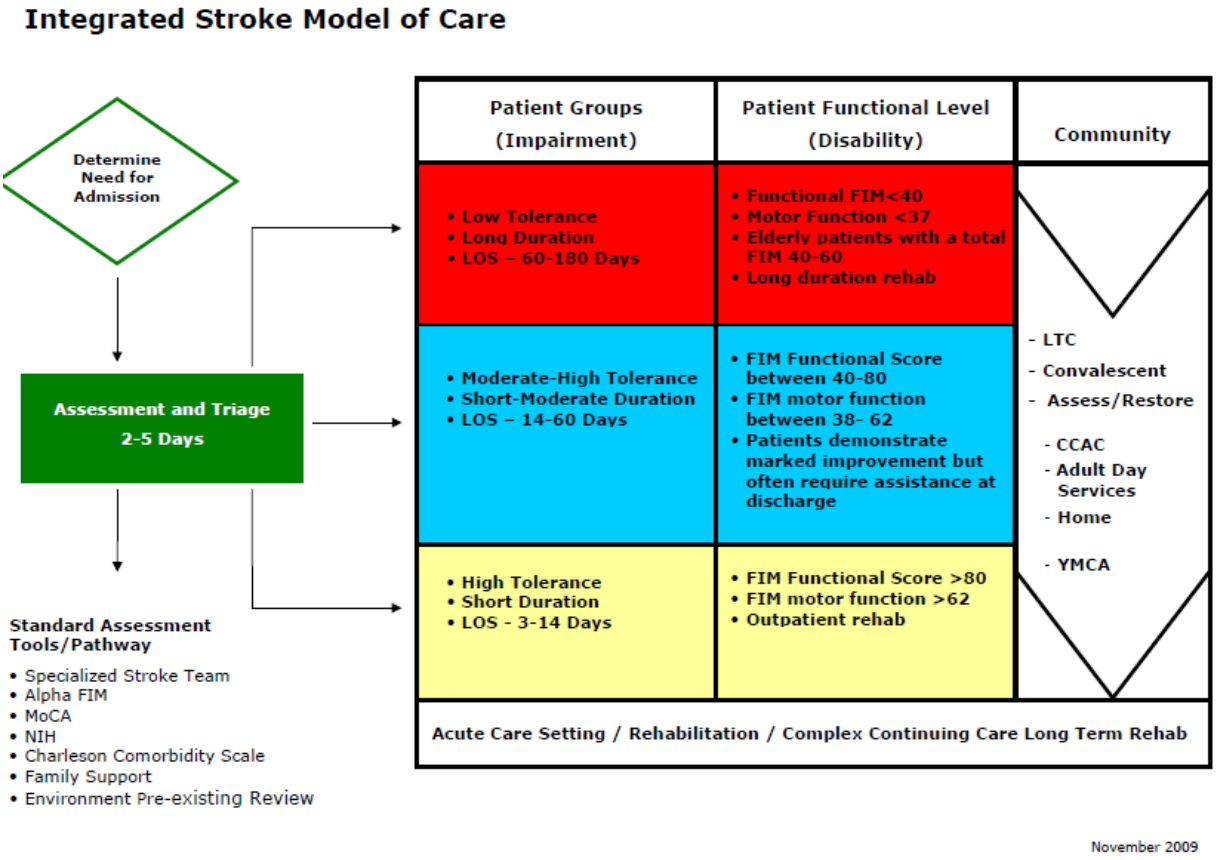
⇒ Band 3: Moderate High Tolerance – Short Moderate Duration

⇒ Band 4: Low Tolerance – Long Duration

⇒ Band 5: Palliative or Patients who are not able to benefit from ongoing rehabilitation - 7 South

⇒ Band 6: Ambulatory Services: Stroke Prevention Clinic and Outpatient Rehabilitation Services, Adult Day Service Program, Community Wellness Programs

Note: *The expectation is to move patients to the designated band at 5 days for Band 2 and 3 and at day 21 for Band 4 patients.*



A "Stroke Care Navigator" role, has been developed, from existing funds, to provide a person who will manage stroke system flow for all stroke patients through their admission to discharge. The navigator ensures that acute interventions and assessments are delivered on time, that early education and discharge planning are initiated and that patients can flow from one level of care to the next with no delay.

The Phase 1 Implementation Plan

In the Phase 1 implementation of the model (January to March 2011) the new bed configuration found acute stroke patients at HGH coming to the acute stroke unit for initial care and assessment. The original 16 acute beds and 2 beds, formerly designated as rehabilitation, now provide 18 beds of acute stroke service. This unit provides assessment and triage beds, early intensive rehabilitation beds for mild stroke patients, care for severe stroke patients who will be transferred to St. Peter's site within 21 days post stroke and care for patients who are not able to move through the bands. 14 of the stroke rehabilitation beds located at the HGH acute site were co located with the 14 existing rehabilitation beds in the Regional Rehabilitation Centre to create a 28 bed specialized stroke rehabilitation unit. St Peter's Hospital provides 10 beds for slow steam rehabilitation.

Hamilton General Hospital Site Data

Stroke Model of Care Bed Map Phase 1 January to March 2011Hamilton General Site 46.5 beds

Band 1 - Assessment and Triage • Expected LOS 3 - 7Days **Calculation - 508* Patients x 7 Days LOS ÷ 365 @ 98% Occupancy = 9.9 Beds*** 19% or **97** patients will not require care after Assessment and Triage Band (7% - 36 patients) will die and 12% (61 patients) will go home within 7 days) leaving ****411 cases** to go through bands.	**Subarachnoid Patients who would require access to** **Bands 2 - 4 after acute neurosurgical period**** **Total Patients: 16.5 patients** Clinical Team on Neurosurgery would complete Assessment Outcome Tools and patient would be triaged to appropriate band.

****Total Cases of Band 1 and SAH Patients who require access to Band 2 - 5: 427 Cases (411 + 16 cases)**

Assume that 100% of remaining cases who do not go home or die within 7 days will flow through the bands.

Band 2 **High Tolerance – Short Duration**		**Band 3** **Moderate-High Tolerance**		**Band 4** **Low Tolerance – Long Duration**		**Band 5**		**Band 6** **Ambulatory Services**
FIM >80 (>70) Rankin 2 LOS 3-14 Days **149 Patients** 35%		FIM 40-80 (50-80) Rankin 3-4 LOS 14-60 Days **231 Patients** 54		FIM 40 (- 50) Rankin 5LOS – 60-180 Days **26 Patients** 6%		Palliative Patients Patients unable to go to Band 4: Semi comatose Severe Cognitive Impaired **21 Patients** 5%		Outpatient Rehabilitation Services Stroke Prevention Clinic Stroke Recovery Associations Adult Day Service Programs
Calculation	**Beds**	**Calculation**	**Beds**	**Calculation**	**Beds**	**Calculation**	**Beds**	
149 x 10 Days ÷ 365 @ 95% =	**4.3**	231 Pts x 41 Days ÷ 365 @ 95% =	**27.3**	26 Pts x 140 Days ÷ 365 @ 98% =	**10.2**	ALC Palliative Patients who die within 21 days 14 Pts X 14 days @ 98%	**0.5**	
				7S LOS for Band 4 Patients: 26 Pts x 14 Days ÷ 365 @ 98% =	**1.0**	Patients who cannot go to Band 4: 7 X 76 days÷ 365 @ 98%	**1.5**	
Total Number of Hamilton General (**17.2)**and Regional Rehabilitation Centre Beds (**27.3**): **44.5 Beds**				Total Number of St. Peter's Beds: **10.2 Beds**				

The Phase 2 Implementation Plan

In April 2011, as a result of the HHS Access to Best Care Initiative, 6 acute stroke beds were transferred to the HGH site from other HHS acute sites, creating a total of 24 acute stroke beds at the HGH site. Based on data analysis from 2006/07 and 2007/08 the Juravinski Hospital and McMaster University Medical Centre had, on average, 230 total cases of patients with a primary diagnosis of acute stroke. This equates to 7.7 beds occupied by acute stroke patients based on 92% occupancy, (4.8 beds and 2.9 beds respectively).The transfer of these 6 beds will increase the number of primary acute stroke cases to 738 annually at the HGH site. The same assumption was made as in Phase 1: That 19% of cases would not require inpatient care after the acute intake and assessment period which would leave 597 cases to move through the Bands.

Phase 2 of the model implementation also includes patients with post admission stroke complications as some of these patients are known to benefit from access to rehabilitation. It was assumed that 30% of these patients would receive care in Band 2 - 4 which equated to 25 cases. An additional 17 subarachnoid hemorrhage patients were included in the bed calculations. Final bed calculations for the Phase 2 Implementation Plan Phase 2 of the model were based on 639 cases per year.

Stroke Model of Care Bed Map Phase2 – Post ABC Transfer of 6Beds
April 2011
Includes: General, Juravinski and McMaster Sites

Band 1 - Assessment and Triage • Expected LOS 3-7 Days **Calculation: 738* Patients x 7 Days LOS x 98% Occupancy = 14.4 Beds*** **141 patients** or 19% will not require care after Assessment and Triage Band (7% (52 patients) will die and 12% (89 patients) will go home within 7 days) **leaving 597**cases to go through the bands**	**Patients who have Stroke coded as a post admit Complication** **Total Cases: 83 cases**** **Assume that 30% of these patients would receive care in Band 2 - 4** **25 cases in the new model**

****Total Cases of Band 1, SAH Patients who require access to Band 2 - 4 and 30% of Stroke as a Secondary Complication Patients who require access to Band 2 - 4: 639 cases (597, 17, 25 cases)**
Assume that 100% of remaining cases who do not go home or die within 7 days will flow through the bands.

Band 2 **High Tolerance – Short Duration**		**Band 3** **Moderate-High Tolerance**		**Band 4** **Low Tolerance – Long Duration**		**Band 5**		**Band 6** **Ambulatory Services**
FIM >80 (>70) Rankin 2 LOS 3-14 Days **224 Patients** 35%		FIM 40-80 (50-80) Rankin 3-4 LOS 14-60 Days **345 Patients** 54%		FIM 40 (- 50) Rankin 5 LOS – 60-180 Days **38 Patients** 6%		Palliative Patients Patients unable to go to Band 4 Semi comatose Severe Cognitive Impaired **32 Patients**5%		Outpatient Rehabilitation Services Stroke Prevention Clinic Stroke Recovery Associations Adult Day Service Programs
Calculation	**Beds**	**Calculation**	**Beds**	**Calculation**	**Beds**	**Calculation**	**Beds**	
224 Pts x 10 days ÷ 365 @ 95% =	**6.5**	345 Pts x 41 Days ÷ 365 @ 95% =	**40.8**	38 Pts x 140 Days ÷ 365 @ 98% =	**14.8**	ALC Palliative Patients who die within 21 days: 20 Pts X 14 days ÷ 365 @ 98% =	**0.75**	
				7S LOS for Band 4 Patients after Band 1: 38 Pts x 14 Days ÷ 365 @ 98% =	**1.5**	Patients who cannot go to Band 4: 12 patients X 76 days ÷ 365 @ 98%	**2.5**	
Total Number of Hamilton General (**25.65**) and Regional Rehabilitation Centre **(40.8)** Beds: **66.45 Beds**				Total Number of St. Peter's Beds: **14.8 Beds**				

Integrated Stroke Model Evaluation Plan

Evaluation of the new stroke model will be achieved through a comprehensive evaluation framework utilizing all current data sets and reporting structures. The evaluation plan for the Integrated Stroke Model includes clinical and system performance indicators. The clinical indicators focus on the provision of best practice stroke care. System indicators focus on measuring patient flow, patient outcomes and costs. A new database was designed to measure stroke system flow and is managed through the Rehabilitation Referral and Waitlist database on a stroke specific stream.

Key elements of the evaluation framework capture the:

- Early assessment and triage of the care band base on early Alpha FIM™ (day 3 -5) score and a series of assessment tools.
- Early and seamless access to all level of rehabilitative care for stroke patients

It is imperative that clinical outcomes are measured in all of the Bands of Recovery, not just rehabilitative outcome data for Band 3 patients admitted to designated inpatient rehabilitation beds. Specifically patients with an Alpha FIM™ of 80+ (band 2) receive early rehabilitation in a dedicated acute care unit and those with an Alpha FIM™ of $\leq$40 (band 4) in a clustered complex care unit specializing in rehabilitative care. In order to successfully analyze the rehabilitation outcomes of the patients in all bands, a CIHI NRS Special Project was obtained to implement NRS data capture in the Band 2 beds in acute care and the Band 4 beds in Complex Care. The use of this tool allows analysis of patient functional gain, days from stroke onset to admission, LOS and LOS efficiency of each care band and ALC discharge days.

Additionally in care band 2, the Rehabilitation Complexity Group (RPG) can be compared to the Case Mixed Grouping (CMG) in the DAD. This will help to evaluate the cost of band 2 on the system. For band 4 patients, no comparable data set is able to provide complexity level or measure specific change in this population. For complex care, this will be a first look at measuring patient specific outcomes and linking onset and LOS with other systems data.

The Benefits

The benefits of the new model are:

1. Improved access to best practice acute and rehabilitation care for all individuals who have suffered a stroke:
    - All patients receive acute stroke unit care and rehabilitation in the right setting.
    - All patients have access to an interdisciplinary team of care providers with expertise in stroke care.
    - All patients have access to standardized assessment of stroke related impairments and functional status.
    - Standardized assessment and implementation of management strategies for stroke complications will result in decreased complication rates and decreased mortality rates.

2. Streamlined patient flow through stroke care service bands:
    - Improved access to rehabilitation: Data indicates that of patients who were transferred to another institution, 29% were transferred to inpatient rehabilitation. It is anticipated that 54% of patients will be transferred to inpatient rehabilitation in the new model.
    - More timely access to inpatient rehabilitation care –prior to implementation of this model, the median length of time between stroke onset and admission to stroke inpatient rehabilitation was between 11 and 18 days depending on the acute care location of the patient. In the new model this will be decreased to 6 - 7 days.
    - ALC days (ALC to Rehab or ALC to Complex Care) should be minimal as patients will flow in a coordinated way through all levels of care.

3. Optimal use of specialized stroke resources:
    - This model enables HHS to further evolve its reputation as a leader in stroke care as the new model will position HHS to have the largest stroke program within the country.

4. The integrated model of stroke will attract academic interest for all professions and enhance interdisciplinary opportunities for stroke research.
    - Training and competencies of all stroke professionals will be increased by working in various streams of care.

The Cost

The new model is designed to be cost neutral. Budgets between the 2 existing stroke units have been realigned to provide the new staffing model.

The Risks

1. Patient flow:
    - The new model must achieve the ELOS assigned in each band in order to keep the system moving. Inability to move patients between bands could result in increased ALC days in acute, rehab and/ or complex care.
    - The off service activity on 7 South must minimized or patient flow will be adversely affected.
    - If overall LOS increases in any band, peer comparison may be affected, causing questions surrounding operational efficiencies. Provision of short term intensive rehab in acute care beds cannot increase the acute ELOS.
    - A close working partnership with CCAC will need to be maintained in order to ensure discharge plans are initiated and monitored throughout inpatient stay in all streams (acute/rehab/complex care).
    - Timely designation of ALC in ALC-IS will be instrumental in ensuring patient flow.

2. Case Costing:
    - It is possible for cost shifting to occur within the model, related to the timing of diagnostic tests and the location of the patient when tests occur.
    - Earlier admission to rehab and complex care may influence costs not usually incurred in rehabilitation or complex care at present. Therefore, the cost per weighted case may shift across streams of care.
    - Resource Intensity Weight may decrease slightly per case based on a decrease in ALC days per case.

3. Decrease in rehab beds:
    - This model sees the transfer of 14 rehabilitation beds and the closure of 2 rehabilitation beds from the HGH acute care site. The HGH rehabilitation institution number will be closed at the Ministry level.
    - Future need for inpatient Stroke rehabilitation beds will need to be managed within the existing 28 rehab bed resource at the Regional Rehabilitation Centre. As noted above, close monitoring of patient flow and ELOS will be imperative.

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