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Transient Ischemic Attack: Where Can Patients Receive Optimal Care? A Rapid Review

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Conflict of Interest Statement

All reports prepared by the Division of Evidence Development and Standards at Health Quality Ontario are impartial. There are no competing interests or conflicts of interest to declare.

Rapid Review Methodology

Clinical questions are developed by the Division of Evidence Development and Standards at Health Quality Ontario in consultation with experts, end-users, and/or applicants in the topic area. A systematic literature search is then conducted to identify relevant systematic reviews, health technology assessments, and meta-analyses; if none are located, the search is expanded to include randomized controlled trials (RCTs), and guidelines. Systematic reviews are evaluated using a rating scale developed for this purpose. If the systematic review has evaluated the included primary studies using the GRADE Working Group criteria (http://www.gradeworkinggroup.org/index.htm), the results are reported and the rapid review process is complete. If the systematic review has not evaluated the primary studies using GRADE, the primary studies included in the systematic review are retrieved and a maximum of two outcomes are graded. If no well-conducted systematic reviews are available, RCTs and/or guidelines are evaluated. Because rapid reviews are completed in very short timeframes, other publication types are not included. All rapid reviews are developed and finalized in consultation with experts.

Disclaimer

This rapid review is the work of the Division of Evidence Development and Standards at Health Quality Ontario, and is developed from analysis, interpretation, and comparison of published scientific research. It also incorporates, when available, Ontario data and information provided by experts. As this is a rapid review, it may not reflect all the available scientific research and is not intended as an exhaustive analysis. Health Quality Ontario assumes no responsibility for omissions or incomplete analysis resulting from its rapid reviews. In addition, it is possible that other relevant scientific findings may have been reported since completion of the review. This report is current to the date of the literature search specified in the Research Methods section, as appropriate. This rapid review may be superseded by an updated publication on the same topic. Please check the Health Quality Ontario website for a list of all publications: http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations.

About Health Quality Ontario

Health Quality Ontario is an arms-length agency of the Ontario government. It is a partner and leader in transforming Ontario's health care system so that it can deliver a better experience of care, better outcomes for Ontarians, and better value for money.

Health Quality Ontario strives to promote health care that is supported by the best available scientific evidence. Health Quality Ontario works with clinical experts, scientific collaborators, and field evaluation partners to develop and publish research that evaluates the effectiveness and cost-effectiveness of health technologies and services in Ontario.

Based on the research conducted by Health Quality Ontario and its partners, the Ontario Health Technology Advisory Committee (OHTAC)—a standing advisory subcommittee of the Health Quality Ontario Board—makes recommendations about the uptake, diffusion, distribution, or removal of health interventions to Ontario's Ministry of Health and Long-Term Care, clinicians, health system leaders, and policy makers.

Rapid reviews, evidence-based analyses and their corresponding OHTAC recommendations, and other associated reports are published on the Health Quality Ontario website. Visit http://www.hqontario.ca for more information.

About Health Quality Ontario Publications

To conduct its rapid reviews, Health Quality Ontario and/or its research partners reviews the available scientific literature, making every effort to consider all relevant national and international research; collaborates with partners across relevant government branches; consults with clinical and other external experts and developers of new health technologies; and solicits any necessary supplemental information.

In addition, Health Quality Ontario collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario can add an important dimension to the review. Information concerning the health benefits, economic and human resources, and ethical, regulatory, social, and legal issues relating to the intervention may be included to assist in making timely and relevant decisions to optimize patient outcomes.

Permission Requests

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List of Abbreviations

ABCD^2	Age, Blood pressure, Clinical features, Duration, and Diabetes
CI	Confidence interval
CT	Computed tomography
ED	Emergency department
EXPRESS	Existing PREventive Strategies for Stroke
IQR	Interquartile range
MRI	Magnetic resonance imaging
PCP	Primary care physician
TIA	Transient ischemic attack

Background

As legislated in Ontario's *Excellent Care for All Act*, Health Quality Ontario's mandate includes the provision of objective, evidence-informed advice about health care funding mechanisms, incentives, and opportunities to improve quality and efficiency in the health care system. As part of its Quality-Based Funding (QBF) initiative, Health Quality Ontario works with multidisciplinary expert panels (composed of leading clinicians, scientists, and administrators) to develop evidence-based practice recommendations and define episodes of care for selected disease areas or procedures. Health Quality Ontario's recommendations are intended to inform the Ministry of Health and Long-Term Care's Health System Funding Strategy.

For more information on Health Quality Ontario's Quality-Based Funding initiative, visit www.hqontario.ca.

Objective of Analysis

Definitive strategies or guidelines supporting the necessity of hospital admission for patients with transient ischemic attack (TIA) do not currently exist. Since the majority of TIA patients do not experience an early stroke following an episode of TIA, it is unclear whether hospitalization is necessary for most TIA patients.

The objective of this rapid review is to investigate whether the place of initial assessment and treatment of patients who present with symptoms of TIA has an impact on the clinical outcomes.

Clinical Need and Target Population

Approximately 30% of strokes are preceded by TIA. (1) Early diagnosis and treatment is therefore critical to reduce mortality and disability in these patients.

The potential advantages of admission to hospital may include earlier administration of thrombolytic therapy in the event of stroke, early completion of diagnostic investigations, and higher rate of adherence to secondary prevention, for example, antihypertensive and lipid-lowering medications.

Definition

TIA was traditionally defined as any focal cerebral ischemic event in the brain or retina the symptoms of which last less than 24 hours. However, based on this definition, evaluation and treatment of TIA patients may not be initiated or completed by all health care professionals. In addition, even 2 neurologists may not agree on which events should be labelled as TIA.

More widespread use of imaging technologies has shown that about one-third of patients with TIA symptoms do in fact have cerebral infarction. This new information has led to the development of a new definition that incorporates imaging findings. This new definition of TIA is "a transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute infarction." (2) Therefore, without diagnostic imaging it is not possible to make a distinction between TIA and stroke.

Risk of Stroke After TIA

In an international study of approximately 300,000 patients presenting to clinics and emergency departments (EDs) with TIA symptoms, the investigators classified 21% of the patients as high risk, 45% as moderate risk, and 34% as low risk. (3) Johnston et al (3) determined the risk of stroke during the first 90 days after TIA as follows:

- 3.9% within first 2 days
- 5.5% within 7 days
- 7.5% within 30 days
- 9.2% within 90 days

Various clinical prediction scores can help detect people at high risk of stroke. For example, $ABCD^2$ (Age, Blood pressure, Clinical features, Duration, and Diabetes) can classify people for urgent diagnosis and possible treatment. Figure 1 shows how to calculate $ABCD^2$ scores.

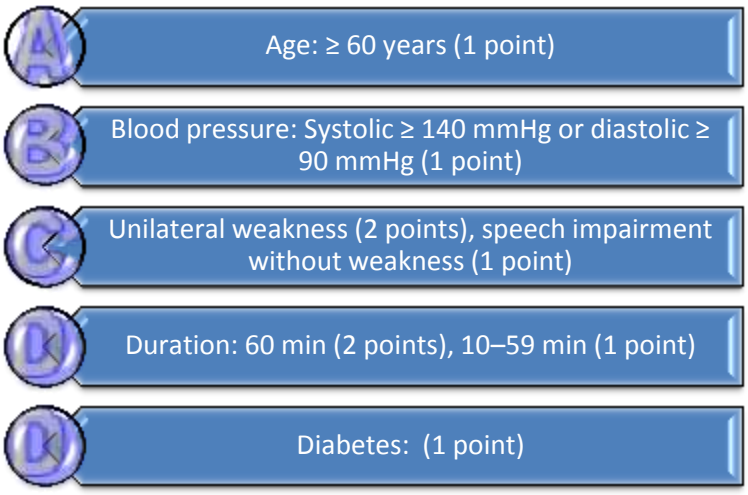

Figure 1: $ABCD^2$ Algorithm for Risk of Stroke Following Transient Ischemic Attack

More recently, imaging data have been included in the prediction scores ($ABCD^2$-I). The most recent version has added brain and vascular imaging to the risk algorithm to create a new prognostic score ($ABCD^3$ and $ABCD^3$-I). The combination of neuroimaging and vascular information has resulted in an improvement in the prognostic accuracy of the risk algorithm in patients with TIA.

Incidence of TIA and Stroke

In 1999–2000, 32,448 strokes led to a first stroke hospitalization in Canada. (4) The incidence of all types of stroke for hospitalized patients was 14.4 per 10,000 population in Canada. The incidence of hospitalized stroke was 15 times higher in those aged 80 years plus than those aged between 45 and 64 years (131.9 versus 8.7 per 10,000 population). The mean length of stay in hospital for all types of stroke was 21 days (95% confidence interval [CI], 20.0–21.4). Approximately 250,000 to 300,000 TIAs occur each year in the United States. (5)

In British Columbia, of the 8,548 first-ever stroke events in 2007–2008, about 60% were acute ischemic, 30% were TIA, and 10% were hemorrhagic events. (1) A survey in United States found that 1 in 15 people older than 65 years, equivalent to 2.3 million people, reported a history of TIA. (5)

Rapid Review

Research Question

Where should patients with signs and symptoms of transient ischemic attack (TIA) receive their initial care—including urgent assessment, appropriate diagnosis, and timely treatment—so as to maximize impact on the clinical outcomes?

Research Methods

Literature Search

A literature search was performed on September 28, 2012, using OVID MEDLINE, OVID MEDLINE In-Process and Other Non-Indexed Citations, OVID EMBASE, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), the Wiley Cochrane Library, and the Centre for Reviews and Dissemination database, for studies published from January 1, 2008, until September 28, 2012.

Inclusion Criteria

- English language full-text reports
- publication between January 1, 2008, and September 28, 2012
- systematic reviews, meta-analyses, and health technology assessments

Exclusion Criteria

- non-English studies

Outcomes of Interest

- rate of stroke following TIA

Results of Literature Search

The database search yielded 85 citations published between January 1, 2008, and September 28, 2012 (with duplicates removed). The titles and abstracts of the retrieved articles were reviewed.

No systematic reviews comparing the benefit and safety of TIA initial care in hospital settings with those in outpatient settings were identified. Therefore, to provide the evidence for this rapid review based on clinical data as well as regulatory requirements, the literature was scanned for the most relevant observational studies published during the last 5 years. In addition, the National Guideline Clearinghouse and other information sources were searched for evidence-based guidelines on the early management of TIA or minor stroke.

Scanning of the literature identified 5 citations relevant to the study question. (6-10) A number of guidelines (listed below) were identified, and sections on the early management of TIA reviewed.

- The Canadian best practice recommendations for stroke care, published by the Canadian Stroke Network and last updated on December 2010, focuses on access and continuity of care (11)
- The Australian Clinical Guidelines for Stroke Management by the National Stroke Foundation, updated in 2010, include the guideline for stroke recognition and prehospital care and the guideline for early assessment and diagnosis (12;13)
- The United States National Stroke Association Guidelines for the Management of TIA, 2006 (14)
- The British Columbia guideline for stroke and TIA management and prevention developed by the Guidelines and Protocols Advisory Committee (GPAC), a joint committee of the British Columbia Medical Association and the British Columbia Ministry of Health, and published in 2009 (1)
- Guideline by the United Kingdom-based National Institute for Health and Clinical Excellence (NICE) on diagnosis and management of acute stroke and transient ischemic attack, published in 2008 (15)
- The Italian guidelines for stroke prevention, part of the Stroke Prevention and Educational Awareness Diffusion (SPREAD) Collaboration, published in 2000 (16)
- Scottish National Clinical Guideline on the management of patients with stroke or TIA by the Intercollegiate Guidelines Network (SIGN), published in 2008 (17)

Addressing the Research Question

To address the research question, different ways through which patients may first seek medical attention were considered. Patients may first seek medical attention through their primary care physicians (PCPs), medical emergency services, or EDs, or they may be referred directly to a hospital. Some organizations have developed rapid, outpatient TIA assessment clinics to expedite initial assessment and to facilitate early deployment of thrombolytic therapy if needed.

Primary Care Physician as the First Contact

No systematic reviews or guidelines were identified for initial evaluation of patients by a PCP. Goldstein et al (9) examined the outcomes of patients with first-ever TIA or stroke who were initially evaluated by their PCPs. The study included 95 patients with a first-ever TIA and 81 patients with stroke, based on medical record abstraction from 27 primary care medical practices in the eastern United States. Although stroke severity was not recorded, it was assumed that patients evaluated in the physicians' offices had minor deficits while those with more severe deficits were more likely referred to hospital EDs for initial evaluation. (9)

This study showed that establishing a clear distinction between TIA and minor stroke may be difficult if relying only on the patient's sign and symptoms. This may indicate the need for more objective diagnostic

measures. The data from this study showed that there were no statistically significant differences in signs and symptoms between patients who had TIA and those who had stroke (Table 1). (9)

Table 1: TIA and Stroke Patients' Signs and Symptoms at Initial Contact with PCP

Sign or Symptom	TIA Patients (N = 95), %	Stroke Patients (N = 81), %	*P* Value
Limb weakness or numbness	46.3	50.6	0.57
Facial weakness	21.1	29.6	0.19
Speech disturbance			
Disarthria	15.8	21.0	0.37
Aphasia	12.6	11.1	0.76
Non-specified speech difficulty	5.3	3.7	0.61
Vision disturbance			
Visual loss	8.4	14.8	0.18
Visual blurring	7.4	6.2	0.75
Diplopia	7.4	6.2	0.75
Ataxia	16.8	23.5	0.27

Abbreviation: PCP, primary care physician; TIA, transient ischemic attack.
Source: Goldstein et al, 2000 (9)

Table 2 summarizes the events, tests ordered, and consultations with specialists at the initial evaluation of the stroke and TIA patients in the study. (9) Significantly more patients with stroke than with TIA were admitted to hospital or received brain imaging ($P = 0.04$); conversely, significantly more patients with TIA than with stroke received a carotid ultrasound ($P < 0.001$).

Table 2: Stroke and TIA Patients' Contact With Health Care Services

	TIA Patients (N = 95), %	Stroke Patients (N = 81), %	*P* Value
Event			
First contacted their PCP on the day their symptom occurred	80	88	0.12
Were admitted to a hospital for evaluation and treatment on the day of the index visit	2	10	0.03
Were not hospitalized and had no evaluations performed during the first month after presenting to a PCP	31	33	0.7
Tests ordered on the day of the initial contact			
Brain MRI/CT	23	37	0.04
Carotid ultrasound studies	40	14	< 0.001
ECG	18	21	0.6
Echocardiogram	19	14	0.34
MRA	2	0	0.2
Cerebral angiogram	1.1	2.5	0.47
Consultation			
Neurologists were consulted	14	20	-
Referred to a cardiologist	13	6	-
Vascular surgeons were consulted	6	3	-

Abbreviations: ECG, electrocardiogram; CT, computed tomography; MRA, magnetic resonance angiogram; MRI, magnetic resonance Imaging; PCP, primary care physician; TIA, transient ischemic attack.
Source: Goldstein et al, 2000. (9)

As shown in Table 2, only 23% of patients with TIA and 37% of patients with stroke received brain magnetic resonance imaging (MRI) or computed tomography (CT), indicating underuse of brain imaging. Of the 176 patients in the study, 32% (31% with TIA and 33% with stroke) were not hospitalized and had no diagnostic studies performed during the first month after their first visit to PCP.

Medical Emergency Services as First Contact

Recommendations made by the Australian Clinical Guidelines for Stroke Management on stroke recognition and prehospital care (12) include the following:

- The general public should receive ongoing education on how to recognize the symptoms of stroke and the importance of early medical assistance (grade B).
- Ambulance services should assign high priority to stroke patients (grade C).
- Ambulance services should use a validated prehospital stroke screening tool and incorporate such tools into prehospital assessment of people with suspected stroke (grade B).
- Health and ambulance services should develop and use prenotification systems for stroke (grade C). (12)

Emergency Departments/TIA Clinics as the First Contact

The EXPRESS study (Existing PREventive Strategies for Stroke) (7) was a vigorous observational study of incident and recurrent TIA and stroke events in Oxfordshire, United Kingdom. It consisted of 2 phases. In phase 1 (April 1, 2002–Sept 30, 2004), all collaborating PCPs were asked to refer all patients with suspected TIA and minor stroke to a daily (weekdays only) hospital outpatient TIA and minor stroke clinic. The clinic then contacted the patient to arrange an appointment as soon as possible. The TIA clinic was appointment-based and as such had inherent delays in receiving referrals and contacting patients. Patients were seen at the clinic on weekdays or at home if the patient was too frail to attend the hospital. Brain imaging (usually CT) and an electrocardiogram (ECG) were conducted on the same day or shortly thereafter, and carotid ultrasound and transthoracic or transesophageal echocardiography (when clinically indicated) during the following week. Following assessment, a report consisting of the initial assessment and specific treatment recommendations was faxed to the PCP (usually within 24 hours). However, the clinic neither initiated any treatment nor issued any prescriptions; patients were only instructed to contact their PCPs as soon as possible. (7)

In phase 2 (October 1, 2004–March 31, 2007), the EXPRESS study team asked the collaborating PCPs to refer all patients suspected of having TIA or minor stroke directly to a clinic where no appointment was necessary (weekdays only) and at which the treatment was initiated immediately following a confirmed diagnosis. Patients were then assessed in the same way as in phase 1 but were given treatment on the same day if they were considered as having TIA or stroke. A report of assessment, diagnosis, and treatment protocol was faxed to the PCP as soon as possible (usually within 24 hours). Therefore, in phase 2, both the mode of access (no appointment necessary) and the time of initiation of treatment (immediately following a confirmed diagnosis) changed. (7)

Of the 620 patients with TIA or stroke who were referred to the hospital outpatient clinic, 591 (95%) were referred directly to the study clinics (310 in phase 1 and 281 in phase 2). Patients in phase 1 and phase 2 had generally similar baseline characteristics. In phase 1, the median time from seeking medical attention to first prescription of the medication recommended by the study clinic was 19 days (interquartile range [IQR], 6–48), whereas in phase 2 it was 1 day (IQR, 0–3; $P < 0.001$).

The results of the study showed that patients in phase 2 had significantly less 90-day rate of recurrent stroke (phase 1: 6 [2.1%], phase 2: 32 [10.3%]; adjusted hazard ratio [HR], 0.20, 95% confidence interval [CI], 0.08–0.49; $P = 0.0001$). In addition, the number of recurrent fatal strokes, the number of disabling strokes, and the overall number of fatal or disabling strokes were significantly less in phase 2 compared with phase 1 (Table 3). The study concluded that urgent assessment and treatment of patients presenting with symptoms of TIA and minor stroke who nevertheless do not require immediate admission to hospital results in preventing about 80% of early recurrent stroke.

Table 3: Clinical Outcomes of Patients with TIA in Phase 1 and Phase 2 of the EXPRESS Study

Event	Phase 1 (N = 310), n (%)	Phase 2 (N = 281), n (%)	*P* Value
		90 days data	
Recurrent stroke	32 (10)	6 (2)	0.0001 HR, 0.20 (95% CI, 0.08–0.49)
Recurrent fatal stroke	8 (3)	1 (0.4)	0.027
Disabling stroke	8 (3)	0 (0)	0.007
Fatal or disabling stroke	16 (5)	1 (0.4)	0.0005
		6 months data	
Death at 6 months	14 (5)	9 (3)	0.41
Progression from no disability at baseline to disability	33 (11)	16 (6)	0.031
Died or became disabled	47 (15)	25 (9)	0.022 OR, 0.51 (95% CI, 0.30–0.85)

Abbreviations: CI, confidence interval; EXPRESS, Existing PREventive Strategies for Stroke; HR, hazard ratio; OR, odds ratio; TIA, transient ischemic attack.
Source: Luengo-Fernandez et al, 2009. (8)

In a separate publication, Luengo-Fernandez et al (8) reported the effect of the EXPRESS intervention on admission to hospital, costs, and disability (Table 4). The authors reported that urgent assessment and treatment of TIA or minor stroke reduced the overall number of days in hospital and generated savings of £624 (GBP) per each patient referred to the TIA clinic. In phase 2, the clinic cost was not included in the analysis. When the data was extrapolated to the population of 1 million individuals, it was equal to the prevention of about 165 strokes annually and a saving of 4,790 hospital bed-days, with monetary saving of £1.12 million (GBP).

Most patients (n = 484 [82%]) were not admitted to the hospital, and therefore did not incur any hospital-related costs.

Table 4: Comparison of EXPRESS Phase 1 and 2 for Hospitalization, Length of Stay, and Costs

Event	Phase 1 (N = 310)	Phase 2 (N = 281)	*P* Value
All cause admission to hospital, n (%)	57 (18)	50 (18)	0.85
Days in hospital due to vascular causes	1,365	427	0.016
Days in hospital due to recurrent stroke	1,147	90	0.005
Days in hospital due to other vascular disease	218	337	0.31
Cost, £ (GBP)			
Total cost	327,474	121,506	-
Mean (SD) cost	1,056 (4,879)	432 (2,277)	0.03
Mean (SD) cost for recurrent stroke	866 (4,788)	76 (998)	0.003
Mean (SD) cost for other vascular cause	191 (1,102)	356 (2,508)	0.19

Abbreviation: EXPRESS, Existing PREventive Strategies for Stroke; SD, standard deviation.
Source: Luengo-Fernandez et al, 2009. (8)

Olivot et al (10) evaluated consecutive patients at a novel ED-based TIA triage system in Stanford, United States, for suspicious TIA. Of the 224 patients in the study, 206 (92%) were seen within 24 hours of symptom onset. At initial evaluation, 157 patients (70%) were discharged to a TIA clinic and 67 (30%) were hospitalized. The median time from symptom onset to ED visit was 3 days, and the median time from ED visit to TIA clinic was 4 days. Of the 157 patients discharged to the TIA clinic, 51 (32%) had a final diagnosis of a cerebrovascular event (46 TIA and 5 minor stroke), and an additional 19 (6%) had a final diagnosis of "possible TIA." (10)

The rate of vascular outcome events for the 157 patients who were referred to the TIA clinic was 0.6% (IQR, 0.1–3.5) at 7 days, and there were no additional outcome events between 7 and 90 days. (10) The stroke rate in patients who were hospitalized was 1.5% (0.3%–8.0%). (10) The combined group had a stroke rate of 0.9% (0.3%–3.2%), which was significantly less than the expected rate at 7 days (4.0%; $P = 0.034$) and 90 days (7.1%; $P = 0.001$) based on $ABCD^2$ (Age, Blood pressure, Clinical features, Duration, and Diabetes) scores. (10)

The SOS-TIA study (6) evaluated the effect of rapid assessment of patients with TIA on clinical decision making, length of hospital stay, and rate of stroke. The SOS-TIA was a hospital-based TIA clinic in France with 24/7-access that was organized to provide an initial standardized assessment of patients within 4 hours of admission. The SOS-TIA clinic, located in the neurology department of a University hospital with a stroke unit, mailed a leaflet on TIA to 15,000 family doctors, cardiologists, neurologists, and ophthalmologists in Paris and its administrative region and to the EDs of community and teaching hospitals. The leaflet contained all the necessary information about TIA and also informed doctors of the availability of the clinic. Apart from being open 24 hours, 7 days a week, the TIA clinic could also be contacted via a toll-free telephone number.

Between January 2003 and December 2005, 1,085 patients with suspected TIA entered the SOS-TIA program. Clinical assessments were performed by vascular neurologists and, if TIA was suspected, further comprehensive tests were initiated. The vascular neurologist was responsible for deciding whether to exclude patients who were judged to have nonischemic transient symptoms such as migraine. After completion of the evaluation, the vascular neurologist contacted the referral doctor to discuss the diagnosis and the most appropriate treatment for patient. Patients were discharged home immediately after the assessment, unless they fulfilled predefined criteria for admission to the hospital stroke unit. If

patients needed antithrombotic therapy (for minor stroke, TIA, and possible TIA), it was started immediately. The family doctors received their patients' discharge summaries including the targets of the prevention therapy. Whether family doctors followed recommendations made by the TIA clinic was not recorded.

A mean of 30 patients were seen at the SOS-TIA clinic each month, and a neurologist saw 946 patients (87%) within 24 hours of initial contact. Baseline characteristics of patients with minor stroke, definite TIA, possible TIA, and those with nonischemic diagnosis were similar.

Of the 946 patients seen by a neurologist, 227 (21%) were admitted to the stroke unit for a mean length of stay of 4 days (IQR, 2–7). The remaining 808 (74%) were judged not to need hospital admission and were discharged home after completion of the examinations. Of these, 478 had a definite TIA or a minor stroke. After their visit to the SOS-TIA clinic, 1,052 (97%) patients were followed up for a median of 16 months (IQR, 12–19); 33 were lost to follow-up.

All the incidents of stroke occurred in patients with definite TIA except 1 that occurred in a patient diagnosed with possible TIA. Patients with the diagnosis of definite TIA and a recent ischemic brain lesion had the highest risk of stroke (Table 5).

Table 5: Observed and Expected Rate of Stroke at 90 Days in Patients Evaluated in a Hospital-Based TIA Clinic

Patients	Observed Rate of Stroke at 90 Days by Kaplan-Meier Analysis, % (95% CI)	Expected Rate of Stroke at 90 Days Based on $ABCD^2$, %
All patients (N = 1,052)	1.24 (0.72–2.12)	5.96
TIA without new lesion (n = 524)	1.34 (0.64–2.78)	6.13
TIA with new lesion (n = 105)	4.76 (2.01–11.06)	7.76
Possible TIA (n = 141)	0.71 (0.10–4.93)	4.00

Abbreviations: $ABCD^2$, Age, Blood pressure, Clinical features, Duration, and Diabetes; CI, confidence interval; TIA, transient ischemic attack.
Source: Lavallee et al, 2007. (6)

One year outcomes are shown in Table 6. However, there was no historical control to compare the results at 1 year.

Table 6: Rate of Stroke and Combined Outcomes at 1 Year in Patients Evaluated in a Hospital-Based TIA Clinic

Patients	All Stroke, % (95% CI)	All Stroke, MI, and Vascular Death, % (95% CI)
All patients (N = 1,052)	1.95 (1.26–3.00)	2.54 (1.74–3.72)
TIA without new lesion (n = 524)	2.17 (3.89–1.20)	2.78 (1.65–4.65)
TIA with new lesion (n = 105)	4.76 (2.01–11.06)	5.74 (2.62–12.34)
Minor stroke (n = 54)	1.96 (0.28–13.12)	3.81 (0.97–14.39)
Possible TIA (n = 141)	2.18 (0.71–6.66)	2.18 (0.71–6.66)
Other diagnosis (n = 228)	No events	0.48 (0.07–3.36)

Abbreviation: MI, myocardial infarction; TIA, transient ischemic attack.
Source: Lavallee et al, 2007. (6)

Recommendations from Guidelines

Recommendations developed by British Columbia Guidelines and Protocols Advisory Committee (1) include the following:

- Consider stroke and emergent TIAs as medical emergencies and perform investigations and treatment as soon as possible. Immediately send patients suspected of having an acute stroke to an ED by ambulance; most will be admitted to hospital for initial care and treatment.
- Consider patients with an emergent TIA for admission.
- The initial investigations for emergent TIAs and suspected acute stroke are the same.
- Patients diagnosed with a nonemergent TIA may be referred to an internist/neurologist or (if available) to a rapid stroke assessment unit. Alternately, a physician may decide to investigate/manage patients diagnosed with a nonemergent TIA as outpatients. (1)

The Canadian Stroke Network (11) best practice recommendations on acute stroke management include the following:

- Patients admitted to hospital because of an acute stroke or TIA should be treated in an interprofessional stroke unit (Evidence level A).
- Patients should be admitted to a stroke unit that is a specialized, geographically defined hospital unit dedicated to the management of stroke patients (Evidence level A).
- The core interprofessional team in the stroke unit should consist of health care professionals with stroke expertise in medicine, nursing, occupational therapy, physiotherapy, speech–language pathology, social work, and dietetics (Evidence level A).
- The interprofessional team should assess patients within 48 hours of admission and formulate a management plan (Evidence level C).
- Clinicians should use standardized, valid assessment tools to evaluate patients' stroke-related impairments and functional status (Evidence level B). (11)

The Australian Clinical Guidelines for Stroke Management recommend the following for early assessment and diagnosis and rapid assessment in the ED: (13)

- Initial diagnosis should be reviewed by a clinician expert in the evaluation of stroke (Grade C).
- Stroke severity should be assessed and recorded on admission by a trained clinician using a validated tool (Grade C).
- ED staff should use a validated stroke screening tool to assist in rapid accurate assessment for all people with stroke (Grade C).
- All patients with suspected stroke should have an urgent brain MRI/CT immediately where facilities are available (within 24 hours) (grade A).
- A repeat MRI/CT and acute medical review should be considered urgently when a patient's condition deteriorates (grade good practice point).
- All patients with carotid territory syndromes who could potentially be candidates for carotid revascularization should have urgent carotid imaging (grade B).
- Further brain, cardiac, or carotid imaging should be undertaken in select patients (grade B). (13)

Clinical tests recommended by the Australian Clinical Guidelines for Stroke Management for early assessment and diagnosis of patients with TIA admitted to an ED are listed in Table 7.

Table 7: Recommendations for Early Assessment and Diagnosis of Patients with TIA

Patient	Detailed History	Prognostic Scores	Blood Tests	Brain Imaging	Carotid Imaging	Grade
All patients with suspected TIA (defined as those whose symptoms and signs have completely resolved within 24 hours) whether first seen in primary or secondary care				Patients with suspected TIA should be assessed by a specialist within 1 week of symptom onset before making a decision for brain imaging		B
Patients identified as high risk, e.g., $ABCD^2$ score ≥ 4 and/or any of the following: AF, carotid territory symptoms, crescendo TIA				Urgent or immediately where available (within first 24 hours); preferably MRI with diffusion-weighted imaging	Urgently in those patients with anterior circulation symptoms who are candidates for carotid revascularization	B
Patients classified as low risk, e.g., $ABCD^2$ scores < 4 without AF or carotid territory symptoms, or patients who presented more than 1 week after last symptoms				As soon as possible (within 48 hours)	Where indicated and as soon as possible (within 48 hours)	B

Abbreviations: $ABCD^2$, Age, Blood pressure, Clinical features, Duration, and Diabetes; AF, atrial fibrillation; MRI, magnetic resonance imaging; TIA, transient ischemic attack.
Source: National Stroke Foundation, 2010. (13)

The Italian guidelines for stroke prevention, part of the Stroke Prevention and Educational Awareness Diffusion (SPREAD) Collaboration, (16) include the following recommendation:

> For patients presenting with TIA, prompt hospital admission is recommended when symptoms are recurrent and last more than 1 hour, and when there is a possible embolic source (arterial or cardiac) (Grade A). (16)

The Guidelines developed by National Institute for Health and Clinical Excellence (NICE) on diagnosis and management of acute stroke and transient ischemic attack (15) include the following:

- People who are admitted to an ED with suspected stroke or TIA should have the diagnosis established rapidly using a validated tool such as ROSIER (Recognition of Stroke in Emergency Room).
- People who have had a suspected TIA should be assessed as soon as possible for their risk of subsequent stroke using a validated scoring system such as $ABCD^2$.
- People who have had a suspected TIA and who are at high risk of stroke ($ABCD^2$ score ≥ 4) should be assessed by a specialist for appropriate investigation and treatment within 24 hours of onset of symptoms.
- People with crescendo TIA (2 or more TIAs in a week) should be treated as being at high risk of stroke, even though they may have an $ABCD^2$ score of ≤ 3. (15)

The Scottish National Clinical Guideline by the Intercollegiate Guidelines Network (17) includes the following:

- Emergency medical services should be redesigned to facilitate rapid access to specialist stroke services.
- Patients with TIA and minor stroke, who are at high risk of early recurrence, should undergo specialist assessment and begin treatment promptly.
- Stroke patients requiring admission to hospital should be admitted to a stroke unit staffed by a coordinated multidisciplinary team with a special interest in stroke care.
- In areas where there is no stroke unit, telemedicine consultation with a hospital with a stroke specialist or other appropriate resources should be considered as soon as possible to facilitate treatment in patients eligible for thrombolysis.

Conclusions

It is of utmost importance that assessment and treatment be initiated as soon as possible when patients present with symptoms of transient ischemic attack (TIA) or minor stroke. This can be done either through referral to a TIA clinic or an emergency department (ED) with stroke expertise and suitable diagnostic facilities.

Evidence from trials of treatment of acute TIA or minor stroke suggests that the relative benefit of interventions is greater in the acute phase. The EXPRESS study demonstrated that urgent assessment and early treatment of TIA or minor stroke reduced the risk of early recurrent stroke by about 80%. (7) Disability, days in hospital, and hospital costs as a result of recurrent stroke were significantly reduced. (8) Most patients (82%) were not admitted to the hospital following appropriate assessment in a TIA clinic where a senior neurologist reviewed all the cases and classified them as TIA, stroke, or other conditions. (8)

Several evidence-based guidelines have made recommendations for urgent assessment, diagnosis, and treatment of patients with TIA. The following points are the key recommendations from these guidelines:

- TIA should be considered as an urgent and time-dependent condition.
- Rapid and complete diagnostic evaluation and timely initiation of treatment in TIA patients are the key points to preventing a major stroke.
- The initial investigations for emergent TIAs and suspected acute stroke are the same.
- All TIA patients should be evaluated by health care professionals with stroke expertise and in facilities where appropriate diagnostic tests can be performed and where treatment can be initiated within 24 hours.
- TIA clinics should have personnel with expertise in TIA diagnosis and management.
- For patients in rural settings or with inadequate critical resources, telemedicine linkage with a hospital with appropriate resources should be considered as soon as possible.
- Patients suspected of having a stroke or having an emergent TIA should be admitted to a stroke unit dedicated to the management of stroke patients.
- Risk stratification using validated scoring systems should be used in clinical practice to identify patients at high or low risk of stroke. Patients can then receive appropriate diagnostic tests according to their risk score.
- The general public should receive ongoing education on how to recognize the symptoms of TIA or stroke and the importance of early medical assistance.

In conclusion, provision of clinical services with stroke expertise, adequate imaging, and laboratory facilities for urgent assessment and timely treatment of patients with TIA and minor stroke is effective in reducing the incidence of subsequent stroke and its associated costs.

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Expert Panel for Health Quality Ontario: 'Episode of Care' for Stroke

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Name	Role	Organization
	Provincial Programs Branch	

Appendix

Final Literature Search – Stroke Mega-Analysis Rapid Review – TIA Clinics

Search date: September 28, 2012
Databases searched: OVID MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, EMBASE; Cochrane Library; CRD

Q: Urgent treatment for transient ischaemic attack/TIA clinics and other service delivery models for TIA management
Limits: 2008-current; English (Human & Adult limits not recommended for MA/SR/HTA)
Filters: health technology assessments, systematic reviews, and meta-analyses

Database: Ovid MEDLINE(R) <1946 to September Week 3 2012>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <September 27, 2012>, Embase <1980 to 2012 Week 38>
Search Strategy:

#	Searches	Results
1	Ischemic Attack, Transient/ use mesz	16920
2	Transient Ischemic Attack/ use emez	21346
3	(transient ischemic attack? or transient ischaemic attack? or transient ischemic seizure? or circulatory epilepsy or transient brain ischemia? or TIA? or (ischemia? adj (transient cerebral or transient brainstem or transient brain stem))).ti,ab.	27890
4	((cerebral ischemia? or ischemic attack?) adj transient).ti,ab.	71
5	or/1-4	52382
6	Ambulatory Care Facilities/ use mesz	11014
7	Ambulatory Care/ use mesz	33992
8	Monitoring, Ambulatory/ use mesz	4671
9	Outpatient Clinics, Hospital/ use mesz	13868
10	Secondary Prevention/	13582
11	Outpatient Department/ use emez	34777
12	exp Ambulatory Care/ use emez	35644
13	(ambulatory* or care center* or care centre* or clinic? or clinic-based).ti,ab.	601034
14	or/6-13	681038
15	((transient ischemic attack? or transient ischaemic attack? or transient ischemic seizure? or circulatory epilepsy or transient brain ischemia? or TIA?) adj5 (ambulatory* or care center* or care centre* or (care* adj3 model*) or clinic? or clinic-based or inpatient* or in-patient* or management* or outpatient* or out-patient* or rapid-access* or specialist? or specialist-clinic? or specialist-service? or urgent care* or urgent-assessment* or urgent-access*)).ti,ab.	2867
16	Meta Analysis.pt.	36479
17	Meta Analysis/ use emez	65909
18	Systematic Review/ use emez	53173
19	exp Technology Assessment, Biomedical/ use mesz	8853
20	Biomedical Technology Assessment/ use emez	11380
21	(meta analy* or metaanaly* or pooled analysis or (systematic* adj2 review*) or published studies or	289866

	published literature or medline or embase or data synthesis or data extraction or cochrane).ti,ab.	
22	((health technolog* or biomedical technolog*) adj2 assess*).ti,ab.	3640
23	or/16-22	349549
24	((5 and 14) or 15) and 23	281
25	limit 24 to english language	258
26	limit 25 to yr="2008 -Current"	119
27	remove duplicates from 26	89

Cochrane Library

Line #	Terms	Results
#1	MeSH descriptor: [Ischemic Attack, Transient] this term only	472
#2	transient ischemic attack? or transient ischaemic attack? or transient ischemic seizure? or circulatory epilepsy or transient brain ischemia? or TIA? or (ischemia? next (transient cerebral or transient brainstem or transient brain stem)):ti,ab,kw or (cerebral ischemia? or ischemic attack?) next transient:ti,ab,kw (Word variations have been searched)	303
#3	#1 or #2	676
#4	MeSH descriptor: [Ambulatory Care Facilities] this term only	319
#5	MeSH descriptor: [Ambulatory Care] this term only	2773
#6	MeSH descriptor: [Monitoring, Ambulatory] this term only	348
#7	MeSH descriptor: [Outpatient Clinics, Hospital] this term only	524
#8	MeSH descriptor: [Secondary Prevention] this term only	115
#9	ambulatory* or care center* or care centre* or clinic? or clinic-based:ti,ab,kw (Word variations have been searched)	23172
#10	#4 or #5 or #6 or #7 or #8 or #9	23274
#11	(transient ischemic attack? or transient ischaemic attack? or transient ischemic seizure? or circulatory epilepsy or transient brain ischemia? or TIA?) near/5 (ambulatory* or care center* or care centre* or (care* near/3 model*) or clinic? or clinic-based or inpatient* or in-patient* or management* or outpatient* or out-patient* or rapid-access* or specialist? or specialist-clinic? or specialist-service? or urgent care* or urgent-assessment* or urgent-access*):ti,ab,kw (Word variations have been searched)	29
#12	(#3 and #10) or #11	19 from 2008 to 2012

CDSR=1
DARE=1
HTA=1

CRD

Search	Hits	
1	MeSH DESCRIPTOR Ischemic Attack, Transient IN DARE,HTA	27
2	(transient ischemic attack? OR transient ischaemic attack? OR transient ischemic seizure? OR circulatory epilepsy OR transient brain ischemia? OR TIA? OR (ischemia? ADJ (transient cerebral OR transient brainstem OR transient brain stem))):TI OR ((cerebral ischemia? OR ischemic attack?) ADJ transient):TI IN DARE, HTA	17
3	#1 OR #2	36
4	MeSH DESCRIPTOR Ambulatory Care Facilities IN DARE,HTA	29

5	MeSH DESCRIPTOR Ambulatory Care IN DARE,HTA	110
6	MeSH DESCRIPTOR Monitoring, Ambulatory IN DARE,HTA	39
7	MeSH DESCRIPTOR Outpatient Clinics, Hospital IN DARE,HTA	15
8	MeSH DESCRIPTOR Secondary Prevention EXPLODE ALL TREES	35
9	(ambulatory* OR care center* OR care centre* OR clinic? OR clinic-based):TI IN DARE, HTA	91
10	#4 OR #5 OR #6 OR #7 OR #8 OR #9	272
11	#3 AND #10	1
12	((transient ischemic attack? OR transient ischaemic attack? OR transient ischemic seizure? OR circulatory epilepsy OR transient brain ischemia? OR TIA?) ADJ5 (ambulatory* OR care center* OR care centre* OR (care* ADJ3 model*) OR clinic? OR clinic-based OR inpatient* OR in-patient* OR management* OR outpatient* OR out-patient* OR rapid-access* OR specialist? OR specialist-clinic? OR specialist-service? OR urgent care* OR urgent-	0

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