The Canadian Stroke Strategy

Canadian Best Practice Recommendations for Stroke Care: 2006

Canadian Stroke Network

Réseau canadien contre les accidents cérébrovasculaires

HEART & STROKE FOUNDATION

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OVERVIEW

The Canadian Stroke Strategy (CSS) was initiated in 2003 under the leadership of the Canadian Stroke Network (CSN) and the Heart and Stroke Foundation of Canada (HSFC). It brings together a multitude of stakeholders and partners with the common vision that

> *"All Canadians have optimal access to integrated, high quality, and efficient services in stroke prevention, treatment, rehabilitation and community reintegration. The Canadian Stroke Strategy serves as a model for innovative and positive health system reform in Canada and internationally."*

The CSS provides a framework to facilitate the widespread adoption of evidence-based best practices for the prevention, treatment and rehabilitation of stroke. The CSS focuses on two levels of change:

- at the provincial/territorial level, the implementation of best practices in stroke prevention, treatment, rehabilitation, and community reengagement; and
- at the national level, the creation of national platforms and Working Groups to support provincial and territorial stroke initiatives through coordination, content development, and communication.

It is recognized that resource issues (financial, system, and human) will make it difficult to implement all recommendations in this document. However, the Best Practices and Standards Working Group consider these recommendations to be "gold standard" benchmarks toward which all stroke care services should be striving. Additionally, these recommendations can also serve as significant starting points for lobbying and advocacy work in aid of improved stroke care services.

Best Practices and Standards Working Group

The Canadian Stroke Strategy Best Practices and Standards Working Group (BPS-WG) was struck to respond to the frequently-reported finding that new research in stroke does not always reach healthcare professionals, hospital administrators, health ministries and, most important, patients. Additionally, best practices are not consistently applied, leaving a significant gap between what should be done and what is being done to provide quality stroke care for all Canadians. Drawing upon successful models of coordinated stroke care, a primary goal of the Canadian Stroke Strategy is to help close this gap. The Canadian Best Practice Recommendations themselves build on the experience and success of the Ontario Best Practice Guidelines for Stroke Care *which were developed and widely disseminated through the* Ontario Stroke Strategy *(now known as the* Ontario Stroke System*).*

The goal of the BPS-WG is to review available literature and recommend best practices in stroke care appropriate to the Canadian context. This document is the first iteration in the development of a comprehensive set of evidence-based recommendations and guidelines. Subsequent editions will address additional issues and topics relevant to quality stroke care, and incorporate new research as it becomes available.
The membership list for the BPS-WG is provided in Appendix Three.

THE RECOMMENDATION DEVELOPMENT PROCESS

A. CONTEXT

This document is the result of an extensive review of national and international evidence-based stroke best practice recommendations and guidelines. It is provided as a starting point for provinces and territories as they move to implement stroke strategies and improve stroke care in Canada across the continuum of care.

To develop this first set of recommendations, the BPS-WG focused on producing best practice recommendations that were:

- supported by the highest levels of evidence, and/or
- considered, in the expert opinion of the Working Group, essential to delivering best practice and integral to driving systems change, and/or
- representative of the full continuum of stroke care.

The Canadian Best Practice Recommendations for Stroke Care 2006 will be updated every two years to remain current and incorporate new research findings.

B. BACKGROUND

Over the past few years, extensive work reviewing stroke care guidelines has been done in Canada. Rather than duplicate this work, the Working Group used as a starting point two recent initiatives: the *Canadian Stroke Quality of Care Study* (CSQCS), which focuses on acute care, telestroke, and secondary prevention; and the *Stroke Canada Optimization of Rehabilitation through Evidence* (SCORE) project, which focuses on rehabilitation. These studies of best practices and performance measurement in stroke care flow from four Canadian consensus panels (three for CSQCS and one for SCORE) conducted during 2004–2006.

- CSQCS reviewed stroke guideline recommendations and developed a core set of performance measures for several phases along the continuum of stroke care. This was achieved through modified Delphi survey methodology involving national expert consensus panels, and discussions at Canadian consensus panel meetings using nominal group process methods. Additional rating rounds followed the panel meetings to ensure final agreement on the performance indicators by panel members.
- SCORE identified Clinical Practice Guidelines for stroke rehabilitation, evaluated each guideline's quality of development using the AGREE instrument[1], and undertook an extensive review process of the guideline content to reach agreement on stroke rehabilitation recommendations for Canada.

The rigorous work of the CSQCS and the SCORE projects formed the foundation of the work of the BPS-WG and provided direction for the identification of Phase I Primary Guidelines and topics.

1. The AGREE tool is a guideline appraisal instrument which assesses the process of guideline development using six domains: Identification of a clinical area to promote best practice; Stakeholder involvement; Rigor of development; Clarity and presentation; Applicability; Editorial independence. **www.agreetrust.org**

C. METHODOLOGY

The BPS-WG chose a conceptual framework to follow for the identification and selection of stroke recommendations. The Practice Guideline Evaluation and Adaptation Cycle (Graham et al, 2005)[2] guided development of the recommendations, which included the following steps: systematic searching for existing practice guidelines; appraising the quality of guidelines using a validated tool; content analysis of guideline recommendations; selecting recommendations for inclusion in the BPS-WG document; obtaining external expert feedback on the proposed recommendations.

C.1 Identification of Primary Guidelines and Topics

In December 2005, the BPS-WG reviewed the SCORE project's ratings of a number of published stroke care guidelines. Those which had the highest scores on the AGREE tool and/or those which were considered most relevant to the Canadian context were selected as the Primary Guidelines for the development of the Phase I recommendations. It was agreed that additional guidelines (European Stroke Initiative, guidelines released since the SCORE/CSQCS projects were completed) would be considered as required to support the recommendation development process.

During this meeting, a sub-group was tasked with preparing a Stroke Best Practices Recommendations Matrix. This matrix would map recommendations and their levels of evidence from the Primary Guidelines onto topic areas identified as relevant to optimal stroke care (i.e. blood pressure management, organization of care).

The sub-group generated the list of topics by identifying recommendations with the highest levels of evidence[3] in each of the Primary Guidelines. Where similar or related recommendations on a particular topic appeared in more than two guidelines, it was added to the topic list. The final list of topics was then cross-referenced with SCORE and the CSQCS studies.

The Best Practices Recommendations Matrix was created through an iterative process of review and discussion among the members of the sub-group and the BPS-WG as a whole.

C.2 Drafting of the 2006 Stroke Recommendations

Once agreement on the Primary Guidelines, topic areas, and the content of the Matrix was reached, the Working Group formed four Ad-hoc Groups to:

- review all recommendations on the Matrix in their areas of expertise
- propose draft recommendation statements for each topic
- state a rationale for inclusion of the recommendation and its relevance to stroke care delivery or patient outcomes
- identify any additional reference sources used to guide their decision-making.

2. Graham ID, Harrison MB, Lorimer K, et al. Advances in Skin & Wound Care, 2005; 18:307–18

3. See Appendix 1 for a *Grading System Summary Table* charting the grading systems used by the Primary Guidelines. Each Guideline group applied a validated grading system method for determining the strength of the evidence used to develop the guideline, and overall several different grading systems were used.

There were some recommendations from the Primary Guidelines which had high levels of supporting evidence but which did not appear on the draft topic list. These were considered by the Ad Hoc Groups; as a result, some topics were revised and three topics (post-stroke depression, post-stroke shoulder pain, and community rehabilitation) were added. No topics were eliminated.

Following this process, a set of draft recommendations was presented to a group of 40 stroke experts and relevant stakeholders from across the country during the Best Practices and Standards National Consensus Conference, held in Halifax in April 2006. (Please see Appendix Three for Attendee List).

C.3 National Consensus Conference

Prior to the Consensus Conference, the draft recommendations were distributed to all participants for review and comment. At the Conference, the conceptual framework and developmental process was reviewed.

This was followed by break-out sessions in which participants met in groups relevant to their expertise and reviewed a specific set of recommendations. Each group was made up of members of the original Ad Hoc Groups as well as other consensus conference participants who were new to the process. These break-out groups had access to all documentation used to develop the recommendations, particularly the Matrix and its supporting documents. They discussed each proposed recommendation with respect to relevance, current evidence and practice, and challenges to uptake and implementation. Each group then presented the results of their discussion to the full group, and suggested changes were debated and approved, rejected, or tabled for further discussion by the BPS-WG.

Following the Consensus Conference, the original Ad Hoc Groups reconvened to review the feedback and propose final wording for the 2006 recommendations. This process was complete by June 2006.

Key changes made following the consensus panel include:

- While all original recommendations were maintained, hypertension management, dyslipidemia management, and glucose management were expanded to include a primary care/population perspective.
- A recommendation for the management of diabetes was added to the prevention section.
- Consultations occurred between the BPS-WG members and the Canadian Hypertension Society guideline development group, the Canadian Dyslipidemia guideline development group, and the Canadian Diabetes group to ensure alignment with related national guidelines and recommendations.
- The two stroke unit recommendations (acute care and inpatient rehabilitation) were amended to ensure they were aligned and relevant to each stage along the continuum.
- The shoulder pain recommendation was significantly reduced to focus on practice recommendations rather than detailed plans of care.
- A section on Systems Implications was added to each recommendation for increased clarity and to identify the necessary resources and structures required to implement the recommendation.

C.4 Performance Measure Development

Draft 4.0 of the document was presented to the CSS Information and Evaluation Working Group (IE-WG) in June 2006. This group reviewed each recommendation and developed an appropriate set of performance measures. Members of the IE-WG represent the full stroke continuum of care, and their expertise guided performance measure development as well as development of the accompanying 'measurement notes' which identify potential data sources, methods to enhance data collection, challenges to data access, and data quality issues.

The IE-WG held a consensus panel in September 2005, during which 19 core performance measures for stroke across the continuum of care were developed. These have been incorporated into the best practice recommendations where appropriate, and are identified by the superscript '^{c}'. Additional performance measures have been provided for several recommendations to provide a comprehensive evaluation of the degree to which the recommendation has been achieved.

It is not expected that each group using these recommendations will be able to document all performance measures provided. Therefore, the most significant measures have been **bolded** for easy identification. The remaining measures are provided for those groups who able to conduct a more extensive evaluation of stroke practice in their region.

The completed recommendation package was finalized by the Canadian BPS-WG in August 2006 and presented to the Canadian Stroke Strategy Steering Committee in fall 2006.

D. DISSEMINATION AND UPTAKE

Concomitant with the development of the document, consideration was given to methods of dissemination and uptake, including:

- Consultation with research experts in the field of knowledge translation and guideline dissemination across Canada.
- Sharing progress with other CSS working groups to ensure alignment and collaboration in dissemination.
- Presentation and discussion during draft stages of development to provincial stroke champions.
- Consultation with other national guideline groups in related fields (hypertension, dyslipidemia, diabetes).
- Presentation for discussion at the Annual General Meeting of the Canadian Stroke Network, with a break-out session on dissemination and uptake.
- Presentation for discussion at the Annual General Meeting of the Canadian Association of Neurological Nurses, and Ontario Stroke Rehabilitation Working Group. Break-out sessions were held to get feedback on the recommendations and have discussion on dissemination and uptake.

Additional knowledge translation activities will be undertaken following initial recommendations release. This will include seeking feedback at local and regional consultation sessions, and providing a guideline review tool for structured feedback as part of the recommendation dissemination package.

E. EVALUATION OF LEVELS OF EVIDENCE

Each recommendation included in this document was evaluated against several criteria: strength of the available research evidence to support the recommendation; degree to which the recommendation drives system change or processes of care delivery; overall validity and relevance as a core recommendation for stroke care along the continuum of care. The levels of evidence included in this document are determined through a structured ranking system which measures the strength of the results in a clinical trial or research study. The design of the study (such as a case report for an individual patient or a randomized double-blinded controlled clinical trial) and the endpoints measured (such as survival or quality of life) affect the strength of the evidence.

The various types of study designs, in descending order of strength, include:

i. Randomized controlled clinical trials (double-blinded or nonblinded) are considered the gold standard of study design.

ii. Meta-analyses of randomized studies offer a quantitative synthesis of previously conducted studies. The strength of evidence from a meta-analysis is based on the quality of the conduct of individual studies. Meta-analyses of randomized studies are placed in the same category of strength of evidence as are randomized studies.

iii. Nonrandomized controlled clinical trials.

iv. Case series: population-based, consecutive series; consecutive cases (not population-based); or, non-consecutive cases. These clinical experiences are the weakest form of study design, but often they can be the only available or practical information.

Several rating systems are used by guideline developers to evaluate the strength of the evidence for their recommendations. These systems vary in the nomenclature used (alpha versus numeric), but there is usually reasonable equivalence in the definitions across the levels of evidence. Each recommendation in this document provides the levels of evidence for the recommendation, as well the reference for the Primary Guideline(s) that were adapted or contributed most to the wording of the recommendation. Refer to the Master Reference List for a detailed list, including website addresses, of the Primary Guidelines.

See "Evidence Table" on the next page for a summary of the definitions for each level reported in this document. Appendix 1 provides more detailed information about the rating systems used by each Primary Guideline.

EVIDENCE TABLE

Level of Evidence*		Definition*
A	I	At least one RCT; or, meta-analysis of randomized controlled trials (RCTs).
B	II	Well designed controlled trial without randomization; or, well designed cohort or case-control analytic study; or, multiple time series, dramatic results of uncontrolled experiment.
C	III	At least one well designed, non-experimental descriptive study (e.g. comparative studies, correlation studies, case studies); or, expert committee reports, opinions and/or experience of respected authorities.
D	IV	Expert committee reports, opinions and/or experience of respected authorities. This grading indicates that directly applicable clinical studies of good quality are absent.
R	R	Recommended good practice based on the clinical experience of the Guideline Development Group.

* Refer to Appendix One for a detailed table defining the evidence rating system used by each primary guideline referenced in this document.

F. ONGOING REVIEW OF BPS-WG RECOMMENDATIONS

The information contained in this document is based on research evidence and knowledge available up to August 2006. The Canadian Best Practice Recommendations for Stroke Care 2006 will undergo a formal review process every two years. This review will include a systematic review of all relevant research literature, reports and other relevant documents published or reported since the last update. New information and evidence will be shared with the Canadian Stroke Strategy and a consensus panel will be convened. All proposed revisions to this document will be disseminated for input by appropriate stakeholders through a coordinated consultation process.

CORE ELEMENTS OF AN INTEGRATED STROKE STRATEGY[4]

Context:

The key components required across the continuum as part of a "system" for coordinated and integrated stroke care are identified in **the table "Core Elements of an Integrated Stroke Strategy" on the next page**. The development of coordinated and integrated stroke strategies at the local, regional and/or provincial/territorial levels should include as many of these components as possible to ensure comprehensiveness of the stroke strategy, although, as stated previously, it is recognized that systemic and resource restrictions may make this difficult for some groups.

4. Adapted from the Ontario Blue Book—Towards an Integrated Stroke Strategy for Ontario—Report of the Joint Stroke Strategy Working Group June 2000; the *Ontario Best Practice Guidelines for Stroke Care*; and the results of the *Canadian Stroke Strategy Information & Evaluation Consensus Panel, September 2005.*

CORE ELEMENTS OF AN INTEGRATED STROKE STRATEGY

Health Promotion and Primary Prevention	Pre-Hospital and Emergency Care	Acute Care/ Treatment	Stroke Rehabilitation	Secondary Stroke Prevention	Community Re-engagement/ Reintegration
• Health promotion efforts that contribute to the primary prevention of stroke in all communities (integrated with existing chronic disease prevention initiatives) • Stroke prevention offered by primary care providers • Public awareness initiatives focusing on the signs and symptoms of stroke • Enhanced public education on the warning signs of stroke and the appropriate response • Definition, dissemination, and implementation of best practices • Ongoing monitoring and evaluation	• Best practices for EMS, physicians and nurses implemented • Heightened emergency response with appropriate protocols • Definition, dissemination, and implementation of best practices • Ongoing monitoring and evaluation	• Organized stroke care (stroke units with critical mass of trained staff, interdisciplinary team) • Initial assessment performed by clinicians experienced in stroke • Timely access to diagnostic services (neuroimaging) • Timely access to thrombolytic therapy (t-PA) and other reperfusion strategies • Definition, dissemination, and implementation of best practices • Ongoing monitoring and evaluation	• Organized stroke care (sub-acute stroke rehabilitation units) • Initial assessment performed by clinicians experienced in stroke • Timely access to specialized, interdisciplinary stroke rehabilitation • Timely access to appropriate levels of rehabilitation intensity for stroke survivors • Stroke rehabilitation support provided to caregivers • Long term rehabilitation services widely available in nursing and continuing care facilities, and in out-patient and community programs • Optimization of strategies to prevent the recurrence of stroke • Outcome data for stroke rehabilitation required • Definition, dissemination, and implementation of best practices • Ongoing monitoring and evaluation	• Stroke Prevention Clinics in place to improve secondary stroke prevention (effective, consistent prevention with early recognition of risk factors and timely, targeted interventions) • Stroke prevention offered by primary care providers • Optimization of strategies to prevent the recurrence of stroke • Definition, dissemination, and implementation of best practices • Ongoing monitoring and evaluation	• Assistance received by stroke survivors and their families with an evolving care plan and regular follow-up assessments • Health care professionals and caregivers in community and long term care settings have stroke care expertise • Ongoing support in the form of community programs, respite care and educational opportunities available to support caregivers in balancing personal needs with care giving responsibilities • Strategies to assist stroke survivors to maintain, enhance, and develop appropriate social support • Definition, dissemination, and implementation of best practices • Ongoing monitoring and evaluation

STROKE RECOMMENDATIONS 2006—TOPIC LIST

SUMMARY OF RECOMMENDATIONS

1 Public Awareness and Responsiveness

1.1 | PUBLIC AWARENESS AND RESPONSIVENESS

All persons (members of the public) should be able to recognize and identify at least two signs and symptoms of stroke (sudden weakness, sudden trouble speaking, sudden vision problems, sudden headache, sudden dizziness) and know to take appropriate action (seek immediate medical attention). (CSQCS V; Evidence Level III)

2 Patient & Family

2.1 | PATIENT AND CAREGIVER EDUCATION

2.1a. Information and education should be provided for all patients with stroke and their families and caregivers, at all stages of care across the continuum (prevention, acute care, rehabilitation, community reintegration). It should address: the nature of stroke and its manifestations, signs and symptoms, impairments and their impact and management, risk factors, planning and decision making, resources and community support. (CSQCS, RCP, NZ, and Australian; Evidence Level A)

2.1b. Information and education should be interactive, timely, up to date, provided in a variety of languages and formats (written, oral, counselling approach), and specific to patient, family, and caregiver needs and impairments. (CSQCS, RCP, NZ, and Australian; Evidence Level A/B)

3 Prevention of Stroke

3.1 | LIFE STYLE MANAGEMENT

Persons at risk of stroke and patients who have had a stroke should be assessed for and given information about risk factors, lifestyle management issues (exercise, smoking, diet, weight, alcohol, stress management), and be counselled about possible strategies to modify their lifestyle and risk factors. (Adapted from RCP, NZ, Australian, VA/DOD, HSFO; Evidence Level III/C/R)

The lifestyle and risk factors and interventions include:

- Exercise: moderate exercise (an accumulation of 30 to 60 min) of brisk walking, jogging, cycling or other dynamic exercise 4 to 7 days each week. Medically supervised exercise programs for high risk patients (e.g. those with cardiac disease). (CHEP, NZ, ASA; Evidence Level A–B/ I–II)
- Smoking: smoking cessation; nicotine replacement therapy and behavioural therapy. (CSQCS, ASA, RCP; Evidence Level II/B–C)
- Diet: diet that is low in fat (especially saturated fat) and sodium, and high in fruit and vegetables. (RCP, ASA; Evidence Level II/B)
- Weight: maintain goal of a BMI of 18.5 to 24.9 kg/m2 and a waist circumference of <88cm for women and <102 cm for men. (CHEP, ASA; Evidence Level II/B–C)
- Alcohol consumption: no alcohol to moderate consumption (less than two standard drinks per day). Men: less than 14 drinks per week/Women: less than 9 drinks per week. (Australian, ASA; Evidence Level C/III)
- Stress management: individualized cognitive behaviour interventions are more likely to be effective when relaxation techniques are employed. (CHEP; Evidence Level C/III)

3.2 | BLOOD PRESSURE MANAGEMENT

3.2a. Blood Pressure Assessment:

- All persons at risk of stroke should have their blood pressure measured at each healthcare encounter. (RCP, CHEP; Evidence Level C)
- Patients found to have elevated blood pressure should undergo thorough assessment for the diagnosis of hypertension following the current guidelines of the Canadian Hypertension Education Program. (ASA, CHEP, RCP; Evidence Level A)

3.2b. Blood Pressure Management:

- Patients with ischemic stroke who are beyond the hyper-acute period should be prescribed anti-hypertensive treatment to target normal blood pressure. (ASA, CSQCS, CHEP, RCP; Evidence Level A)
- Target blood pressure levels as per the Canadian Hypertension Education Program (CHEP) guidelines for prevention of stroke and other vascular events.
  - CHEP guideline recommendations 2006:
    - For the prevention of first stroke in the general population: < 140 mm Hg systolic and < 90 mm Hg diastolic as minimal target.
    - For the prevention of first or recurrent stroke in patients with diabetes or chronic kidney disease: < 130 mm Hg systolic and < 80 mm Hg diastolic.
    - Blood pressure lowering is recommended in patients with blood pressure <140/90 who have had a stroke.

3.3 | LIPID-MANAGEMENT

3.3a. Lipid Assessment:

- Fasting lipid levels (TC, TG, LDL-C, HDL-C) should be measured every 1 to 3 years and other cardiovascular risk factors assessed for all men 40 years or older, and women who are post-menopausal and /or 50 years or older. (CDS, VA/DOD, Class IIa, Level C). More frequent testing should be performed for patients with abnormal values or if treatment is initiated.[5]
- Screen at any age adults with major CAD risk factors (such as diabetes, smoking, hypertension, obesity, cardiovascular disease, chronic kidney disease, lupus, exertional chest discomfort, evidence of atherosclerosis). (CDG; Evidence Level IIa/C)

3.3b. Lipid Management:

- Ischemic stroke patients with LDL-C of >2.0 mmol/ L should be managed with lifestyle modification, dietary guidelines, and medication recommendations. (CSQCS, Australian, VA/DOD; Evidence Level A)
- Statin agents should be prescribed for all patients who have had an ischemic stroke/TIA event (Australian, VA/DOD; evidence level A), in order to achieve a target goal of an LDL-C of <2.0 mmol/L and TC/HDL-C < 4.0 mmol/L. (CDS, CSQCS; Evidence Level A).

3.4 | DIABETES MANAGEMENT

3.4a. Diabetes Assessment:

- All individuals should be evaluated annually for type 2 diabetes risk on the basis of demographic and clinical criteria. (CDA; Evidence Level D)
- A fasting plasma glucose (FPG) should be performed every 3 years in individuals > 40 years of age to screen for diabetes. (CDA; Evidence Level D) More frequent and/or earlier testing with either an FPG or plasma glucose drawn two hours after a 75-g oral glucose load should be considered in people with additional risk factors for diabetes. (CDA; Evidence Level D) Some of these risk factors include: family history, high risk population, vascular disease, history of gestational diabetes, hypertension, dyslipidemia, overweight, abdominal obesity, polycystic ovary syndrome.
- In adults fasting lipid levels (TC, HDH-C, TG and calculated LDL-C) should be measured at the time of diagnosis of diabetes and then every 1 to 3 years as clinically indicated. More frequent testing should be performed if treatment for dyslipidemia is initiated. (CDA; Evidence Level D)
- Blood pressure should be measured at every diabetes visit. (CDA; Evidence Level D)

3.4b. Diabetes Management:

- Glycemic targets must be individualized (CDA, ESI; Evidence Level III); however, therapy in most patients with type 1 or type 2 diabetes should be targeted to achieve an A1C ≤7.0% in order to reduce the risk of microvascular(CDA; Evidence Level A/I) and macrovascular complications. (CDA; Evidence Level C)
- To achieve an A1C ≤7.0%, patients with type 1 or type 2 diabetes should aim for FPG or preprandial PG targets of 4.0 to 7.0 mmol/L and 2-hour postprandial PG targets of 5.0 to 10.0 mmol/L. (CDA; Evidence Level B)
- If it can be safely achieved, lowering PG targets toward the normal range should be considered (CDA; Evidence Level C/3): A1C ≤6.0% (CDA; Evidence Level D); FPG/preprandial PG: 4.0 to 6.0 mmol/L (CDA; Evidence Level D); and 2-hour postprandial PG: 5.0 to 8.0 mmol/L. (CDA; Evidence Level D)
- Adults at high risk of a vascular event should be treated with a statin to achieve an LDL-C <=2.0 mmol/L. (CDA; Evidence Level A/1)
- Unless contraindicated, low dose ASA therapy (80 to 325 mg/day) is recommended in all patients with diabetes with evidence of CVD, as well as for those individuals with atherosclerotic risk factors that increase their likelihood of CV events. (CDA; Evidence Level A)

3.5 | ANTIPLATELET THERAPY

All patients with ischaemic stroke or transient ischaemic attack should be on antiplatelet therapy (ASA) for secondary prevention of recurrent stroke unless there is an indication for anticoagulation or a contraindication to ASA. (CSQCS, ASA, NZ, RCP, Australian, VA/DoD; Evidence Level A) Usual maintenance dosage is 81–325 mg per day. (VA/DoD, CSQCS)

- There is evidence to support the use of alternative antiplatelet agents, including extended-release dipyridamole plus ASA, or clopidogrel. (RCP, Australian, ASA; Evidence Level A)
- Long-term combinations of aspirin and clopidogrel are not recommended. (Evidence Level A)

3.6 | ANTITHROMBOTIC THERAPY FOR ATRIAL FIBRILLATION

3.6a. For primary prevention of stroke in patients with atrial fibrillation, ASA or anticoagulation with warfarin should be considered based on the clinical circumstances. (BPS-WG; Evidence Level A)

3.6b. Patients with stroke and atrial fibrillation should be treated with warfarin at a target INR of 2.5, range 2.0 to 3.0, (target INR of 3.0 for mechanical cardiac valves, range 2.5 to 3.5), if they are likely to be compliant with the required monitoring and are not at high-risk for bleeding complications. (CSQCS, ASA, Australian, SIGN, VA/DoD; Evidence Level A/I)

3.7 | CAROTID INTERVENTION

Patients with symptomatic carotid artery disease of 70–99% stenosis (measured at angiography or by two concordant non-invasive imaging modalities) should be offered carotid intervention (carotid endarterectomy) within 2 weeks of the incident stroke or TIA. (CSQCS, SIGN 14, NZ, ASA; Evidence Level A)

- Carotid intervention is recommended for selected patients with moderate (50 to 69%) symptomatic stenosis. These patients should be evaluated by a physician with expertise in stroke management. (CSQCS, SIGN 14, NZ, ASA; Evidence Level A)
- The standard of care procedure is carotid endarterectomy. (BPS-WG; Evidence Level A)
- Carotid endarterectomy (CEA) should be performed by a surgeon with a known perioperative morbidity and mortality of <6%. (CSQCS, NZ, ASA; Evidence Level A)
- Carotid stenting may be offered open-label to those patients who are not operative candidates for technical, anatomical, or medical reasons. (BPS-WG: Evidence Level C)
- Carotid endarterectomy is contraindicated for patients with mild (<50%) stenosis. (CSQCS, SIGN 14, ASA; Evidence Level A)

5. *Canadian Lipid Guidelines 2006, Unpublished data, used with permission of the authors (Dr. George Fodor, June 8th, 2006)*

4 Acute Stroke Management

4.1 | ACUTE STROKE UNIT CARE

Patients admitted to hospital because of an acute stroke should be treated in an interdisciplinary stroke unit. (CSQCS, SCORE, SIGN 64; Evidence Level A/I)

- A stroke unit is a specialized, geographically defined hospital unit dedicated to the management of stroke patients. (Australian, RCP; Evidence Level A/I)
- The core interdisciplinary team should consist of appropriate levels of medical, nursing, nutrition, occupational therapy, physiotherapy, social work and speech-language pathology staff. Additional disciplines may include pharmacy, (neuro) psychology and recreation therapy. (SIGN 64, Australian, SCORE; Evidence Level B)
- The interdisciplinary team should assess patients within 48 hours of admission and formulate a management plan. (BPS-WG; Evidence Level C)
- Clinicians should use standardized, valid assessments to evaluate the patient's stroke-related impairments and functional status. (RCP, BPS-WG; Evidence Level III)

4.2 | BRAIN IMAGING

All patients with suspected acute stroke should undergo brain imaging immediately. In most instances, the modality of choice is a non-contrast Computer-assisted Tomographic (CT) scan. If Magnetic Resonance Imaging (MRI) is performed, the scan should include diffusion-weighted sequences to detect ischemia, and gradient echo and FLAIR sequences for hemorrhage. (CSQCS, RCP, NZ; Evidence Level B)

4.3 | BLOOD GLUCOSE

All patients with suspected acute stroke should have their blood glucose concentration checked immediately. Blood glucose measurement should be repeated if the first value is abnormal or if the patient is known to have diabetes. Hypoglycemia should be corrected immediately. Markedly elevated blood glucose concentrations should be treated with glucose lowering agents. (CSQCS, Australian; Evidence Level B-C)

4.4 | ACUTE THROMBOLYTIC TREATMENT

All acute ischemic stroke patients should be evaluated to determine their eligibility for treatment with intravenous tissue-plasminogen activator (tPA) using the criteria from the National Institute of Neurological Disorders and Stroke (NINDS) rt-PA Stroke Study. Administration of t-PA should follow the American Stroke Association guidelines. (ASA, CSQCS, RCP; Evidence Level A-B)

- All eligible patients should receive tPA within one hour of hospital arrival. ("Eligible patients" refers to those who arrive at hospital within 3 hours of the onset of stroke symptoms and where tPA is not contraindicated.) (CSQCS, RCP; Evidence Level B-C)

4.5 | CAROTID ARTERY IMAGING

Carotid imaging should be performed within 24 hours of a carotid territory TIA or non-disabling ischemic stroke unless the patient is clearly not a candidate for carotid endarterectomy. (CSQCS, BPS-WG, SIGN14; Evidence Level B)

4.6 | DYSPHAGIA ASSESSMENT

4.6a. All patients with stroke should have their swallow screened prior to initiating oral intake of fluids or food utilizing a simple valid reliable bedside testing protocol. (CSQCS, SCORE, SIGN 78, NZ; Evidence Level B)

4.6b. Patients with stroke presenting with features indicating dysphagia or pulmonary aspiration should receive a full clinical assessment of swallowing by an SLP or appropriately trained specialist who should advise on safe swallow and consistency of diet and fluids. (RCP, CSQCS, SCORE, NZ; Evidence Level A)

4.7 | ACUTE ASPIRIN THERAPY

After brain imaging has excluded intracranial hemorrhage all acute stroke patients should be given at least 160 mg of acetylsalicylic acid (ASA) immediately as a one time loading dose. (RCP, NZ, SIGN13; Evidence Level A)

- In patients treated with r-tPA, ASA should be delayed until after the 24-hour post-thrombolysis scan has excluded intracranial hemorrhage. (RCP, NZ; Evidence Level A)
- ASA (50-325 mg daily) should then be continued indefinitely or until an alternative antithrombotic regime is started. (RCP; Evidence Level A)
- In dysphagic patients, ASA may be given by enteral tube or by rectal suppository. (RCP; Evidence Level A)

4.8 | MANAGEMENT OF SUBARACHNOID AND INTRACEREBRAL HEMORRHAGE

4.8a. Patients with suspected subarachnoid hemorrhage should have an urgent neurosurgical consultation for diagnosis and treatment. (BPS-WG; Evidence Level B)

4.8b. Patients with cerebellar hemorrhage should have an urgent neurosurgical consultation for consideration of craniotomy and evacuation of the hemorrhage. (BPS-WG; Evidence Level C)

4.8c. Patients with supratentorial intracerebral hemorrhage should be cared for on a stroke unit. (BPS-WG; Evidence Level B-C)

5 Stroke Rehabilitation

5.1 | INITIAL STROKE REHABILITATION ASSESSMENT

5.1a. All people admitted to hospital with acute stroke should have an initial assessment by rehabilitation professionals as soon as possible after admission (RCP Level A); preferably within the first 24–48 hours. (NZ; Evidence Level C)

5.1b. All people with acute stroke not admitted to hospital should undergo a comprehensive outpatient assessment(s) which includes a medical evaluation and functional assessments (RCP; Evidence Level A), preferably within two weeks. (BPS-WG; Evidence Level C/D)

5.1c. Clinicians should use standardized, valid assessments to evaluate the patient's stroke-related impairments and functional status, and encourage patient's participation in community and social activities. (AHA-ASA; Evidence Level III)

5.2 | PROVISION OF INPATIENT REHABILITATION

All patients with stroke who are admitted to hospital and who require rehabilitation should be treated in a comprehensive or rehabilitation stroke unit by an interdisciplinary team. (Australian Rehabilitation; Evidence Level A/I)

- Post-acute stroke care should be delivered in a setting in which rehabilitation care is formally coordinated and organized. (AHA-ASA; Evidence Level 1)
- All patients should be referred to a specialist rehabilitation team on a geographically defined unit as soon as possible after admission. (RCP; Evidence Level A)
- Post-acute stroke care should be delivered by a variety of treatment disciplines, experienced in providing post stroke care, to ensure consistency and reduce the risk of complications. (RCP; Evidence Level C)
- The interdisciplinary team may consist of a physician, nurse, physical therapist, occupational therapist, speech and language pathologist, psychologist, recreation therapist, patient and family/caregivers. (ASA-AHA; Evidence Level 1). This "core" interdisciplinary team should consist of appropriate levels of these disciplines, as identified by the Stroke Unit Trialists' Collaboration. (SIGN 64; Evidence Level B)
- The interdisciplinary team should assess patients within 24–48 hours of admission, and develop a comprehensive rehabilitation plan to reflect the severity of the stroke and the needs and goals of the stroke survivor. (HSFO, NZ; Evidence Level C)
- Stroke unit teams should conduct at least one formal interdisciplinary meeting per week to discuss the progress and problems, rehabilitation goals, and discharge arrangements for patients on the unit. (SIGN 64; Evidence Level B)
- Standardized assessment tools should be used to assess the functional status of stroke patients. (AHA-ASA; Evidence Level II)
- Where admission to a stroke rehabilitation unit is not possible, longer-term inpatient rehabilitation should be provided on a mixed rehabilitation unit (i.e. where interdisciplinary care is provided to patients disabled by a range of disorders including stroke). (SIGN 64; Evidence Level B)

5.3 | COMPONENTS OF INPATIENT STROKE REHABILITATION

All patients with stroke should begin rehabilitation therapy as early as possible once medical stability is reached. (AHS/ASA; Evidence Level I)

- Patients should undergo as much therapy appropriate to their needs as they are willing and able to tolerate. (RCP; Evidence Level A)
- The team should promote the practice of skills gained in therapy into the patient's daily routine in a consistent manner. (RCP; Evidence Level A)
- Therapy should include repetitive and intense use of novel tasks that challenge the patient to acquire necessary motor skills to use the involved limb during functional tasks and activities. (SCORE; Evidence Level A)
- Stroke unit teams should conduct at least one formal interdisciplinary meeting per week at which patient problems are identified, rehabilitation goals set, progress monitored, and support after discharge planned. (SIGN 64; Evidence Level B)

5.4 | IDENTIFICATION AND MANAGEMENT OF POST-STROKE DEPRESSION

All patients with stroke should be considered to be at a high level of risk for depression. The clinical team should assess the patient's prior history of depression and previous risk factors of depression as part of the initial screening. All patients with stroke should be screened for depression initially and at three-month intervals or key stages of the rehabilitation process and after rehabilitation services has been discontinued. (BPS-WG; Evidence Level A)

- Patients diagnosed with a depressive disorder should be given a trial of antidepressant medication, if no contraindication exists. The Working Group makes no recommendation for the use of one class of antidepressants over another; however, side effect profiles suggest that Serotonin-Specific Reuptake Inhibitors (SSRIs) may be favored in this patient population. (AHA-ASA; Evidence Level I)
- In patients with severe, persistent, or troublesome tearfulness, SSRIs are recommended as the antidepressant of choice. (AHA-ASA; Evidence Level I)
- Routine use of prophylactic antidepressants is not recommended in post stroke patients. (AHA-ASA; Evidence Level 1)
- Patients should be given information, advice and the opportunity to talk about the impact of illness upon their lives. (RCP; Evidence Level B)
- Patients with marked anxiety should be offered psychological therapy, given by an appropriately trained and supervised practitioner. (RCP; Evidence Level B)
- Patients and their carers should have their individual psychosocial and support needs reviewed on a regular basis as part of the longer-term management of stroke. (RCP; Evidence Level A)

5.5 | SHOULDER PAIN ASSESSMENT AND TREATMENT

5.5a. Factors that contribute to, or exacerbate, shoulder pain should be identified and managed appropriately.

- Educate staff and carers about correct handling of the hemiplegic arm. (RCP, SCORE; Evidence Level B)
- Consider use of supports for the arm. (RCP; Evidence Level A)

5.5b. Joint protection strategies should be instituted to minimize joint trauma.

- The shoulder should not be passively moved beyond 90 degrees of flexion and abduction unless the scapula is upwardly rotated and the humerus is laterally rotated. (SCORE; Evidence Level A)
- Overhead pulleys should not be used. (Ottawa Panel; Evidence Level A)
- The upper limb must be handled carefully during functional activities. (SCORE; Evidence Level B)
- Staff should position patients, whether lying or sitting, to minimize the risk of complications such as shoulder pain. (RCP; Evidence Level B)

5.5c. Shoulder pain and limitations in range of motion should be treated through gentle stretching and mobilization techniques focusing especially on external rotation and abduction. (SCORE; Evidence Level B)

5.6 | COMMUNITY-BASED REHABILITATION

Stroke survivors should continue to have access to specialized stroke care and rehabilitation after leaving hospital (acute and/or inpatient rehabilitation). (RCP; Evidence Level A)

- Early supported discharge services provided by a well resourced, coordinated specialist interdisciplinary team are an acceptable alternative to more prolonged hospital stroke unit care and can reduce the length of hospital stay for selected patients. (SIGN 64; Evidence Level A) In addition, early supported discharge services to generic (non-specific) community services should not be undertaken. (RCP; Evidence Level A) See rationale below for explanation of early supported discharge.
- People who have difficulty in activities of daily living (ADL) should receive Occupational Therapy or multi-disciplinary interventions targeting ADL. (Australian; Evidence Level 1)
- Multifactorial interventions provided in the community including an individually prescribed exercise program, may be provided for people who are at risk of falling, in order to prevent or reduce the number and severity of falls. (Australian; Evidence Level 1)

6

Follow-up and Community Reintegration After Stroke

6.1 | FOLLOW-UP AND EVALUATION IN THE COMMUNITY

6.1a. Stroke survivors and their caregivers should have their individual psychosocial and support needs reviewed on a regular basis. (RCP; Evidence Level A)

6.2b. Any stroke survivor with reduced activity at six months or later after stroke should be assessed for appropriate targeted rehabilitation. (RCP; Evidence Level A)

6.3c. People living in the community who have difficulty with ADL should have access, as appropriate, to therapy services to improve, or prevent deterioration in ADL .(Australian; Evidence Level I)

6.4d. Recommendation # 21 (Identification and Management of Post-Stroke Depression) should also be observed as part of follow-up and evaluation of stroke survivors in the community. (BPS-WG)

1 Public Awareness and Responsiveness

1.1 | PUBLIC AWARENESS AND RESPONSIVENESS

BEST PRACTICE RECOMMENDATION 1.1: PUBLIC AWARENESS AND RESPONSIVENESS

All persons (members of the public) should be able to recognize and identify at least two signs and symptoms of stroke (sudden weakness, sudden trouble speaking, sudden vision problems, sudden headache, sudden dizziness) and know to take appropriate action (seek immediate medical attention). (CSQCS V; Evidence Level III)

RATIONALE

Many people, including those with hemorrhagic stroke, ischemic stroke, and TIA, do not recognize the symptoms of stroke and so do not realize that seeking treatment is urgent. Recognition of symptoms is the first step in order to seek help for stroke. Early detection results in timely treatment and better outcomes.

SYSTEM IMPLICATIONS

- Health promotion efforts that contribute to the primary prevention of stroke in all communities (integrated with existing chronic disease prevention initiatives).
- Public awareness initiatives focusing on the signs and symptoms of stroke, and the sudden nature of the onset of these signs and symptoms.
- Enhanced public education on the warning signs of stroke and the appropriate response.
- Best practices for EMS, physicians and nurses implemented.
- Heightened emergency response with appropriate protocols.
- Definition, dissemination, and implementation of best practices.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. **Proportion of the population that can name two or more stroke symptoms.** [c6]

ii. Proportion of patients who seek medical attention within 2.5 hours of stroke symptom onset.

iii. Median time from stroke symptom onset to presentation at an ED. [c]

iv. Proportion of emergency medical service (EMS) providers trained in stroke recognition and use of stroke triage algorithms for prioritizing stroke cases for transport within regions.

v. The incidence of stroke in each province/territory by stroke type.[c]

Measurement Notes

a. Data for indicator #i may come from Heart and Stroke Foundation public polls.

b. Data for indicators #ii & iii would be obtained from chart audit data at this time.

c. For iv, unit of analysis may vary depending on the model for emergency health services management within each province/territory.

d. Stroke symptom onset may be known if the patient was awake and conscious at the time of onset, or it may be unknown if it symptoms were present on wakening. It is important to record whether the time of onset was estimated or exact when measuring this indicator. The time would qualify as exact provided that (1) the patient is competent and definitely noted the time of symptom onset or (2) the onset was observed by another person who took note of the time.

e. Data sources include Emergency Department triage sheet or admission note, history & physical, consultant's notes, Emergency Medical Services ambulance records.

6. The superscript 'c' following a recommended performance measure indicates that the performance measure is part of the CSS Core set of stroke performance measures identified at the CSS Information and Evaluation consensus meeting, 2005.

SUMMARY OF THE EVIDENCE

Excerpt from the European Stroke Guidelines (2003): Stroke is a medical and occasionally also a surgical emergency. Successful care of the acute stroke victim begins with the recognition both by the public and the health professional that stroke is an emergency, like acute myocardial infarction (MI) and trauma. The majority of stroke patients do not receive adequate therapy because they do not reach the hospital soon enough. (Barber et al, 2001)

Successful care of the acute stroke victim as an emergency depends on a 4-step chain:

1. Rapid recognition of and reaction to stroke warning signs
2. Immediate use of emergency medical system (EMS) services
3. Priority transport with notification of the receiving hospital, and
4. Rapid and accurate diagnosis and treatment at the hospital.

Failure to recognize stroke symptoms and to consult a primary physician delay the interval between stroke onset and hospital arrival. (Ferro et al, 1994; Wester et al, 1999; Derex et al, 2002; Harraf et al, 2002).

Warning Signs of Stroke
Heart and Stroke Foundation of Canada, 2006

Weakness	Sudden weakness, numbness or tingling in the face, arm or leg
Trouble speaking	Sudden temporary loss of speech or trouble understanding speech
Vision problems	Sudden loss of vision, particularly in one eye, or double vision
Headache	Sudden severe and unusual headache
Dizziness	Sudden loss of balance, especially with any of the above signs

ACTION: CALL 9-1-1 OR YOUR LOCAL EMERGENCY NUMBER IMMEDIATELY

www.heartandstroke.ca

2

Patient and Caregiver Education

2.1 | PATIENT AND CAREGIVER EDUCATION

** Note: This recommendation applies across the entire continuum of stroke care and should be considered at every patient encounter with health care providers during acute and post-acute phases of stroke care and recovery.*

BEST PRACTICE RECOMMENDATION 2.1: PATIENT AND CAREGIVER EDUCATION

2.1a. Information and education should be provided for all patients with stroke and their families and caregivers, at all stages of care across the continuum (prevention, acute care, rehabilitation, community reintegration). It should address: the nature of stroke and its manifestations, signs and symptoms, impairments and their impact and management, risk factors, planning and decision making, resources and community support. (CSQCS, RCP, NZ, and Australian; Evidence Level A)

2.1b. Information and education should be interactive, timely, up to date, provided in a variety of languages and formats (written, oral, counselling approach), and specific to patient, family, and caregiver needs and impairments. (CSQCS, RCP, NZ, and Australian; Evidence Level A/B)

RATIONALE

Education is a vital part of the recovery process for many illnesses, including stroke. Inclusion of the survivor, family members and both formal and informal caregivers enables them to have a better understanding of the needs of the patient and enhance recovery and coping. Simple provision of information alone is not effective.

SYSTEM IMPLICATIONS

- Coordinated efforts among stakeholders such as Heart and Stroke Foundations (national and provincial), public health agencies, ministries of health, and care providers across the continuum to produce patient, family and caregiver education materials with consistent information and messages.
- Coordinated process for ensuring access to educational materials, programs, activities and other media related to stroke by healthcare professionals, patients, and caregivers. Process should include advertising of educational material availability, effective dissemination mechanisms and follow-up.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of stroke patients with documentation of education provided for patient, family, and/or caregivers at each stage throughout the continuum of stroke management and recovery.

ii. Total time spent on patient/family education during a healthcare encounter for stroke.

Measurement Notes:

a. Quantity and method of patient education are very important elements of this recommendation. Measurement for patient/family education should be expanded when feasible to measure these aspects.

b. Data sources include all documents, charts and records related to patient care across the continuum (primary care, acute care, follow-up clinics, inpatient and outpatient rehabilitation programs, community programs and services) and would be obtained through primary chart audit or review, and various logging/audit practices of individual groups.

c. Documentation quality by health care professionals involved in the patient's care may affect ability to monitor this indicator reliably.

SUMMARY OF THE EVIDENCE

Information for patients and their families following stroke can be offered in a variety of formats. Patient information booklets are published with these guidelines, and are also available on the web. Patients' organizations have a variety of leaflets and web-based materials on stroke. However, research demonstrates how difficult it is to give information effectively and that failure to provide sufficient information is one of the commonest causes of patients' complaints.

Clinical practice guidelines provide strong consensus (and one cites some evidence supporting specific recommendations) to provide patient and family members with stroke education during hospitalization, and to provide information or other resources for social support and services. Nine randomized controlled trials of a heterogeneous group of education and support strategies for stroke patients and carers provide modest evidence of some measurable benefit for patient and caregiver outcomes; negative studies tended to have small sample sizes and may have been able to detect only very large effects. A systematic review of 19 trials of organized inpatient stroke care identified several features that characterized the stroke units in these trials and distinguished them from conventional care. Some of those features were routine involvement of carers in rehabilitation and in interdisciplinary team meetings, and routine provision of information to carers (all p values for comparisons of stroke unit vs. conventional care < 0.01). While the unique impact of these features of stroke units in the improved patient outcomes associated with organized inpatient stroke care cannot be ascertained with certainty, these findings provide some additional evidence supporting the benefit of patient and caregiver education and support during hospitalization for acute stroke.

3 Prevention of Stroke

3.1 | LIFE STYLE AND RISK FACTOR MANAGEMENT

This section addresses two components of stroke prevention:

***Primary prevention** recommendations (lifestyle and risk factor management, hypertension screening, dyslipidemia, and diabetes): which emphasize the importance of screening and monitoring those patients at high risk of having a first stroke event.*

***Secondary prevention** recommendations (lifestyle management, hypertension, dyslipidemia, antiplatelet therapy, antithrombotic therapy, carotid revascularization): which focus on the management of patients who have experienced a stroke/TIA event, as they are at ongoing risk of subsequent events. This section includes those patients seen in primary care only, those patients treated in an emergency department for a stroke/TIA event then released directly from the emergency department, as well as those patients who spend time as an inpatient in an acute care hospital for their stroke/TIA event. Secondary prevention should also be considered and monitored while patients are participating in post-stroke rehabilitation, and when they return to the community following acute stroke management and rehabilitation.*

BEST PRACTICE RECOMMENDATION 3.1: LIFESTYLE AND RISK FACTOR MANAGEMENT

Persons at risk of stroke and patients who have had a stroke should be assessed for and given information about risk factors, lifestyle management issues (exercise, smoking, diet, weight, alcohol, stress management), and be counselled about possible strategies to modify their lifestyle and risk factors. (Adapted from RCP, NZ, Australian, VA/DOD, HSFO; Evidence Level III/C/R)

The lifestyle and risk factors and interventions include:

- Exercise: moderate exercise (an accumulation of 30 to 60 min) of brisk walking, jogging, cycling or other dynamic exercise 4 to 7 days each week. Medically supervised exercise programs for high risk patients (e.g. those with cardiac disease). (CHEP, NZ, ASA; Evidence Level A-B/ I-II)
- Smoking: smoking cessation; nicotine replacement therapy and behavioural therapy. (CSQCS, ASA, RCP; Evidence Level II/B-C)
- Diet: diet that is low in fat (especially saturated fat) and sodium, and high in fruit and vegetables. (RCP, ASA; Evidence Level II/B)
- Weight: maintain goal of a BMI of 18.5 to 24.9 kg/m2 and a waist circumference of <88cm for women and <102 cm for men. (CHEP, ASA; Evidence Level II/B-C)
- Alcohol consumption: no alcohol to moderate consumption (less than two standard drinks per day). Men: less than 14 drinks per week/Women: less than 9 drinks per week. (Australian, ASA; Evidence Level C/III)
- Stress management: individualized cognitive behaviour interventions are more likely to be effective when relaxation techniques are employed. (CHEP; Evidence Level C/III)

RATIONALE

Promoting optimal health in the population is very important to prevent stroke. Healthy lifestyles and management of specific risk factors reduce the risk of an initial stroke and the risk for a subsequent stroke for patients with a prior stroke. Current smokers who smoke 20 cigarettes a day or more per day have a stroke risk approximately 2 to 4 times that of a non smoker.

SYSTEM IMPLICATIONS

- Health promotion efforts that contribute to the primary prevention of stroke in all communities (integrated with existing chronic disease prevention initiatives).
- Stroke prevention offered by primary care providers and mechanisms to ensure it is addressed during encounters with healthcare professionals throughout the continuum of care.
- Definition, dissemination, and implementation of best practices.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. The proportion the population who has identified risk factors for stroke including: hypertension, obesity, smoking history, low physical activity, hyperlipidemia, diabetes, atrial fibrillation.[c]

ii. Percentage of the population who can identify the major risks for stroke.

iii. Percentage of the population who know what to do to prevent/reduce stroke risk.

iv. Percentage of people who are aware of the healthy targets for each stroke risk factor.

v. The annual occurrence of stroke in each province and territory by stroke type.[c]

vi. The stroke mortality rates across provinces and territories, including in-hospital or 30 day, and one-year.[c]

Measurement Notes:

a. Mortality rates need to be risk adjusted for age, gender, stroke severity, co-morbidities.

b. For measure (i), data will need to be extracted from provincial and national health surveys.[c]

c. For measure (ii) and (iii), data is available at the local, provincial and national levels using administrative data.

SUMMARY OF THE EVIDENCE

Physical Activity: Lee et al (2003) published a meta-analysis of 23 studies published between 1983 and 2002 examining the association between physical activity and stroke incidence or mortality. Eighteen cohort studies and five case control studies were included for analysis. When both types of study were examined together, highly active individuals were reported as having a 27% lower risk of stroke than individuals who were designated as low active. Individuals who were designated as moderately active also had a significantly reduced risk of stroke when compared to low active individuals (RR=0.80, $p<0.001$). The benefits of high and moderate levels of activity were reported for both ischemic and hemorrhagic strokes. In that the meta-analysis showed increasing benefit with increasing activity, a dose-response relationship is also established. However, as Lee et al (2003) point out, given the range of definitions of level of physical activity in the studies included for assessment, their analysis suffers from the lack of a single, cohesive definition of what constitutes low, moderate and high levels of activity. The question of what type/quantity of activity is required to reach a moderate level and so benefit from a 20% reduction in the risk of stroke is one that needs to be investigated by means of a randomized controlled trial.

Excerpt from the European Guidelines (2003): In men, vigorous exercise was associated with a decreased risk of stroke. (Lee et al, 1999) The data suggested that this association was mediated through beneficial effects on body weight, blood pressure, serum cholesterol and glucose tolerance, and that, apart from these effects, physical activity had no influence on stroke incidence. Substantial evidence supports the use of diets high in nonhydrogenated unsaturated fats, whole grains, fruit and vegetables, fish once a month and adequate n–3 fatty acids to reduce the risk of ischaemic heart disease and probably stroke. (Hu and Willett, 2002; He et al, 2002)

Excerpts from the Evidence-Based Review of Stroke Rehabilitation (Salter, Teasell, et al, 2005):
Smoking: It has been demonstrated that current smokers who smoke 20 or more cigarettes per day have an associated increase of stroke risk approximately 2–4 times that of a non-smoker. (Wolf et al, 1988; Kawachi et al, 1993; Robbins et al, 1994; Flemming and Brown Jr. 2004) Overall, given an estimated 25% of adults are active smokers, approximately 18% of strokes may be attributed to active smoking. (Goldstein et al, 2001)

Smoking acts as a risk factor in a dose-dependent fashion such that heavy smokers have more risk than light smokers who in turn have more risk than non-smokers. (Wolf et al, 1988, Robbins et al, 1994; Hankey 1999; Bonita et al, 1999) Results reported in a recent study (Kurth et al, 2003) demonstrated that the relative risk for ischemic stroke associated with smoking fewer than 20 cigarettes per day was 1.56 when compared to non-smokers and 2.25 when 20 or more cigarettes were smoked per day.

Reported relative risks for hemorrhagic stroke among smokers follow a similar pattern. Within a male population, smoking fewer than 20 cigarettes was associated with a 1.6 fold increase for intracerebral haemorrhage and a 1.8 fold increase for SAH compared to non smokers. (Kurth et al, 2003) When rate of smoking increased to ≥ 20 cigarettes, the associated risk increased to 2.1 and 3.2 for ICH and SAH respectively. A study conducted within a female subject population yielded a similar pattern of risk. (Kurth et al, 2003).

Risk associated with current cigarette smoking is greatest in the middle years and declines with age. (Hankey, 1999) The recent *Cardiovascular Study in the Elderly* (CASTEL; Massa et al, 2001) reported the relative risk associated with current smoking compared to current non-smokers to be 1.60 for fatal stroke. Mortality was particularly high among current smokers who had been smoking for 40 or more years (7.2% vs. 1.8% for non-smokers, $p<0.01$).

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Diet: Gillman et al (1995) reported that, based on data collected as part of the Framingham Study, age-adjusted risk for stroke decreased as consumption of fruits and vegetables increased such that RR=0.78 for each increase of 3 servings per day. This effect was independent of BMI, smoking, glucose intolerance, physical activity, blood pressure, serum cholesterol and intake of energy, ethanol and fat. Analyses of data from the Nurses' Health Study, the Health Professionals' Follow-up Study and the Women's Health Study supported the association between consumption of fruit and vegetables and reduction of stroke risk in men and women. (Joshipura et al, 1999; Liu et al, 2000) In an analysis of combined data from the Nurses' Health Study and the Health Professionals' Follow-up Study, Joshipura et al (1999) found that an increase in one serving per day of fruits or vegetables was associated with a reduction of risk of 6% and that cruciferous vegetables, leafy green vegetables and citrus fruit (including juice) contributed most to this effect. Liu et al (2000) reported a significant inverse relationship between consumption of fruits and vegetables and risk for cardiovascular disease events including stroke. When individuals consuming the most fruits and vegetables were compared to those consuming the least, a relative risk reduction of 0.68 was demonstrated in favour of those with higher consumption levels. (Liu et al 2000)

Alcohol: A meta-analysis of 35 observational studies examining the effects of alcohol consumption on stroke risk revealed a significant (p=0.004), J-shaped relationship between the amounts of alcohol consumed per day on the risk for ischemic stroke (Reynolds et al, 2003). In that analysis, individuals who consumed 1–2 drinks per day had the least risk for ischemic stroke (RR=0.72) while those having more than 5 drinks per day had the most risk (RR=1.69) when compared to a group of abstainers. The analysis also confirmed that alcohol consumption has a linear, dose-dependent effect on risk of hemorrhagic stroke. Heavy drinking (more than 5 drinks per day) was associated with a relative risk of hemorrhagic stroke of 2.18. Irregular and binge drinking (more than 5 drinks at one sitting) have also been associated with an increase in risk for hemorrhagic stroke. (Mazzaglia et al, 2001)

Data from the Copenhagen City Heart Study was used to examine whether the type of alcohol consumed was related to the apparent decreased risk of ischemic stroke with moderate alcohol consumption. (Truelsen et al, 1998) The overall beneficial effect of moderate alcohol consumption was confirmed; however, the benefit was seen mostly among those individuals who consumed wine. Wine drinking on a daily, weekly or monthly basis was associated with reduced risk of ischemic stroke (RR=0.68, 0.66, 0.88 respectively, after adjustments for age, gender, smoking, BMI, physical activity, systolic BP, cholesterol, antihypertensive treatment, triglycerides, education and diabetes mellitus). No similar effect was demonstrated among drinkers of beer or spirits. Both Kiechl et al (1998) and Sacco et al (1999) reported the greatest risk reduction (RR= 0.41 & 0.40 respectively) among wine drinkers; however, this was not significantly lower than among drinkers of beer, liquor or a combination of types of alcohol.

Stress management: There is a paucity of research evidence linking stress management directly to a reduction in stroke risk. Lloyd and Foster (2006) report that although many factors increase an individual's risk of having a stroke, high levels of stress is one that is amenable to intervention. Stress management has been cited as an important tool in reducing the risk of stroke, based on a meta-analysis of psychoeducational programs for cardiovascular patients. (Dusseldorp et al, 1999) The articles included in the meta-analysis provided few or vague details on program descriptions or the specific mechanisms that may have impacted stroke risk reduction. Lloyd and Foster (2006) also reported that although no universally accepted recommendations exist that specify the level of stress that must be sustained to prevent disease, the chronicity of stressors is a key factor.

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Several studies have been reported that suggest a connection between stress and stroke risk with respect to high blood pressure. In one of a series of articles published by the Canadian Hypertension Society, Spence (1999) reports the only study to evaluate the relation between stress and stroke found a significantly higher incidence of stroke among men reporting a higher level of stress. Significant correlations have also been found between clinical symptoms of coronary artery disease and the type A behaviour pattern, as well as high levels of life stress, and job strain. He reports that one study found an association between type A behaviour and carotid artery atherosclerosis, as measured by ultrasonography. These findings suggest a link between psychosocial factors and atherosclerosis; however, the specific nature of the association is not known. Spence (1999) makes the following recommendations related to stroke risk and hypertension: (1) In patients with hypertension, the contribution of stress should be considered. (2) For hypertensive patients in whom stress appears to be an important issue, stress management should be considered as an intervention. Individualized cognitive behavioural interventions are more likely to be effective than single-component interventions. These recommendations were not accompanied by a validation process in clinical practice.

Earlier research by Spence (1997) on stress management and stroke reported that recent advances in methodology for demonstrating effects of stress are now beginning to build a foundation of evidence that supports those beliefs. In human beings, mental stress provokes myocardial ischemia, and haemodynamic responses to mental stress predict progression of left ventricular enlargement, and progression of carotid atherosclerosis. There is now some evidence that stress management in the form of individualized cognitive behavioural interventions reduces blood pressure. Further work is needed to determine whether it is safe to withhold treatment in white-coat syndrome, and whether stress management can reduce atherosclerosis and ischaemic events.

3.2 | BLOOD PRESSURE MANAGEMENT

BEST PRACTICE RECOMMENDATION 3.2: BLOOD-PRESSURE MANAGEMENT

3.2a. Blood Pressure Assessment:

- All persons at risk of stroke should have their blood pressure measured at each healthcare encounter. (RCP, CHEP; Evidence Level C)
- Patients found to have elevated blood pressure should undergo thorough assessment for the diagnosis of hypertension following the current guidelines of the Canadian Hypertension Education Program. (ASA, CHEP, RCP; Evidence Level A)

3.2b. Blood Pressure Management:

- Patients with ischemic stroke who are beyond the hyper-acute period should be prescribed anti-hypertensive treatment to target normal blood pressure. (ASA, CSQCS, CHEP, RCP; Evidence Level A)
- Target blood pressure levels as per the Canadian Hypertension Education Program (CHEP) guidelines for prevention of stroke and other vascular events.
  - CHEP guideline recommendations 2006:
    - For the prevention of first stroke in the general population: < 140 mm Hg systolic and < 90 mm Hg diastolic as minimal target.
    - For the prevention of first or recurrent stroke in patients with diabetes or chronic kidney disease: < 130 mm Hg systolic and < 80 mm Hg diastolic.
    - Blood pressure lowering is recommended in patients with blood pressure <140/90 who have had a stroke.

RATIONALE

Numerous population-based studies have found that elevated blood pressure is a powerful risk factor for primary and recurrent strokes; hypertension is estimated to account for about 60% of the population attributable risk for cerebrovascular disease. A 28% relative risk reduction in recurrent stroke has been reported for patients treated with antihypertensive medication. (INDANA, 1997; PROGRESS Trial)

SYSTEM IMPLICATIONS

- Coordinated hypertension awareness programs at the provincial and community levels, that involve community groups, pharmacists, primary care, and other relevant partners.
- Stroke prevention, including routine blood-pressure monitoring, offered by primary care providers in the community as part of comprehensive patient management.
- Definition, dissemination, and implementation of best practices.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES:

i. Proportion of persons at risk for stroke who have their blood pressure measured at each healthcare encounter.

ii. Proportion of the population who report having hypertension.

iii. **Proportion of the population who have diagnosed elevated blood pressure (hypertension).**

iv. **Percentage of the population with known hypertension who are on blood-pressure lowering therapy.**

v. Proportion of stroke/TIA patients prescribed blood pressure lowering agents on discharge from acute care.

vi. Proportion of stroke/TIA patients prescribed blood pressure lowering agents after assessment in a secondary prevention clinic.

Measurement Notes:

a. Data for (i) through (iv) may be available through the Canadian Hypertension Education Program data base, and from the Canadian Community Health Survey.

b. Prescription for lipid lowering agents may occur during the inpatient stay or during a secondary prevention assessment and follow-up. When tracking these performance rates, it is important to record the time/location of initiating this therapy.

c. Data sources may include physician order sheets, physician/nurses notes, discharge summary, or copies of prescriptions given to patient.

d. Prescriptions given to patient does not imply compliance.

e. Blood values should be taken from official laboratory reports where possible.

SUMMARY OF THE EVIDENCE

The National Heart, Lung, and Blood Institute Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure have defined normal blood pressure as less than 120/80. (JAMA 2003)

Hypertension is a major problem in nearly all countries around the world, including Canada, and is the most important modifiable risk factor for stroke. A continuous and linear relationship between blood pressure and risk of stroke has been reported, which holds even in individuals with a normal blood pressure. Weber (2005) reports that the high sensitivity of the relationship between blood pressure and stroke risk is now being more fully realized. Individually, current studies do not always have the power to identify the impact that blood pressure changes of only a few mmHg have on risk. However, a recent meta-analysis of 61 studies with more than 1 million participants, an average 12-year follow-up and 120,000 recorded deaths showed that each 2-mmHg reduction in systolic blood pressure (SBP) is associated with a 7% reduction in mortality from ischaemic heart disease and a 10% reduction in mortality from stroke (Lewington, 2002).

Du et al (2000) reports that some 20 to 30% of adult populations are affected, as are over 60% of people over 65 years and about 70% of stroke patients. Hypertension is quantitatively the largest single risk factor for premature death and disability, because of the large number of people afflicted and the consequences of uncontrolled hypertension. Hypertension is closely associated with the risk of total mortality and the risk of all types of stroke, coronary heart disease, diabetes and renal disease No other modifiable factor has been identified which contributes more than hypertension to the development of stroke. The authors further emphasize that hypertension should not be regarded so much as a disease but more as one of the treatable or reversible risk factors for premature death due to arterial disease. At least three-quarters of strokes in hypertensive patients are preventable by treatment. However, strokes are not only caused by a single risk factor such as hypertension but by the interaction of multiple risk factors, some having a stronger independent relationship with risk of stroke than others. The probability of stroke in an individual depends on the presence and level of other risk factors.

Most patients with stroke or TIA will benefit from treatment with a blood pressure lowering agent, regardless of the presence or absence of hypertension. For secondary prevention, ACE inhibitors, angiotensin receptor blockers, and thiazide diuretics have all been shown to reduce recurrent stroke and other vascular events. There is less evidence on the role of beta blockers and calcium channel blockers in the secondary prevention of stroke, but they may be of benefit. Aggressive treatment of blood pressure is of greater benefit than more modest reductions.

Categorizing patients as "hypertensive" or "normotensive" based on an arbitrary blood pressure threshold may not be helpful with respect to secondary stroke prevention for several reasons. First, the relationship between blood pressure and stroke is continuous and graded, with no evidence of a lower blood pressure threshold for stroke risk (Lewington et al, 2002; Rodgers et al, 1996). Second, several controlled trials have demonstrated that blood pressure reduction benefits patients who would not normally be designated as hypertensive ((HOPE trial, PROGRESS Collaborative Group, 2001). Blood pressure lowering therapy reduces the risk of vascular events across a wide spectrum of initial blood pressures (Sleight et al, HOPE Trial, 2001).

Angiotensin receptor blockers have also demonstrated efficacy for the prevention of stroke in both the primary and secondary prevention settings. Three recently completed trials of angiotensin receptor blockers include the Losartan Intervention For Endpoint Reduction Study, the Acute Candesartan Cilexetil Therapy in Stroke Survivors Study (ACCESS), and the Study on Cognition and Prognosis in the Elderly. All three trials demonstrated consistent relative risk reductions for stroke in the range of 24 to 34%, despite the enrolment of different patient populations, the use of varying angiotensin receptor blockers, and differing interventions in the control group (placebo-based or conventional therapy).

3.3 | LIPID-MANAGEMENT

BEST PRACTICE RECOMMENDATION 3.3: BLOOD-PRESSURE MANAGEMENT

3.3a. Lipid Assessment:

- Fasting lipid levels (TC, TG, LDL-C, HDL-C) should be measured every 1 to 3 years and other cardiovascular risk factors assessed for all men 40 years or older, and women who are post-menopausal and /or 50 years or older. (CDS, VA/DOD, Class IIa, Level C). More frequent testing should be performed for patients with abnormal values or if treatment is initiated.[7]

- Screen at any age adults with major CAD risk factors (such as diabetes, smoking, hypertension, obesity, cardiovascular disease, chronic kidney disease, lupus, exertional chest discomfort, evidence of atherosclerosis). (CDG; Evidence Level IIa/C)

3.3b. Lipid Management:

- Ischemic stroke patients with LDL-C of >2.0 mmol/ L should be managed with lifestyle modification, dietary guidelines, and medication recommendations. (CSQCS, Australian, VA/DOD; Evidence Level A)

- Statin agents should be prescribed for all patients who have had an ischemic stroke/TIA event (Australian, VA/DOD; evidence level A), in order to achieve a target goal of an LDL-C of <2.0 mmol/L and TC/HDL-C < 4.0 mmol/L. (CDS, CSQCS; Evidence Level A)

RATIONALE

Most patients with ischemic stroke or TIA will benefit from statin therapy. Aggressive reduction of LDL cholesterol is likely to yield greater benefit than more modest reductions. A 20–30% relative risk reduction has been reported in recurrent vascular events for patients with a history of stroke without coronary heart disease treated with statin agents.

SYSTEM IMPLICATIONS

- Coordinated dyslipidemia awareness programs at the provincial and community levels that involve community groups, pharmacists, primary care, and other relevant partners.

- Stroke prevention, including lipid level monitoring offered by primary care providers in the community as part of comprehensive patient management.

- Definition, dissemination, and implementation of best practices.

- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

7. *Canadian Lipid Guidelines 2006, Unpublished data, used with permission of the authors (Dr. George Fodor, June 8th, 2006)*

PERFORMANCE MEASURES:

i. **Proportion of the population who report that they have dyslipidemia (high LDL).**

ii. Proportion of stroke patients prescribed lipid-lowering agents for secondary prevention of stroke.

iii. **Proportion of stroke patients with an LDL-C between 1.8–2.5 mmol/L at 3 months following stroke event.**

iv. Proportion of stroke patients with an LDL-C < 1.8 mmol/L at 3 months following stroke event.

v. Proportion of stroke patients with an LDL-C < 1.8 mmol/L at 3 months following stroke event.

Measurement Notes:

a. Data for (i) and (ii) may be available through the Canadian Hypertension Education Program data base, and from the Canadian Community Health Survey.

b. Prescription for lipid lowering agents may occur during the inpatient stay or during a secondary prevention assessment and follow-up. When tracking these performance rates, it is important to record the time/location of initiating this therapy.

c. Data sources may include physician order sheets, physician/nurses notes, discharge summary, or copies of prescriptions given to patient.

d. Prescription(s) given to patient does not imply compliance.

e. Blood values should be taken from official laboratory reports where possible.

SUMMARY OF THE EVIDENCE

The causal relationship between dyslipidemia and atherosclerosis is well-documented. Screening and appropriate management of dyslipidemia by health care providers is imperative in both primary and secondary prevention of coronary artery disease, peripheral vascular disease, and stroke. (Nichols, 2004)

Several systematic reviews of lipid-lowering therapies have affirmed the following points: 1) the relative reduction in stroke risk is on the order of 25–30%; 2) ischemic stroke is reduced, with little effect on hemorrhagic stroke; and 3) the relative reduction in stroke events is constant irrespective of the baseline risk of stroke. The latter indicates that a greater absolute benefit may accrue from treating patients with a history of stroke or TIA, who have a markedly higher baseline risk of recurrent cerebrovascular events.

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A large meta-analysis of various lipid-lowering therapies (including statins, fibrates, niacin, bile acid sequestrants, and diet) found that only statins reduce the risk of stroke, with a risk reduction of 26% (95% CI 14–36%) for secondary prevention. (Corvol, 2003). Non-statin drug therapy (with 32 550 subjects studied, of whom 73% were randomized in trials employing fibrates) was associated with a non-significant risk reduction of 7%. (RR 0.93; 95% CI 0.79-1.08)

The Heart Protection Study (HPS, 2004) contributed a substantial amount of information about the role of statin therapy in persons at high risk of serious vascular events. The HPS randomized 20,536 patients with a total serum cholesterol of >3.4 to simvastatin or placebo for a mean duration of 5 years; inclusion criteria were any of the following: coronary artery disease, cerebrovascular disease, peripheral vascular disease, diabetes, or patients over 65 years with hypertension. The Heart Protection Study showed that simvastatin 40 mg once daily rapidly produced a definite and substantial reduction in ischaemic stroke, irrespective of the patient's age, gender, or blood lipid concentrations when treatment was initiated. It also demonstrated that statin therapy reduced the risk of major vascular events among people who have previously had a stroke or other cerebrovascular event, even if they did not already have manifest coronary disease. These results have important implications for revising national and international treatment guidelines which do not currently take into account cerebrovascular disease risk reduction when considering the initiation of statin therapy. In addition to reductions in coronary-related events and death, there were highly significant reductions in the simvastatin arm in the incidence of strokes (RRR 25%; 95% CI 15–44%), transient ischemic attacks, and the need for carotid endarterectomy or angioplasty. This benefit was evident in every subgroup tested: patients who had or did not have coronary artery disease; those with cerebrovascular disease, peripheral vascular disease, or diabetes; men or women; those over or under 75 years at entry; and those whose low density lipoprotein (LDL) cholesterol was over or under 2.6 mmol/L. Treatment benefits were independent of the baseline cholesterol level, indicating that the LDL cholesterol thresholds currently recommended for initiation of treatment in high-risk patients may be too high. The results of HPS imply that the initiation of statin therapy should be based more on the assessment of a patient's absolute risk of cardiovascular disease, rather than just the baseline LDL cholesterol concentration.

The Stroke Prevention by Aggressive Reduction in Cholesterol Levels (SPARCL) trial (NEJM, 2006) randomly as signed 4731 patients who had a stroke or TIA within one to six months before study entry, had LDL levels of 2.6 to 4.9 mmol/L, and had no known coronary heart disease to double-blind treatment with atorvastatin 80 mg once daily or placebo. The mean LDL level during the trial was 1.9 mmol/L among patients receiving atorvastatin and 3.3 mmol/L in the placebo group. The five-year absolute reduction in risk of any stroke was 2.2%; adjusted hazard ratio (HR), 0.84 (95% CI 0.71 to 0.99; P=0.03). The reduction in ischemic stroke (HR 0.78 [95% CI 0.66 to 0.94]) was offset by a statistically significant increase in hemorrhagic stroke (HR 1.66 [95% CI 0.21 to 1.40]). The five-year absolute reduction in risk of major cardiovascular events was 3.5% (HR 0.80 [95% CI 0.69 to 0.92; P=0.002]). The reason for the statistically significant increase in hemorrhagic stroke, not seen other statin trials, remains unexplained. (Amarenco, 2004)

3.4 | DIABETES MANAGEMENT

BEST PRACTICE RECOMMENDATION 3.4: DIABETES MANAGEMENT

3.4a. Diabetes Assessment:

- All individuals should be evaluated annually for type 2 diabetes risk on the basis of demographic and clinical criteria. (CDA; Evidence Level D)
- A fasting plasma glucose (FPG) should be performed every 3 years in individuals > 40 years of age to screen for diabetes. (CDA; Evidence Level D) More frequent and/or earlier testing with either an FPG or plasma glucose drawn two hours after a 75-g oral glucose load should be considered in people with additional risk factors for diabetes. (CDA; Evidence Level D) Some of these risk factors include: family history, high risk population, vascular disease, history of gestational diabetes, hypertension, dyslipidemia, overweight, abdominal obesity, polycystic ovary syndrome.
- In adults fasting lipid levels (TC, HDH-C, TG and calculated LDL-C) should be measured at the time of diagnosis of diabetes and then every 1 to 3 years as clinically indicated. More frequent testing should be performed if treatment for dyslipidemia is initiated. (CDA; Evidence Level D)
- Blood pressure should be measured at every diabetes visit. (CDA; Evidence Level D)

3.4b. Diabetes Management:

- Glycemic targets must be individualized (CDA, ESI; Evidence Level III); however, therapy in most patients with type 1 or type 2 diabetes should be targeted to achieve an A1C ≤7.0% in order to reduce the risk of microvascular(CDA; Evidence Level A/I) and macrovascular complications. (CDA; Evidence Level C)
- To achieve an A1C ≤7.0%, patients with type 1 or type 2 diabetes should aim for FPG or preprandial PG targets of 4.0 to 7.0 mmol/L and 2-hour postprandial PG targets of 5.0 to 10.0 mmol/L. (CDA; Evidence Level B)
- If it can be safely achieved, lowering PG targets toward the normal range should be considered (CDA; Evidence Level C/3): A1C ≤6.0% (CDA; Evidence Level D); FPG/preprandial PG: 4.0 to 6.0 mmol/L (CDA; Evidence Level D); and 2-hour postprandial PG: 5.0 to 8.0 mmol/L. (CDA; Evidence Level D)
- Adults at high risk of a vascular event should be treated with a statin to achieve an LDL-C <=2.0 mmol/L. (CDA; Evidence Level A/1)
- Unless contraindicated, low dose ASA therapy (80 to 325 mg/day) is recommended in all patients with diabetes with evidence of CVD, as well as for those individuals with atherosclerotic risk factors that increase their likelihood of CV events. (CDA; Evidence Level A)

RATIONALE

Diabetes is a major risk factor for cardiovascular disease and is recognized as an independent risk factor for ischemic stroke (European Stroke Initiative 2003). Most adults with type 1 or type 2 diabetes should be considered at high risk for vascular disease. The exceptions are younger adults with type 1 and type 2 diabetes with shorter duration of disease and without complications of diabetes (including established CVD) and without other CVD risk factors. Diabetes increases the risk of stroke and is a particularly potent risk factor in younger individuals, with studies suggesting an increase in stroke risk of as much as 10 fold in some younger subgroups. Overall, diabetes is considered a major risk factor for many conditions as is considered here as part of a comprehensive package supporting prevention and lifestyle management.

SYSTEM IMPLICATIONS

- Coordinated diabetes awareness programs at the provincial and community levels that involve community groups, pharmacists, primary care, and other relevant partners.
- Coordinated education and support programs for persons with diabetes to increase compliance and reduce ongoing risks for cardiovascular complications.
- Definition, dissemination, and implementation of best practices for diabetes management.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of the population a confirmed diagnosis of diabetes (Type 1 and Type II).

ii. Proportion of persons with diabetes presenting to hospital with a new stroke event.

Measurement Notes

a. Data sources may include physician order sheets, physician/nurses notes, discharge summary, or copies of prescriptions given to patient.

b. Blood values should be taken from official laboratory reports where possible.

c. Monitoring and tracking of trends and benchmarks through the National Diabetes Surveillance System data.

SUMMARY OF THE EVIDENCE

Diabetes mellitus (DM) is an important modifiable risk factor for a first ischemic stroke (IS). A recent review of risk factors for stroke reports that nearly half of stroke patients had diabetes mellitus (Bener et al, 2006). In a review of stroke and diabetes mellitus, Idris et al (2006) state the combination of diabetes and stroke disease is a major cause of morbidity and mortality worldwide. Evidence from large clinical trials performed in patients with diabetes supports the need for aggressive and early intervention to target patients' cardiovascular (CV) risks in order to prevent the onset, recurrence and progression of acute stroke. They describe the epidemiology of diabetes and stroke, and report an estimate that the risk of stroke is increased by 1.5–3 fold for patients with diabetes, diabetes also doubles the risk of stroke recurrence, and stroke outcomes are significantly worse among patients with diabetes with increased hospital and long-term stroke mortality, more residual neurological, functional disability and longer hospital stays. From a clinical perspective, diabetes increases the risk of ischaemic stroke more than haemorrhagic stoke, resulting in a greater ischaemic to haemorrhagic stroke ratio in the people with diabetes compared with the general population. They further report that although strokes in patients with diabetes are associated with a worse outcome, there is no evidence to suggest that diabetes induces a larger area of cerebral infarction.

The high stroke risk in diabetes may be due to the complex interplay between the various haemodynamic and metabolic components of the diabetes syndrome. Other than the many recognized risk factors associated with acute stroke (e.g. hypertension, dyslipidemia and atrial fibrillation), specific risk factors attributable to diabetes have also been reported. Components of the metabolic syndrome such as insulin resistance, central obesity, impaired glucose tolerance and hyperinsulinaemia, both individually and collectively, are associated with an excess risk of stroke disease. (Idris et al, 2006)

Many diabetes patients exhibit metabolic syndrome and these additional risk factors, such as raised hypertension and cholesterol, multiply the overall risk. Reducing these risk factors to target levels is essential and requires a multifactorial approach. Lifestyle changes, tight glycemic control, antiplatelet drugs (aspirin) and control of lipid levels, e.g. using statins, can all have significant beneficial effects. Blood pressure control is another vital aspect in reducing risk and a number of recent studies have provided evidence supporting the use of angiotensin-converting enzyme inhibitors as first-line treatment in patients with diabetes.

Karapanayiotides et al (2004) report that the Framingham Study found a 2.5-fold incidence of IS in diabetic men and a 3.6-fold one in diabetic women. In the largest case control study with adjustment for multiple known risk factors, the risk of IS for diabetic individuals was increased by 2.3. Two other large studies reported similar findings with odds ratios (OR) of 2.12 and 2.47. However, it is difficult to determine the level of association between DM and IS, as DM is also associated with a twofold higher incidence of hypertension and cardiac disease and with an increased incidence of asymptomatic carotid artery disease and hyperlipidemia. They concluded that other risk factors for stroke such as hypertension, hypercholesterolemia, cardiac ischemic disease, and vascular claudication are significantly more frequent in diabetic individuals, confirming that diabetic patients have high cerebro- and cardiovascular risk.

Lehto et al (1996) conducted a seven-year follow up study diabetic patients and non-diabetic controls to assess risk for stroke. They found diabetic men had a twofold to threefold higher risk, and diabetic women a fivefold higher risk for stroke than corresponding nondiabetic subjects (men: OR, 2.4 [95% CI, 1.2 to 4.9] in East Finland; OR, 3.3 [95% CI, 1.6 to 6.9] in West Finland; women: OR, 5.5 [95% CI, 2.4 to 12.9] in East Finland; OR,

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5.4 [95% CI, 2.3 to 12.6] in West Finland). Ischemic stroke was the most common cause of stroke in nondiabetic subjects and NIDDM patients in both areas. High fasting plasma glucose was a risk factor for stroke even after adjustment for other variables. In addition to fasting plasma glucose, glycemic control was also assessed by GHbA1, which reflects hyperglycemia during the preceding 2 months. There was a dose-response relationship between GHbA1 and risk of stroke. The duration of diabetes was also an important risk factor for stroke events in NIDDM subjects In addition, participants with low levels of high-density lipoprotein cholesterol (less than 0.90 mmol/L), high levels of total triglyceride (more than 2.30 mmol/L), and the presence of hypertension were associated with a twofold increase in the risk of stroke mortality or morbidity.

The Treating to New Targets study (Shepherd, 2006) showed that intensive lipid-lowering therapy with atorvastatin 80 mg/day provides significant clinical benefit beyond that afforded by atorvastatin 10 mg/day in patients with stable coronary heart disease (CHD). A total of 1,501 patients with diabetes and CHD, with LDL cholesterol levels of <3.36 mmol/L, were randomized to double-blind therapy with either atorvastatin 10 (n = 753) or 80 (n = 748) mg/day. Patients were followed for a median of 4.9 years. The primary end point was the time to first major cardiovascular event, defined as death from CHD, nonfatal non–procedure-related myocardial infarction, resuscitated cardiac arrest, or fatal or nonfatal stroke. The results found end-of-treatment mean LDL cholesterol levels were 2.55 mmol/L with atorvastatin 10 mg and 1.99 mmol/L with atorvastatin 80 mg. A primary event occurred in 135 patients (17.9%) receiving atorvastatin 10 mg, compared with 103 patients (13.8%) receiving atorvastatin 80 mg (hazard ratio 0.75 [95% CI 0.58–0.97], P = 0.026). Significant differences between the groups in favour of atorvastatin 80 mg were also observed for time to cerebrovascular event (0.69 [0.48–0.98], P = 0.037) and any cardiovascular event (0.85 [0.73–1.00], P = 0.044). There were no significant differences between the treatment groups in the rates of treatment-related adverse events and persistent elevations in liver enzymes. The researchers concluded that among patients with clinically evident CHD and diabetes, intensive therapy with atorvastatin 80 mg significantly reduced the rate of major cardiovascular events by 25% compared with atorvastatin 10 mg.

3.5 | ANTIPLATELET THERAPY

BEST PRACTICE RECOMMENDATION 3.5: ANTIPLATELET THERAPY

All patients with ischaemic stroke or transient ischaemic attack should be on antiplatelet therapy (ASA) for secondary prevention of recurrent stroke unless there is an indication for anticoagulation or a contraindication to ASA. (CSQCS, ASA, NZ, RCP, Australian, VA/DoD; Evidence Level A) Usual maintenance dosage is 81–325 mg per day. (VA/DoD, CSQCS)

- There is evidence to support the use of alternative antiplatelet agents, including extended-release dipyridamole plus ASA, or clopidogrel. (RCP, Australian, ASA; Evidence Level A)
- Long-term combinations of aspirin and clopidogrel are not recommended. (Evidence Level A)

RATIONALE

There is a 25% relative risk reduction in recurrent stroke for patients treated on aspirin (Antithrombotic Trialists' Collaboration, BMJ, 2002). Also, there are 25 fewer non-fatal strokes, 6 fewer non-fatal myocardial infarctions, and 15 fewer deaths over three years for every 1000 patients with a prior stroke or TIA treated with ASA. (CARPIE, ESPS-2, MATCH, CHARISMA)

SYSTEM IMPLICATIONS

- Stroke prevention clinics in place to improve secondary stroke prevention (effective, consistent prevention with early recognition of risk factors and timely, targeted interventions).
- Optimization of strategies at the local, regional and provincial levels to prevent the recurrence of stroke.
- Definition, dissemination, and implementation of best practices throughout healthcare system.
- Stroke prevention awareness and education of secondary prevention for primary care practitioners and specialists who manage stroke patients during the acute phase and post-discharge from acute care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of stroke/TIA patients prescribed antiplatelet therapy on discharge from acute care.[c]

ii. Proportion of stroke/TIA patients prescribed antiplatelet therapy on discharge from secondary prevention clinic care.[c]

Measurement Notes:

a. Data sources include patient chart nurses notes, physician's orders and discharge summary note. Documentation quality may affect ability to accurately monitor this performance measure.

b. Challenge to measure compliance and prescribing patterns in primary care.

SUMMARY OF THE EVIDENCE

Substantial evidence from randomized trials and meta-analyses supports the use of antithrombotic agents in patients who have experienced an ischemic stroke. Although some controversy regarding dosage still exists, most guidelines recommend medium dose aspirin (75–325 mg/d) as the first choice in secondary prevention of stroke. Other antiplatelet agents are acceptable alternatives. For patients with a stroke due to a cardioembolic source (e.g., atrial fibrillation, mechanical heart valve), warfarin is generally recommended (see Recommendation #8) unless contraindicated. Warfarin is not recommended for secondary stroke prevention in patients presumed to have a non-cardioembolic stroke or TIA.

The recent systematic review by the Cochrane Collaboration assessed the efficacy and safety of dipyridamole versus control in the secondary prevention of vascular events in patients with vascular disease (DeSchryver et al, 2006). The review included randomized long-term secondary prevention trials with concealed treatment allocation, treatment for more than one month, starting within six months after presentation of an arterial vascular disease. Treatment consisted of dipyridamole with or without other antiplatelet drugs compared with no drug or an antiplatelet drug other than dipyridamole. Twenty-seven trials were included, with 20242 patients, among whom 1399 vascular deaths and 3090 fatal and non-fatal vascular events occurred during follow up. Compared with control, dipyridamole had no clear effect on vascular death (relative risk (RR) 1.02, 95% confidence internal (CI) 0.90 to 1.17). This result was not influenced by the dose of dipyridamole or type of presenting vascular disease. In the presence of aspirin, dipyridamole appeared to reduce the risk of vascular events compared with control (RR 0.90, 95% CI 0.82 to 0.97), due to a single large trial in patients presenting with cerebral ischemia. The authors concluded that for patients who presented with arterial vascular disease, there was no evidence that dipyridamole, in the presence or absence of another antiplatelet drug reduced the risk of vascular death, though it may reduce the risk of further vascular events. However, this benefit was found in only one single large trial and only in patients presenting after cerebral ischemia. There was no evidence that dipyridamole alone was more efficacious than aspirin. Further trials comparing the effects of the combination of dipyridamole with aspirin versus aspirin alone are justified.

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The Antithrombotic Trialists Collaboration conducted an updated meta-analysis of RCTs for antiplatelet therapy in high risk patients. (Chen et al, 2000). They found that aspirin and other forms of antiplatelet drugs reduced the incidence of non-fatal stroke by one-quarter. Absolute reduction in the rates of having a serious vascular event 36(6) per 1000 treated for two years among those patients with previous stroke or TIA. They concluded that the benefits of aspirin and other anti-platelet drugs substantially outweigh the absolute risks of major extracranial bleeding.

ESPRIT *(Lancet 2006)*: The European/Australian Stroke Prevention Reversible Ischemia Trial group conducted a randomized controlled trial in which patients were assigned to aspirin (30–325 mg daily) with (n=1363) or without (n=1376) dipyridamole (200 mg twice daily) within 6 months of a transient ischaemic attack or minor stroke of presumed arterial origin. The primary outcome event was the composite of death from all vascular causes, non-fatal stroke, non-fatal myocardial infarction, or major bleeding complication, whichever happened first. Treatment was open, but auditing of outcome events was blinded. Primary analysis was by intention to treat. Mean follow-up was 3·5 years (SD 2·0). Median aspirin dose was 75 mg in both treatment groups (range 30–325); extended-release dipyridamole was used by 83% (n=1131) of patients on the combination regimen. Primary outcome events arose in 173 (13%) patients on aspirin and dipyridamole and in 216 (16%) on aspirin alone (hazard ratio 0·80, 95% CI 0·66–0·98; absolute risk reduction 1·0% per year, 95% CI 0·1–1·8). Addition of the ESPRIT data to the meta-analysis of previous trials resulted in an overall risk ratio for the composite of vascular death, stroke, or myocardial infarction of 0·82 (95% CI 0·74–0·91). Patients on aspirin and dipyridamole discontinued trial medication more often than those on aspirin alone (470 vs. 184), mainly because of headache. The ESPRIT results, combined with the results of previous trials, provide sufficient evidence to prefer the combination regimen of aspirin plus dipyridamole over aspirin alone as antithrombotic therapy after cerebral ischaemia of arterial origin.

CHARISMA *(NEJM 2006)*: This trial randomly assigned 15,603 patients with either clinically evident cardiovascular disease or multiple risk factors to receive clopidogrel (75 mg per day) plus low-dose aspirin (75 to 162 mg per day) or placebo plus low-dose aspirin and followed them for a median of 28 months. The primary efficacy end point was a composite of myocardial infarction, stroke, or death from cardiovascular causes. The results showed the rate of the primary efficacy end point was 6.8 percent with clopidogrel plus aspirin and 7.3 percent with placebo plus aspirin (relative risk, 0.93; 95 percent confidence interval, 0.83 to 1.05; P=0.22). The respective rate of the principal secondary efficacy end point, which included hospitalizations for ischemic events, was 16.7 percent and 17.9 percent (relative risk, 0.92; 95 percent confidence interval, 0.86 to 0.995; P=0.04), and the rate of severe bleeding was 1.7 percent and 1.3 percent (relative risk, 1.25; 95 percent confidence interval, 0.97 to 1.61 percent; P=0.09). The rate of the primary end point among patients with multiple risk factors was 6.6 percent with clopidogrel and 5.5 percent with placebo (relative risk, 1.2; 95 percent confidence interval, 0.91 to 1.59; P=0.20) and the rate of death from cardiovascular causes also was higher with clopidogrel (3.9 percent vs. 2.2 percent, P=0.01). In the subgroup with clinically evident atherothrombosis, the rate was 6.9 percent with clopidogrel and 7.9 percent with placebo (relative risk, 0.88; 95 percent confidence interval, 0.77 to 0.998; P=0.046). The investigators concluded that in this trial, there was a suggestion of benefit with clopidogrel treatment in patients with symptomatic atherothrombosis and a suggestion of harm in patients with multiple risk factors. Overall, clopidogrel plus aspirin was not significantly more effective than aspirin alone in reducing the rate of myocardial infarction, stroke, or death from cardiovascular causes.

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MATCH Trial *(Lancet 2004)*: The MATCH trial aimed to assess whether addition of aspirin to clopidogrel could have a greater benefit than clopidogrel alone in prevention of vascular events with potentially higher bleeding risk. A randomized, double-blind, placebo-controlled trial to compared aspirin (75 mg/day) with placebo in 7599 high-risk patients with recent ischaemic stroke or transient ischaemic attack and at least one additional vascular risk factor who were already receiving clopidogrel 75 mg/day. Duration of treatment and follow-up was 18 months. The primary endpoint was a composite of ischaemic stroke, myocardial infarction, vascular death, or rehospitalization for acute ischemia (including rehospitalization for transient ischaemic attack, angina pectoris, or worsening of peripheral arterial disease). The results reported 596 (15.7%) patients reached the primary endpoint in the group receiving aspirin and clopidogrel compared with 636 (16.7%) in the clopidogrel alone group (relative risk reduction 6.4%, [95% CI -4.6 to 16.3]; absolute risk reduction 1% [-0.6 to 2.7]). Life-threatening bleedings were higher in the group receiving aspirin and clopidogrel versus clopidogrel alone (96 [2.6%] vs. 49 [1.3%]; absolute risk increase 1.3% [95% CI 0.6 to 1.9]). Major bleedings were also increased in the group receiving aspirin and clopidogrel but no difference was recorded in mortality. The investigators concluded that adding aspirin to clopidogrel in high-risk patients with recent ischaemic stroke or transient ischaemic attack is associated with a non-significant difference in reducing major vascular events. However, the risk of life-threatening or major bleeding is increased by the addition of aspirin. This effect was observed at the eighteen month follow-up.

3.6 | ANTITHROMBOTIC THERAPY IN ATRIAL FIBRILLATION

BEST PRACTICE RECOMMENDATION 3.6: ANTITHROMBOTIC THERAPY IN ATRIAL FIBRILLATION

3.6a. For primary prevention of stroke in patients with atrial fibrillation, ASA or anticoagulation with warfarin should be considered based on the clinical circumstances. (BPS-WG; Evidence Level A)

3.6b. Patients with stroke and atrial fibrillation should be treated with warfarin at a target INR of 2.5, range 2.0 to 3.0, (target INR of 3.0 for mechanical cardiac valves, range 2.5 to 3.5), if they are likely to be compliant with the required monitoring and are not at high-risk for bleeding complications. (CSQCS, ASA, Australian, SIGN, VA/DoD; Evidence Level A/I)

RATIONALE

A 68% relative risk reduction in recurrent stroke has been found for patients anticoagulated with adjusted-dose warfarin (Cochrane Review, 2003).

SYSTEM IMPLICATIONS

- Stroke Prevention Clinics in place to improve secondary stroke prevention (effective, consistent prevention with early recognition of risk factors and timely, targeted interventions).
- Optimization of strategies at the local, regional and provincial levels to prevent the recurrence of stroke.
- Definition, dissemination, and implementation of best practices throughout healthcare system.
- Stroke prevention awareness and education of secondary prevention for primary care practitioners and specialists who manage stroke patients during the acute phase and post-discharge from acute care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of eligible stroke/TIA patients with atrial fibrillation prescribed anticoagulant therapy on discharge from acute care. [c]

ii. Proportion of stroke/TIA patients with atrial fibrillation prescribed anticoagulant therapy after a visit to a secondary prevention clinic. [c]

iii. Proportion of patients with stroke and atrial fibrillation on aspirin and not prescribed anticoagulant agents.

iv. Proportion of patients on warfarin with INR in therapeutic range at 3 months and 1 year following index stroke event.

Measurement Notes:

a. If there was documentation of atrial fibrillation, the chart should be reviewed for medications prescribed to the patient at the time of discharge, specifically including Coumadin, Warfarin, or Heparin.

b. Data sources may include discharge summary, history and physical, physician's orders.

c. In order to measure whether the patient's INR was in therapeutic range, laboratory reports or other reliable documentation is required to verify the INR levels.

d. It is important to note that providing a prescription does not ensure patient compliance with medication administration.

SUMMARY OF THE EVIDENCE

There is general agreement that all patients with atrial fibrillation should be considered for treatment with warfarin or aspirin for the primary prevention of stroke, with strong recommendations for warfarin in patients at high risk for stroke. Specifically, for those patients with atrial fibrillation and recent cerebral ischemia, warfarin is indicated over aspirin for secondary stroke prevention. The timing of initiating long-term anticoagulation is variable but in most cases should take place prior to discharge.

The Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy: Evidence Based Guidelines (Chest, 2004) reviewed the clinical trials and pooled analyses that included patients with chronic persistent (also known as "sustained," and including the category "permanent") or, less commonly, paroxysmal AF (PAF) (intermittent AF). In most instances, AF had been present for many months to years. Each of these trials stopped early because of the large effect of oral anticoagulants in preventing ischemic stroke and systemic embolism (the Canadian Atrial Fibrillation Anticoagulation (CAFA trial was stopped early because of the superiority of anticoagulation seen in other trials). Because of this, the number of outcome events observed was relatively small, resulting in fairly wide confidence limits around estimates of efficacy. The intention-to-treat analysis of

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these pooled data revealed a reduction in annual stroke rate from 4.5% for the control patients to 1.4% for the patients assigned to adjusted-dose warfarin. The efficacy of warfarin was consistent across studies with an overall relative risk reduction (RRR) of 68% (95% confidence interval [CI], 50 to 79%). The absolute risk reduction implies that 31 ischemic strokes will be prevented each year for every 1,000 patients treated (or patients needed to treat [NNT] for 1 year to prevent 1 stroke = 32).

The Cochrane Library recent update identified two related trials (Saxena et al, 2006). The European Atrial Fibrillation Trial (EAFT) involved 455 patients, who received either anticoagulants (International Normalized Ratio (INR) 2.5 to 4.0), or aspirin (300 mg/day). Patients joined the trial within three months of transient ischemic attack or minor stroke. The mean follow up was 2.3 years. In the Studio Italiano Fibrillazione Atriale (SIFA) trial, 916 patients with NRAF and a TIA or minor stroke within the previous 15 days were randomized to open label anticoagulants (INR 2.0 to 3.5) or indobufen (a reversible platelet cyclooxygenase inhibitor, 100 or 200 mg BID). The follow-up period was one year. The combined results show that anticoagulants were significantly more effective than antiplatelet therapy both for all vascular events (Peto odds ratio (Peto OR) 0.67, 95% confidence interval (CI) 0.50 to 0.91) and for recurrent stroke (Peto OR 0.49, 95% CI 0.33 to 0.72). Major extracranial bleeding complications occurred more often in patients on anticoagulants (Peto OR 5.16, 95% CI 2.08 to 12.83), but the absolute difference was small (2.8% per year versus 0.9% per year in EAFT and 0.9% per year versus 0% in SIFA). Warfarin did not cause a significant increase of intracranial bleeds. The evidence from two trials suggests that anticoagulant therapy is superior to antiplatelet therapy for the prevention of stroke in people with NRAF and recent non-disabling stroke or TIA. The risk of extracranial bleeding was higher with anticoagulant therapy than with antiplatelet therapy.

3.7 | CAROTID INTERVENTION

BEST PRACTICE RECOMMENDATION 3.7: CAROTID INTERVENTION

Patients with symptomatic carotid artery disease of 70–99% stenosis (measured at angiography or by two concordant non-invasive imaging modalities) should be offered carotid intervention (carotid endarterectomy) within 2 weeks of the incident stroke or TIA. (CSQCS, SIGN 14, NZ, ASA; Evidence Level A)

- Carotid intervention is recommended for selected patients with moderate (50 to 69%) symptomatic stenosis. These patients should be evaluated by a physician with expertise in stroke management. (CSQCS, SIGN 14, NZ, ASA; Evidence Level A)
- The standard of care procedure is carotid endarterectomy. (BPS-WG; Evidence Level A)
- Carotid endarterectomy (CEA) should be performed by a surgeon with a known perioperative morbidity and mortality of <6%. (CSQCS, NZ, ASA; Evidence Level A)
- Carotid stenting may be offered open-label to those patients who are not operative candidates for technical, anatomical, or medical reasons. (BPS-WG: Evidence Level C)
- Carotid endarterectomy is contraindicated for patients with mild (<50%) stenosis. (CSQCS, SIGN 14, ASA; Evidence Level A)

RATIONALE

A 45% relative risk reduction has been found in recurrent stroke after carotid endarterectomy in patients with moderate to severe (70–99%) carotid artery stenosis (NASCET, NEJM, 1991). In patients with moderate to severe (70–99%) stenosis, NNT=8 to prevent 1 stroke at 2 years. In patients with mild to moderate (50–69%) stenosis, NNT=15 to prevent 1 stroke at 5 years (NASCET, NEJM, 1991; Barnett et al, NEJM, 1998).

Note: considerations regarding patients with asymptomatic carotid stenosis were beyond the scope of this document, and will be addressed in the next edition of the CSS Stroke Best Practice Recommendations.

SYSTEM IMPLICATIONS

- Initial assessment performed by clinicians experienced in stroke that are able to determine carotid territory involvement.
- Timely access to diagnostic services for evaluating carotid arteries.
- Timely access to surgical consults, including a mechanism in place for expedited referrals as required.
- Definition, dissemination, and implementation of best practices for patients with suspected carotid territory involvement in stroke.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. **Proportion of stroke patients with moderate to severe (70–99%) carotid artery stenosis who undergo a carotid intervention procedure following the index stroke event.**

ii. Proportion of stroke patients with moderate carotid stenosis (50–69%) who undergo carotid intervention procedure following the index stroke event.

iii. Proportion of stroke patients with mild carotid stenosis (<50%) who undergo carotid intervention procedure following the index stroke event.

iv. **Median time from stroke symptom onset to carotid endartarectomy (CEA) surgery.** [c]

v. Proportion of stroke patients requiring carotid intervention, who undergo the procedure within two weeks of the index stroke event.

vi. **Proportion of CEA patients who experience peri-operative in-hospital stroke, AMI or death.**

vii. The 30-day in-hospital post-CEA mortality and stroke rates by carotid occlusion severity.

viii. Proportion of patients who undergo CEA within 2 weeks, from 2–4 weeks; between 2 weeks and 3 months, and between 3–6 months of stroke onset.

ix. Proportion of patients who wait > 6 months for CEA or who are cancelled due to long wait times.

x. Proportion of patients who experience a subsequent stroke event or death while waiting for CEA.

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Measurement Notes:

a. Time interval measurements should be taken from the time the patient/family reports as the time of stroke symptom onset to the time documented as the actual surgical date.

b. Analysis should be stratified between those patients undergoing carotid stenting and those patients undergoing carotid endartarectomy.

c. Data source for surgical date should be surgical note, nurses notes, discharge summary.

d. The stroke onset time will depend on patient report or that of a reliable observer at the time of the event.

e. In some cases, it may be more appropriate/relevant to record the time interval from the first time the patient has contact with medical care until the time of carotid surgery. This has occurred previously in cases where the patient was out of the country at the time of the stroke event and chose to return to Canada prior to seeking definitive medical intervention. It is important to note the nature of the start time when calculating turn-around times or intervention times.

SUMMARY OF THE EVIDENCE

It has been well established that carotid endarterectomy is beneficial for stroke prevention in appropriate patients. There are 3 large trials of endarterectomy for symptomatic stenosis: the North American Symptomatic Carotid Endarterectomy Trial (NASCET), the European Carotid Surgery Trial (ECST), and the Veterans Affairs 309 Trial. According to a pooled analysis of these trials (Rothwell et al, 2003), endarterectomy is highly beneficial in symptomatic patients with severe (70–99%) angiographic stenosis (NNT = 6 to prevent one stroke over 5 years), moderately beneficial for symptomatic patients with moderate (50–69%) stenosis (NNT=22, to prevent one stroke over 5 years), and not beneficial for mild (<50%) stenosis. Guidelines on carotid endarterectomy from the American Heart Association (1998) and the Canadian Neurosurgical Society (1997) recommend surgery for symptomatic high-grade stenosis (70–99%), but have not been updated to include the most recent evidence regarding symptomatic patients with moderate stenosis or patients with asymptomatic stenosis.

Endarterectomy for symptomatic patients should be performed with a maximum combined perioperative stroke and death rate of 6% according to the American Academy of Neurology guidelines (2005) and the Canadian Neurosurgical Society guidelines (1997); the American Heart Association guidelines recommend a 5% rate for patients with TIA and 7% for patients with stroke. Endarterectomy for asymptomatic patients should be performed with a maximum combined perioperative stroke and death rate of <3% according to all of these guidelines.

The benefit of endarterectomy depends not only on the degree of carotid stenosis, but also on the timing of surgery after the presenting event. Until recently, the importance of performing carotid surgery early after the

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ischemic event was not fully appreciated, and there has frequently been a policy of deferring surgery for 4 to 6 weeks post stroke or longer both in the large endarterectomy trials and in clinical practice. Indeed, the American Heart Association guidelines on carotid endarterectomy (last updated 1998) recommend that surgery be performed up to 6 months after symptom onset. The 1997 Canadian guidelines acknowledged that there was insufficient data at that time for firm guidelines but recommended that endarterectomy should not be deliberately postponed more than 30 days after a non-disabling hemispheric stroke". New data from a pooled analysis of NASCET and ECST (Rothwell et al. 2004) demonstrates that the benefit of carotid endarterectomy is extremely time-dependent. For example, in patients with severe stenosis (70–99%), surgery was most effective when performed within 2 weeks of the index TIA or stroke (NNT=5, to prevent one stroke in 5 years) and this benefit declined quickly over time (NNT = 125 for patients who undergo surgery more than 12 weeks after the symptomatic event). This time-dependent decline in benefit was even more pronounced in patients with moderate stenosis (50–69%): endarterectomy performed within the first 2 weeks of the ischemic event was beneficial, but the benefit was lost (and there is net harm) when surgery was delayed more than 3 months. A Cochrane review on the timing of carotid surgery is planned.

The risk of carotid endarterectomy in relation to the timing of surgery was investigated in a systematic review of endarterectomy trials.(Bond et al. 2003) The operative risk of stroke and death was not increased in neurologically stable patients when surgery is performed early (<3 to 6 weeks) vs. late (>3 to 6 weeks). However, in unstable patients who underwent "urgent" endarterectomy in the acute phase for stroke in evolution or crescendo TIA, there was an increased perioperative risk (20%) that was significantly higher than the risk in stable patients. The American Academy of Neurology report provided no recommendation regarding the value of emergent endarterectomy in patients with a progressing neurologic deficit.

A consensus statement on carotid endarterectomy from the American Academy of Neurology Therapeutics and Technology Assessment Subcommittee (2005) states: "It is reasonable to consider (carotid endarterectomy) for patients between the ages of 40 and 75 years and with asymptomatic stenosis of 60 to 99% if the patient has an expected five year life expectancy and if the surgical stroke or death frequency can be reliably documented to be <3% (level A recommendation)". (Chaturvedi et al, 2005) The potential benefits must be weighed against the up-front risk of surgical complications, and surgeons who perform this procedure should have a demonstrated perioperative stroke or death rate <3%. As such, some experts caution against routine endarterectomy for asymptomatic patients; patient selection is key and additional risk factors should be sought. The procedure may be viewed as an "investment in the future" for individuals with a good life expectancy and low surgical risk.

Practice gaps in carotid disease management have been identified. According to a recent Canadian study, the appropriate patients who are most likely to benefit from endarterectomy are not always being referred, and many procedures are performed (inappropriately) on patients at low risk of stroke. (Kennedy et al, 2004) In an Oxfordshire population-based study (Fairhead et al, 2005) of TIA and stroke patients referred for endarterectomy for >50% stenosis, only 6% had surgery within 2 weeks of their ischemic event and only 43% within 3 months; 32% of patients had a recurrent stroke while awaiting endarterectomy. Stroke prevention clinics, then, have an important role in promoting adherence to guidelines and ensuring appropriate patient selection and timely referral for this procedure. Delays from presenting event to initial assessment, carotid imaging, and endarterectomy are new key indicators that should be monitored as part of stroke quality assurance programs.

4

Acute Stroke Management

4.1 | STROKE UNIT CARE

BEST PRACTICE RECOMMENDATION 4.1: STROKE UNIT CARE

Patients admitted to hospital because of an acute stroke should be treated in an interdisciplinary stroke unit. (CSQCS, SCORE, SIGN 64; Evidence Level A/I)

- A stroke unit is a specialized, geographically defined hospital unit dedicated to the management of stroke patients. (Australian, RCP; Evidence Level A/I)
- The core interdisciplinary team should consist of appropriate levels of medical, nursing, nutrition, occupational therapy, physiotherapy, social work and speech-language pathology staff. Additional disciplines may include pharmacy, (neuro) psychology and recreation therapy. (SIGN 64, Australian, SCORE; Evidence Level B)
- The interdisciplinary team should assess patients within 48 hours of admission and formulate a management plan. (BPS-WG; Evidence Level C)
- Clinicians should use standardized, valid assessments to evaluate the patient's stroke-related impairments and functional status. (RCP, BPS-WG; Evidence Level III)

RATIONALE

Level 1 evidence from a systematic review of randomized controlled clinical trials indicates that stroke unit care reduces the likelihood of death and disability in men and women of any age with mild, moderate or severe stroke. Stroke unit care is characterized by a coordinated interdisciplinary team approach for preventing stroke complications, preventing stroke recurrence, accelerating mobilization, and providing early rehabilitation therapy.

Note: Refer to Recommendation 20 for components of inpatient stroke rehabilitation (which commences in the acute care hospital) and for additional information on stroke unit usage for inpatient rehabilitation.

SYSTEM IMPLICATIONS

- Organized system of stroke care including stroke units with a critical mass of trained staff, (interdisciplinary team). If not feasible, then mechanisms for coordinating the care of stroke patients to ensure application of best practices and optimization of outcome.
- Definition, dissemination, and implementation of best practices for stroke patients across the continuum of care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. **Number of stroke patients treated on a stroke unit at any time during their in-patient hospital stay for an acute stroke event (numerator) as a percentage of total number of stroke patients admitted to hospital.** [c]

ii. **Proportion of total time in hospital for an acute stroke event spent on a stroke unit.**

iii. Percentage increase Telehealth/telestroke coverage to remote communities to support organized stroke care across the continuum.

iv. Percentage of patients discharged to their home or place of residence following an inpatient admission for stroke. [c]

Measurement Notes:

a. Measure 1 could be calculated for all cases, then stratified by type of stroke.

b. Definition of stroke unit varies widely from institution to institution. Where stroke units do not exist that meet the criteria defined in the recommendation, then a hierarchy of other stroke care models could be considered: a) dedicated stroke unit; (b) designated area within a general nursing unit where clustering of stroke patients occurs; (c) peripatetic (mobile) stroke team care; (d) managed on a general nursing unit by staff using guidelines and protocols.

c. It is important to note the operational definition of stroke unit being used by any institution collecting this data to ensure standardization and validity when data is collected and reported across institutions.

SUMMARY OF THE EVIDENCE

The Stroke Unit Trialists' Collaboration [Cochrane systematic review] assessed the effect of stroke unit care compared with alternative forms of care for patients following a stroke. The alternative service was usual care provided on an acute medical ward without routine interdisciplinary input.

Organized inpatient (stroke unit) care typically involved: i) coordinated interdisciplinary rehabilitation, ii) staff with a specialist interest in stroke or rehabilitation, iii) routine involvement of carers in the rehabilitation process, and iv) regular programs of education and training. The core characteristics which were invariably included in the stroke unit setting were: interdisciplinary staffing i.e. medical, nursing and therapy staff (usually including physiotherapy, occupational therapy, speech therapy, social work); and coordinated interdisciplinary team care with meetings at least once per week.

The typical components of care in the stroke unit trials (Langhorne et al, 2002) were as follows: a) assessment—medical evaluation and diagnostic testing (including CT scanning), early assessment of nursing and rehabilitation therapy needs; b) early management policies—early mobilization, prevention of complications (e.g. pressure area care, careful positioning and handling), treatment of hypoxia, hyperglycemia, fever and dehydration; and, c) ongoing rehabilitation policies (coordinated interdisciplinary team care, early assessment of needs after discharge).

The Stroke Unit Trialists' systematic review included 23 randomized and quasi-randomized trials containing outcome information on 4911 patients. Of the 23 trials, 22 incorporated rehabilitation lasting several weeks if required; 15 of these units admitted patients acutely, and eight after a delay of one or two weeks. Only one trial evaluated an acute stroke unit with no continuing rehabilitation. No trials evaluated an "intensive care" model of stroke unit.

Compared with alternative services, stroke unit care showed reductions in the odds of death recorded at final (median one year) follow-up (odds ratio 0.86; 95% confidence interval 0.71 to 0.94; P=0.005), the odds of death or institutionalized care (0.80; 0.71 to 0.90; P=0.0002) and death or dependency (0.78; 0.68 to 0.89; P=0.0003). There was no indication that organized stroke unit care resulted in increased hospital stay. There are no firm grounds for restricting access according to a patient's age, gender, or stroke severity. Stroke units should aim to replicate those core service characteristics identified in the randomized trials (Phillips et al). The absolute benefits of organized inpatient (stroke unit) care appear to be sufficiently large (numbers needed to treat to ensure one extra "good" outcome are 33 for survival, 20 to regain independence and 20 to return home) to justify the reorganization of services.

4.2 | BRAIN IMAGING

BEST PRACTICE RECOMMENDATION 4.2: BRAIN IMAGING

All patients with suspected acute stroke should undergo brain imaging immediately. In most instances, the modality of choice is a non-contrast Computer-assisted Tomographic (CT) scan. If Magnetic Resonance Imaging (MRI) is performed, the scan should include diffusion-weighted sequences to detect ischemia, and gradient echo and FLAIR sequences for hemorrhage. (CSQCS, RCP, NZ; Evidence Level B)

RATIONALE

Clinicians disagree on the clinical diagnosis of stroke (versus not stroke) in about 20% of patients. It is impossible to differentiate infarct from hemorrhage on clinical grounds. Brain imaging is required to guide management, including the selection of acute, time-sensitive interventions. In a decision-analysis model, a policy of 'scan all immediately' was more cost-effective than 'scan all within 48 hours' or 'scan patients on anticoagulants or in a life-threatening condition immediately and the rest within 14 days'.

SYSTEM IMPLICATIONS

- Initial assessment performed by clinicians experienced in stroke to determine diagnostic needs and urgency.
- Timely access to diagnostic services (neuro-imaging), including local protocols in place for prioritizing stroke patients for rapid access to appropriate diagnostics such as CT scans.
- Organized system of stroke care across regions to ensure timely access to diagnostic services if not available at the initial hospital for stroke patients.
- Definition, dissemination, and implementation of best practices related to diagnostic services for stroke patients across the continuum of care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of stroke patients who receive a brain CT/MRI within 25 minutes of hospital arrival.

ii. Proportion of stroke patients who receive a brain CT/MRI within 24 hours of hospital arrival.

iii. Proportion of stroke patients who receive a brain CT/MRI prior to hospital discharge. [c]

Measurement Notes:

a. Time interval measurements should be taken from the time the patient is triaged or registered at the hospital (whichever time comes first chronologically) until the time noted on the actual brain imaging scan. These numbers are both generated by hospital computer systems and have been found to be the most reliable. In the absence of a information system-generated arrival time, the first time documented on the patient record should be used for calculations.

b. Analysis should be stratified for those patients who arrive within 2.5 hours of stroke symptom onset and those who arrive beyond 2.5 hours.

SUMMARY OF THE EVIDENCE

Despite the absence of randomized trials, there is uniform agreement that head CT should be the initial imaging study of patients who present with acute ischemic stroke. The primary purpose of the head CT is to exclude intracranial hemorrhage although other important information may be obtained. A head CT should be obtained emergently in those patients potentially eligible for thrombolytic therapy. Strict goals of 25 minutes from presentation to the ER to completion of the scan and 45 minutes until interpretation have been recommended based on randomized controlled trials of thrombolytic therapy. Although MRI may provide more information in specific cases, it is not generally recommended as the initial brain imaging study in patients with an acute stroke.

Eight clinical practice guidelines have recommended head CT as the initial imaging study for patients with acute ischemic stroke. Whereas all guidelines recommend obtaining the CT scan promptly, more recent guidelines concerning patients eligible for thrombolytic therapy have established target times of 25 minutes for completion of the CT scan following presentation to the ER and 45 minutes for interpretation of the CT scan. Most importantly, CT scanning allows the early detection of intracranial hemorrhage, an absolute contraindication to thrombolytic therapy. CT images also provide information regarding early ischemic changes in the brain, mass effect from edema, middle cerebral artery embolic material (hyperdense MCA sign), other vascular lesions, and prior cerebral infarctions.

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Members of the Stroke Council of the AHA have issued specific guidelines for the use of imaging in transient ischemic attacks and acute stroke. The authors strongly recommend CT of the head without contrast enhancement as the initial brain imaging procedure in patients with acute stroke. This recommendation was classified by the authors as a "strong positive recommendation" resulting from evidence based on one or more well-designed studies of a diverse population using a gold standard reference test in a blinded evaluation appropriate for the proposed diagnostic application.

Wardlaw et al (2004) conducted a cost-effectiveness analysis of the use of CT and tested 13 strategies. The study indicates that of 13 possible imaging strategies, a policy of "CT scan all patients immediately" is dominant. Although the costs of CT scanning are highest for this strategy because of more scanning occurring after hours, these higher costs are offset by savings in the length of inpatient stay because many management decisions and better outcomes depend on accurate early diagnosis of stroke. The costs of after-hours scanning would have to rise markedly (well above the current maximum costs) to outweigh the cost savings in length of stay on current bed occupancy cost figures. The results were sensitive to a fall in the cost of inpatient days. The unusual sensitivity of the incremental cost effectiveness estimates is largely a product of the very small difference in outcome between a strategy of "scan all immediately" and one of "scan all within 48 hours of admission to hospital." Because the majority of patients have cerebral infarction, the main treatment is aspirin, and there is no good evidence of a time dependency of the effect of aspirin up to 48 hours after stroke.

4.3 | BLOOD GLUCOSE

BEST PRACTICE RECOMMENDATION 4.3: BLOOD GLUCOSE

All patients with suspected acute stroke should have their blood glucose concentration checked immediately. Blood glucose measurement should be repeated if the first value is abnormal or if the patient is known to have diabetes. Hypoglycemia should be corrected immediately. Markedly elevated blood glucose concentrations should be treated with glucose lowering agents. (CSQCS, Australian; Evidence Level B-C)

RATIONALE

Diabetes mellitus is a major modifiable risk factor for vascular disease that may be first diagnosed at the time of a stroke. Hypoglycemia may cause focal neurological deficits that can be reversed by giving glucose. Severe hyperglycemia (blood glucose >22 mmol/L) is a relative contraindication to the administration of intravenous alteplase. Hyperglycemia at the time acute stroke increases infarct size in experimental animals and is associated with poor clinical outcomes in epidemiological studies.

SYSTEM IMPLICATIONS

- Initial comprehensive assessment performed by clinicians experienced in stroke.
- Timely access to diagnostic services, with predetermined protocols for initial blood work which includes glucose screening.
- Definition, dissemination, and implementation of best practices for stroke patients across the continuum of care to ensure ongoing monitoring and management of blood glucose levels as required.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of patients with blood glucose levels documented during assessment in the ED or on the inpatient ward.

ii. Proportion of patients with known diabetes who have blood glucose levels in therapeutic range for that patient.

Measurement Notes:

a. Data may be obtained from laboratory reports or patient chart.

b. Medical history should indicate whether patient was a known diabetic prior to stroke event.

c. Glucose levels will need to be monitored for a period of time to determine whether glucose levels achieve and are sustained in therapeutic range. Therapeutic range may vary between patients.

SUMMARY OF THE EVIDENCE

Elevated blood sugar (hyperglycemia) in the acute setting of stroke is common, documented in up to 40% of patients with stroke. Several large clinical studies have now demonstrated a positive association between post-stroke hyperglycemia and poor outcome from stroke, infarct progression, greater mortality, and reduced functional recovery. Hyperglycemia is clearly shown to have deleterious effects on brain tissue in animal models of cerebral ischemia, increasing the size of the damaged brain tissue and surrounding edema in the brain. It remains unclear as to what extent post-stroke hyperglycemia is a "normal" physiological response, or whether hyperglycemia per se increases cerebral damage in the acute phase. There are accumulating clinical data to suggest that much of this response is associated with impaired glucose metabolism, with the prevalence of previously unrecognized diabetes mellitus (DM), or impaired glucose tolerance preceding stroke as high as 42%. Although a direct causal relationship has not yet been established, it is probable that an important relationship exists between hyperglycemia and stroke outcome. Patients with hyperglycemia have worse functional outcomes at hospital discharge and are less likely to be living independently at 6 months and 1 year post-stroke. Mortality in stroke patients with early hyperglycemia is also significantly higher. To date, no strong evidence exists for a specific strategy for treating hyperglycemia in stroke to improve stroke outcomes; however, practice guidelines uniformly recommend treating elevated glucose levels.

4.4 | ACUTE THROMBOLYTIC TREATMENT

BEST PRACTICE RECOMMENDATION 4.4: ACUTE THROMBOLYTIC TREATMENT

All acute ischemic stroke patients should be evaluated to determine their eligibility for treatment with intravenous tissue-plasminogen activator (tPA) using the criteria from the National Institute of Neurological Disorders and Stroke (NINDS) rt-PA Stroke Study. Administration of t-PA should follow the American Stroke Association guidelines. (ASA, CSQCS, RCP; Evidence Level A-B)

- All eligible patients should receive tPA within one hour of hospital arrival. ("Eligible patients" refers to those who arrive at hospital within 3 hours of the onset of stroke symptoms and where tPA is not contraindicated). (CSQCS, RCP; Evidence Level B-C)

RATIONALE

Meta-analysis of the randomized controlled trials of intravenous alteplase for acute ischemic stroke has shown that thrombolytic treatment can reduce the risk of disability, despite the risk of serious bleeding. Most of this evidence is derived from the National Institute of Neurological Disorders and Stroke tPA Stroke Study, which enrolled patients within three hours of stroke onset.

The data from the trials are limited. Consequently, uncertainty persists around the effectiveness of intravenous alteplase in routine clinical practice, particularly in small community hospitals.

SYSTEM IMPLICATIONS

- Organized stroke care (stroke units with critical mass of trained staff, interdisciplinary team).
- Initial assessment performed by clinicians experienced in stroke to determine appropriateness for acute thrombolytic therapy.
- Timely access to diagnostic services (neuro-imaging) for potential tPA candidates.
- Timely access to thrombolytic therapy (t-PA) and other reperfusion strategies, including established protocols for determining eligibility and defining administration process.
- Definition, dissemination, and implementation of best practices for stroke patients receiving acute thrombolytic therapy.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of all ischemic stroke patients who receive acute thrombolytic therapy (tPA). [c]

ii. Proportion of all thrombolysed ischemic stroke patients who receive acute thrombolytic therapy (tPA) within one hour of hospital arrival. [c]

iii. Median time from patient arrival in the emergency department to administration of acute thrombolytic agent (in minutes).

iv. Proportion of patients in rural or remote communities who receive thrombolysis through the use of telestroke technologies (as a proportion of all ischemic stroke cases in that community, and as a proportion of all telestroke consults for ischemic stroke cases).

v. Proportion of patients with secondary intracerebral hemorrhage following thrombolysis.

Measurement Notes:

a. Data source will be the patient chart and obtained by chart audit/review.

b. Time interval measurements should be taken from the time the patient is triaged or registered at the hospital (whichever time comes first chronologically) until the time of medication administration noted in the patient chart (nursing notes, emergency department record, or medication record).

c. When recording if tPA is given, the route of administration should also be recorded, as there are different time to administration benchmarks for intravenous versus intra-arterial routes.

SUMMARY OF THE EVIDENCE

Thrombolysis has the potential to improve outcome of patients with cerebral ischemia, however it is a high-risk treatment and should only be administered by personnel trained in its use, in a centre equipped to investigate and monitor patients appropriately. Evidence from Phase IV studies on intravenous thrombolysis in North America has shown that unless the protocols for treatment are strictly adhered to outcomes are worse. The evidence for the benefits of intra-arterial thrombolysis remains limited.

The 2006 Cochrane Library systematic review update (n=5727; 18 trials) evaluated all available evaluated all available randomized trials of thrombolysis in acute ischemic stroke (with pre-randomization CT and treatment within 14 days of stroke symptom onset). Sixteen trials were double-blind. The trials tested urokinase, streptokinase, recombinant tissue plasminogen activator or recombinant pro-urokinase. Two trials used intra-arterial administration but the rest used the intravenous route. About 50% of the data (patients and trials) come from trials testing intravenous tissue plasminogen activator. There are few data from patients aged over 80 years. Much of the data comes from trials conducted in the first half of the 1990s when, in an effort to reduce delays to trial drug administration, on site randomization methods were used that, in consequence, limited the ability

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to stratify randomization on key prognostic variables. Several trials, because of the biological effects of thrombolysis combined with the follow-up methods used, did not have complete blinding of outcome assessment. Thrombolytic therapy, administered up to six hours after ischaemic stroke, significantly reduced the proportion of patients who were dead or dependent (modified Rankin 3 to 6) at the end of follow-up at three to six months (OR 0.84, 95% CI 0.75 to 0.95). This was in spite of a significant increase in: the odds of death within the first ten days (odds ratio [OR] 1.81, 95% confidence interval [CI] 1.46 to 2.24), the main cause of which was fatal intracranial haemorrhage (OR 4.34, 95% CI 3.14 to 5.99). Symptomatic intracranial haemorrhage was increased following thrombolysis (OR 3.37, 95% CI 2.68 to 4.22). Thrombolytic therapy also increased the odds of death at the end of follow-up at three to six months (OR 1.33, 95% CI 1.15 to 1.53). For patients treated within three hours of stroke, thrombolytic therapy appeared more effective in reducing death or dependency (OR 0.66, 95% CI 0.53 to 0.83) with no statistically significant adverse effect on death (OR 1.13, 95% CI 0.86 to 1.48). There was heterogeneity between the trials that could have been due to many trial features including: thrombolytic drug used, variation in the use of aspirin and heparin, severity of the stroke (both between trials and between treatment groups within trials), and time to treatment. Trials testing intravenous recombinant tissue plasminogen activator suggested that it may be associated with slightly less hazard and more benefit than other drugs when given up to six hours after stroke but these are non-random comparisons—death within the first ten days OR 1.24, 95% CI 0.85 to 1.81, death at the end of follow-up OR 1.17, 95% CI 0.95 to 1.45, dead or dependent at the end of follow-up OR 0.80, 95% CI 0.69 to 0.93. However, no trial has directly compared rt-PA with any other thrombolytic agent. There is some evidence that antithrombotic drugs given soon after thrombolysis may increase the risk of death.

The authors of the Cochrane review concluded that, overall, thrombolytic therapy appears to result in a significant net reduction in the proportion of patients dead or dependent in activities of daily living. However, there appears to be a net increase in deaths within the first seven to ten days, symptomatic intracranial haemorrhage, and deaths at follow-up at three to six months. The data from trials using intravenous recombinant tissue plasminogen activator, from which there is the most evidence on thrombolytic therapy so far, suggest that it may be associated with less hazard and more benefit.

The heterogeneity between the trials for some outcomes means that and the optimum criteria to identify the patients most likely to benefit and least likely to be harmed, the latest time window, the agent, dose, and route of administration, remain unclear. The data are promising and may justify the use of thrombolytic therapy with intravenous recombinant tissue plasminogen activator in experienced centres in highly selected patients where a license exists. However, the data do not support the widespread use of thrombolytic therapy in routine clinical practice at this time, but suggest that further trials are needed to identify which patients are most likely to benefit from treatment and the environment in which it may best be given.

Several clinical practice guidelines recommend treatment with thrombolytic therapy (i.e., rt-PA) in eligible patients. They all support the recommendation that thrombolytic therapy be administered within 3 hours of ischemic stroke onset. They also recommend strict adherence to eligibility criteria for the use of IV rt-PA based on the NINDS trial protocol.

4.5 | CAROTID ARTERY IMAGING

BEST PRACTICE RECOMMENDATION 4.5: CAROTID ARTERY IMAGING

Carotid imaging should be performed within 24 hours of a carotid territory TIA or non-disabling ischemic stroke unless the patient is clearly not a candidate for carotid endarterectomy. (CSQCS, BPS-WG, SIGN14; Evidence Level B)

RATIONALE

Symptomatic carotid artery stenosis is known modifiable risk factor for stroke. Recent meta-analyses of individual patient data have demonstrated that the timing of endarterectomy is of paramount importance. For patients with moderate (50–69%) stenosis, statistically significant benefit from carotid endarterectomy cannot be demonstrated if surgery is delayed by more than 4 weeks after symptom onset. For patients with severe (>70%) stenosis, statistically significant benefit from carotid endarterectomy cannot be demonstrated if surgery is delayed by more than 12 weeks after symptom onset. Therefore, patients who may be suitable for carotid endarterectomy should have rapid access to non-invasive imaging of the carotid arteries. Non-invasive imaging typically comprises Doppler ultrasound, followed (if necessary) by magnetic resonance angiography (MRA) or computerized tomographic angiography (CTA).

SYSTEM IMPLICATIONS

- Initial assessment performed by clinicians experienced in stroke that are able to determine carotid territory involvement.
- Timely access to diagnostic services for evaluating carotid arteries.
- Definition, dissemination, and implementation of best practices for patients with suspected carotid territory involvement in stroke.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of stroke patients who receive carotid imaging prior to hospital discharge.

ii. Proportion of patients who do not undergo carotid imaging in hospital who have an appointment booked before discharge for carotid imaging as an outpatient.

iii. Median time from stroke symptom onset to carotid imaging.

Measurement Notes:

a. Time interval measurements should be taken from the time the patient is triaged or registered at the hospital (whichever time comes first chronologically) until the time noted on the actual carotid imaging report. These numbers are both generated by hospital computer systems and have been found to be the most reliable. In the absence of an information system-generated arrival time, the first time documented on the patient record should be used for calculations. This may be difficult to calculate in cases where the testing is completed as an outpatient.

b. For carotid imaging booked on an outpatient basis, a notation should appear in the discharge summary, or nurses notes, and an indication that the test had actually been booked prior to the patient leaving hospital.

c. Link this Best Practice Recommendation and performance measures to Recommendation #9 for those patients who require carotid revascularization.

SUMMARY OF THE EVIDENCE

About 15–20% of ischemic strokes are caused by symptomatic extracranial carotid artery disease. Rapid dentification of patients with symptomatic carotid artery disease who would be candidates for carotid revascularization is a management priority.

Since patients with carotid territory TIA or minor stroke and high-grade ipsilateral carotid artery stenosis are at very high risk of early stroke recurrence, and because the absolute benefit derived from carotid endarterectomy is highly time-dependent, there is a need to quickly rule in or rule out the presence of significant carotid artery disease in appropriate patients. Of all the diagnostic tests, then, carotid imaging is arguably the most important study to be performed early; (outdated) guidelines recommend that it be performed within one week of the presenting event, but more recent expert opinion recommends that it be performed within 24 hours. The opportunity for stroke prevention may be missed if there are delays in diagnosis and treatment of symptomatic carotid disease (Fairhead et al. 2005).

4.6 | DYSPHAGIA ASSESSMENT

BEST PRACTICE RECOMMENDATION 4.6: DYSPHAGIA ASSESSMENT

15a. All patients with stroke should have their swallow screened prior to initiating oral intake of fluids or food utilizing a simple valid reliable bedside testing protocol. (CSQCS, SCORE, SIGN 78, NZ; Evidence Level B)

15b. Patients with stroke presenting with features indicating dysphagia or pulmonary aspiration should receive a full clinical assessment of swallowing by an SLP or appropriately trained specialist who should advise on safe swallow and consistency of diet and fluids. (RCP, CSQCS, SCORE, NZ; Evidence Level A)

RATIONALE

Dysphagia is not in itself a disease. It is an impairment of the swallow in one or more of the four phases of the swallow; oral, oral preparatory, pharyngeal or esophageal. Dysphagia occurs in approximately 55% of people with new onset strokes (Cerebrovascular accidents) (Martino et al, 2005). Of those affected, approximately 50% do not recover to a normal swallow by six months after onset. (Martino et al, 200; Mann et al, 2001)

Dysphagia itself may lead to poor nutrition (Davalos et al, 1996) and hydration (Finestone et al, 2001) in stroke patients It can result in aspiration leading to pneumonia (Smithard et al, 1996). It is important for the prevention of these secondary complications to screen each new stroke patient for signs and symptoms of dysphagia and for those who fail screening to follow with a complete assessment. A complete assessment should include a full bedside assessment and, if deemed necessary following the clinical assessment, followed with an instrumental assessment such as the videofluoroscopic assessment of swallowing.

Bedside screening of each new stroke patient: The bedside screening may involve observation of the patient's level of alertness to participate in the screening process. It should include an evaluation of the patient's oral motor function and oral sensation as well as the presence of a cough. It may also include trials of fluid such as that included in the TOR-BSSTã or Burke test. These tools recommend that water be administered using a preset protocol and that signs for impaired swallowing be monitored. Coughing during and for up to one minute after completion of the test and/or "wet" or hoarse voice are suggestive of an abnormal swallow.

Cautionary note: Silent aspiration may occur in patients who do not cough, complain of any problems with swallow or have no wet sounding voice. If there is silent aspiration, the patient may not display any signs or symptoms on the trial swallows. It is possible for them to pass the initial screen and still be aspirating. Therefore all stroke patients, regardless of whether they pass or fail the screening, should be informally monitored during their hospital stay for symptoms of swallowing problems.

Specialized Assessment and Management: If the patient "fails" the screening test, a full beside assessment and possibly a videofluoroscopic assessment should be completed by a Speech Language Pathologist as soon as possible. Results from these assessments may also help determine what textures are not aspirated and the effectiveness of compensatory techniques that will help keep the patient from aspirating.

SYSTEM IMPLICATIONS

- Initial screening performed by trained clinicians (nurses or other staff) to all newly admitted stroke patients.
- For those patients who failed screening, an initial clinical assessment performed by specialized clinicians (SLPs).
- Development and delivery of educational programs to train appropriate staff to perform an initial swallowing screening for stroke patients.
- Definition, dissemination, and implementation of best practices for screening, assessment and management of swallowing in stroke patients during the early acute phase.
- Mechanisms for ongoing monitoring and evaluation of swallowing, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of stroke patients with documentation that an initial dysphagia screening assessment was performed during hospital admission (can be performed by any trained clinician such as an SLP, dietician, OT or nurse).

ii. Median time from patient arrival in the emergency department to initial swallowing screening by a trained clinician (in minutes).

iii. Proportion of stroke patients who fail initial screening who then receive a comprehensive assessment by a speech language pathologist or other appropriately trained health care professional.

Measurement Notes:

a. These indicators may be altered or refined pending the results from the Canadian Stroke Rehabilitation Outcomes Consensus Panel.

b. Data sources include emergency department record, nurses notes, medical notes, allied health notes.

SUMMARY OF THE EVIDENCE

Information on the incidence and prevalence of dysphagia is now emerging. In 1994, it is estimated that dysphagia was present in approximately 21,000 new stroke patients older than 65 years of age, and that only half of these patients would recover within the first week. (Martino et al, 2000) Based on a systematic review of the stroke literature, it is estimated 55% of patients demonstrate some degree of dysphagia within their acute stay. (Martino et al,2005) Dysphagia tends to be lower after hemispheric stroke and remains prominent in the rehabilitation brain stem stroke. (Martino et al, 2005) There is evidence for an increased risk for pneumonia in stroke patients with dysphagia (RR, 3.17: 95% CI, 2.07, 4.87) and an even greater risk in stroke patients with aspiration (RR, 11.56; 95% CI, 3.36, 39.77). Aspiration is a precursor to pneumonia and therefore has the potential to be life threatening in a population that is already dealing with the serious effects of stroke. (Sharma et al, 2001)

There is emerging evidence that a systematic program for screening, diagnosis and treatment of dysphagia in acute stroke patients may yield dramatic reductions in pneumonia rates (Martino et al, 2000; Perry & Love, 2001; Smith & Connolly, 2003), feeding tube dependency and length of hospital stay (Martino et al, 2000). The prompt attention to dysphagia screening (Hinchey et al, 2005) followed by appropriate assessment and management is a deterrent to concomitant problems of aspiration, compromised nutrition and hydration. Currently available data, however, are too sparse and unsatisfactory to conclusively recommend one screening technique over another as well as one treatment program over another.

4.7 | ACUTE ASPIRIN THERAPY

BEST PRACTICE RECOMMENDATION 4.7: ACUTE ASPIRIN THERAPY

After brain imaging has excluded intracranial hemorrhage all acute stroke patients should be given at least 160 mg of acetylsalicylic acid (ASA) immediately as a one time loading dose. (RCP, NZ, SIGN13; Evidence Level A)

- In patients treated with r-tPA, ASA should be delayed until after the 24-hour post-thrombolysis scan has excluded intracranial hemorrhage. (RCP, NZ; Evidence Level A)
- ASA (50–325 mg daily) should then be continued indefinitely or until an alternative antithrombotic regime is started. (RCP; Evidence Level A)
- In dysphagic patients, ASA may be given by enteral tube or by rectal suppository. (RCP; Evidence Level A)

RATIONALE

Acute-phase aspirin therapy reduces the risk of early recurrent ischemic stroke. Long-term aspirin therapy reduces the risk of ischemic stroke, myocardial infarction and vascular death. The randomized trials of aspirin therapy in acute ischemic stroke enrolled patients within 48 hours of stroke onset and used doses of 160–325 mg daily. There are no data from randomized controlled trials to support the use of other antiplatelet regimes in acute stroke patients. In the NINDS r-tPA Stroke Study, antithrombotic drugs (including aspirin) were avoided until after the 24-hour post-thrombolysis scan had excluded intracranial hemorrhage. In trials of long-term secondary prevention therapy, daily aspirin doses of 50–325 mg were as effective as higher doses and less likely to cause gastrointestinal side-effects. Aspirin therapy reduces the risk of venous thromboembolism.

SYSTEM IMPLICATIONS

- Organized stroke care (stroke units with critical mass of trained staff, interdisciplinary team).
- Initial assessment performed by clinicians experienced in stroke to determine appropriateness for acute aspirin therapy.
- Protocols in place for timely access to diagnostic services (neuro-imaging).
- Protocols established for timely access to thrombolytic therapy (t-PA) and other reperfusion strategies.
- Definition, dissemination, and implementation of best practices for stroke patients in the acute phase.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of ischemic stroke patients who receive acute aspirin therapy within the first 48 hrs following a stroke event.

ii. Median time from stroke onset to administration of first dose of aspirin in hospital.

Measurement Notes:

a. Time interval measurements should be taken from the time the patient is triaged or registered at the hospital (whichever time comes first chronologically) until the time noted for the first dose administered.

b. This indicator focuses on aspirin. Some centres may also choose to include other antiplatelet medications, such as: clopidogrel (Plavix), ticlopidine (Ticlid), or Aggrenox (ASA/extended release dipyridamole). In cases where another agent is used instead of aspirin in the first 48 hours, this should be clearly noted in the indicator definition.

c. Possible data sources include: history and physical, physician's admission notes, nurses' admission notes, medication record.

SUMMARY OF THE EVIDENCE

The most recent Cochrane Library systematic review update (2006) of aspirin in acute stroke included nine trials involving 41,399 patients.. Two trials testing aspirin 160 to 300 mg once daily started within 48 hours of onset contributed 98% of the data. The maximum follow-up was six months. With treatment, there was a significant decrease in death or dependency at the end of follow-up (OR = 0.94; 95% CI 0.91 to 0.98). In absolute terms, 13 more patients were alive and independent at the end of follow-up for every 1000 patients treated. Furthermore, treatment increased the odds of making a complete recovery from the stroke (OR = 1.06; 95% CI 1.01 to 1.11). In absolute terms, 10 more patients made a complete recovery for every 1000 patients treated. Antiplatelet therapy was associated with a small but definite excess of 2 symptomatic intracranial hemorrhages for every 1000 patients treated, but this was more than offset by a reduction of 7 recurrent ischaemic strokes and about one pulmonary embolus for every 1000 patients treated.

The authors concluded antiplatelet therapy with aspirin 160 to 300 mg daily, given orally (or per rectum in patients who cannot swallow), and started within 48 hours of onset of presumed ischaemic stroke reduces the risk of early recurrent ischaemic stroke without a major risk of early hemorrhagic complications and improves long-term outcome.

Several guidelines included in this document state that patients treated with rt-PA should not receive any tiplatelet or anticoagulant therapy for the first 24 hours after beginning treatment.

Long-term antiplatelet therapy reduces the risk of subsequent serious vascular events by about one quarter (Antithrombotic Trialists' Collaboration). In-hospital initiation of secondary prevention therapy before hospital discharge after an ischemic stroke or TIA is associated with high treatment adherence rates three months after hospitalization (Ovbiagele et al 2004).

4.8 | MANAGEMENT OF SUBARACHNOID AND INTRACEREBRAL HEMORRHAGE

BEST PRACTICE RECOMMENDATION 4.8:
MANAGEMENT OF SUBARACHNOID AND INTRACEREBRAL HEMORRHAGE

4.8a Patients with suspected subarachnoid hemorrhage should have an urgent neurosurgical consultation for diagnosis and treatment. (BPS-WG; Evidence Level B)

4.8b Patients with cerebellar hemorrhage should have an urgent neurosurgical consultation for consideration of craniotomy and evacuation of the hemorrhage. (BPS-WG; Evidence Level C)

4.8c Patients with supratentorial intracerebral hemorrhage should be cared for on a stroke unit. (BPS-WG; Evidence Level B-C)

RATIONALE

Subarachnoid hemorrhage is a neurosurgical emergency. Cerebellar hemorrhage poses a risk of obstruction of the fourth ventricle, brainstem compression and sudden death. Although no trial evidence exists, most would consider it good clinical practice to closely monitor such patients in order to determine the need for surgical decompression of the posterior fossa.

At the time of the writing of this best practice recommendation, there is no good evidence to support a surgical approach to treat supratentorial intracerebral hemorrhage. However, all patients, regardless of stroke type, stand to benefit from organized care on a stroke unit.

SYSTEM IMPLICATIONS

- Organized stroke care (stroke units with critical mass of trained staff, interdisciplinary team)
- Initial assessment performed by clinicians experienced in stroke to determine nature of stroke and appropriate management.
- Timely access to diagnostic services (neuro-imaging) with protocols for prioritizing potential stroke patients.
- Timely access to neurosurgical specialists for hemorrhagic patient management, including rapid referral process if neurosurgical services not available within the initial treating hospital.
- Definition, dissemination, and implementation of best practices for stroke patients across the continuum of care to ensure appropriate and comprehensive management of hemorrhagic stroke patients.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of hemorrhagic stroke patients treated on an acute stroke unit.

ii. Proportion of total time in hospital spent on an acute stroke unit.

iii. Percentage of hemorrhagic stroke patients who receive a neurosurgical consult while in hospital.

iv. Proportion of hemorrhagic stroke patients discharged to: their place of residence, inpatient stroke rehabilitation, Complex Continuing Care, or Long Term Care following hospital discharge.

v. Mortality rate for subarachnoid and intracerebral hemorrhage at 30-days in hospital.

Measurement Notes:

a. Analysis should be stratified for intracerebral and subarachnoid hemorrhage patients.

SUMMARY OF THE EVIDENCE

Subarachnoid Hemorrhage: recurrent hemorrhage remains a serious consequence of aneurysmal SAH, with a case-fatality rate of approximately 70% for persons who rebleed. In recent years improved diagnosis of SAH and rapid referral to specialized centers have delineated a distinct pattern of rebleeding compared with older studies. In the prospective Cooperative Aneurysm Study rebleeding was maximal (4%) on the first day after SAH and then constant at a rate of 1% to 2% per day over the subsequent 4 weeks. Several prospective follow-up cohorts have demonstrated that the risk of rebleeding with conservative therapy is between 20% and 30% for the first month after hemorrhage and then stabilizes at a rate of approximately 3% per year. (As reported in Mayberg et al, 1994)

The International Subarachnoid Aneurysm Trial (ISAT) was a randomized controlled trial that compared endovascular treatment with neurosurgical treatment in patients with aneurysmal subarachnoid hemorrhage. ISAT enrolled 2143 patients with ruptured intracranial aneurysms and randomly assigned them to neurosurgical clipping (n=1070) or endovascular treatment by detachable platinum coils (n=1073). Clinical outcomes were assessed at 2 months and at 1 year with interim ascertainment of rebleeds and death. The primary outcome was the proportion of patients with a modified Rankin scale score of 3–6 (dependency or death) at 1 year. Trial recruitment was stopped by the steering committee after a planned interim analysis (Published 2002). Analysis was per protocol. Final analysis was completed after all patients completed the 1-year follow-up (Published 2005). Secondary outcomes included rebleeding from the treated aneurysm and risk of seizures.

The one year outcomes are reported for 1063 of 1073 patients allocated to endovascular treatment, and 1055 of 1070 patients allocated to neurosurgical treatment. 250 (23.5%) of 1063 patients allocated to endovascular treatment were dead or dependent at 1 year, compared with 326 (30.9%) of 1055 patients allocated to neurosurgery, an absolute risk reduction of 7.4% (95% CI 3.6-11.2, p=0.0001). The early survival advantage was maintained for up to 7 years and was significant (log rank p=0.03). The risk of epilepsy was substantially lower in

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patients allocated to endovascular treatment, but the risk of late rebleeding was higher. The study concluded that endovascular coiling, compared with neurosurgical clipping, for ruptured intracranial aneurysms that were anatomically suitable for either procedure leads to a significant reduction in the relative risk of death or dependency of 23.9% (12.4-33.9). This equates to an absolute risk reduction of 7.4% (3.6-11.2), which is equivalent to 74 patients avoiding death or dependency at 1 year for every 1000 patients treated.

Timing of aneurysm surgery has been addressed in several nonrandomized clinical series. Kassell et al observed no preoperative rebleeds in 27 patients with early (less than 3 days after SAH) surgery compared with 7 of 24 patients (29%) with late surgery. At surgery, both groups had the same intraoperative hemorrhage rate (26%). Chyatte et al found 4.7% preoperative rebleeds with acute (0 to 3 days) surgery, 6.0% with intermediate (4 to 7 days) surgery, and 16% with late (more than 7 days) surgery. The International Cooperative Study on the Timing of Aneurysm Surgery analyzed management comparison in 3521 patients, of whom 83% underwent surgical repair of the ruptured aneurysm. Timing of surgery after SAH was significantly related to the likelihood of preoperative rebleeding (0 to 3 days, 5.7%; 4 to 6 days, 9.4%; 7 to 10 days, 12.7%; 11 to 14 days, 13.9%; and 15 to 32 days, 21.5%). Postoperative rebleeding did not differ among time intervals (1.6% overall). Nevertheless, there was no significant difference in overall outcome in this study related to timing of surgery.

In recent years there has been a trend toward early surgery for ruptured aneurysms, especially in good- and moderate-grade patients. In addition, early surgery facilitates the aggressive therapy of vasospasm. Regardless of surgical timing, early referral to centers with facilities for intensive care of patients with SAH is essential, since many therapies need to be initiated in the acute period. (Mayberg et al, 1994)

Supratentorial Intracerebral Hemorrhage: A Cochrane Library Review update (2006) assessed the effects of surgery plus routine medical management, compared with routine medical management alone, in patients with primary supratentorial intracerebral haematoma. Randomized and quasi-randomized trials of routine medical treatment plus intracranial surgery compared with routine medical treatment, in patients with presumed or confirmed primary supratentorial intracerebral haematoma. Intracranial surgery included craniotomy, stereotactic endoscopic evacuation or stereotactic aspiration. Four trials were included. No trial had blinded outcome assessment. Craniotomy and endoscopic evacuation were analyzed separately. Craniotomy showed a non-significant trend towards increased odds of death and dependency among survivors (odds ratio 1.99, 99% confidence interval 0.92 to 4.31). The result was inconclusive in the two trials with patients confirmed as having primary supratentorial intracerebral haematoma by CT. Endoscopic evacuation was not shown to significantly decrease the odds of death and dependency among survivors in one trial involving 100 patients (odds ratio 0.45, 99% confidence interval 0.15 to 1.33). The authors concluded that there is not enough evidence currently available to evaluate the effect of craniotomy or stereotactic surgery, or endoscopic evacuation in patients with supratentorial intracerebral haematoma.

Four small randomized trials of medical therapy for ICH have been conducted: two for steroid versus placebo treatment, and one each for hemodilution versus best medical therapy, and glycerol versus placebo. None of these studies showed any significant benefit for the three therapies; patients who were treated with steroids were more likely to develop infectious complications than those treated with placebo.

Stroke Unit Care: In a prospective randomized study comparing mortality rates among intracranial hemorrhage patients managed on an acute stroke unit versus medical ward, Ronning et al (2001) found that stroke unit care was associated with reduced mortality at 30 days (39% vs 63%, P=0.007) and one year (52% vs 69%, P=0.013).

5

Stroke Rehabilitation and Community Reintegration

5.1 | INITIAL STROKE REHABILITATION ASSESSMENT

BEST PRACTICE RECOMMENDATION 5.1: INITIAL STROKE REHABILITATION ASSESSMENT

5.1a. All people admitted to hospital with acute stroke should have an initial assessment by rehabilitation professionals as soon as possible after admission (RCP Level A); preferably within the first 24–48 hours. (NZ; Evidence Level C)

5.1b. All people with acute stroke not admitted to hospital should undergo a comprehensive outpatient assessment(s) which includes a medical evaluation and functional assessments (RCP; Evidence Level A), preferably within two weeks. (BPS-WG; Evidence Level C/D)

5.1c. Clinicians should use standardized, valid assessments to evaluate the patient's stroke-related impairments and functional status, and encourage patient's participation in community and social activities. (AHA-ASA; Evidence Level III)

RATIONALE

Most people with a stroke severe enough to require admission to hospital will have physical, cognitive or communication difficulties that requires assessment and management. Specialized nursing care will promote early recognition of complications and management of skin, bowel and bladder problems, Physical therapy roles include mobilization of the patient, management of any lung problems caused by immobility and minimize biomechanical limitations, and promotion of recovery of normal movement. Occupational therapy will attempt to promote return to independence in usual roles, assess safety for discharge home and provide appropriate equipment. Speech language pathology will address problems with swallowing and communication. Medical Specialists in physical medicine and rehabilitation will address complications such as pain, spasticity (increased resistance in the muscles and bowel and bladder incontinence). Early consultation with rehabilitation professionals can contribute to a reduction in the risk of complications from stroke related immobility such as joint contracture, falls, aspiration pneumonia and deep vein thrombosis. There is evidence that this interdisciplinary approach is one of the factors that result in reduced deaths in specialized stroke units. Another benefit of early consultation with rehabilitation professionals is early planning for transition or discharge from acute care to specialized rehabilitation units or to the community.

SYSTEM IMPLICATIONS

- Initial assessment performed by clinicians experienced in stroke and stroke rehabilitation.
- Long term rehabilitation services widely available in nursing and continuing care facilities, and in outpatient and community programs.
- Timely access to appropriate type and intensity of rehabilitation for stroke survivors.
- Definition, dissemination, and implementation of best practices for stroke rehabilitation across the continuum of care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. **Proportion of acute stroke patients discharged from acute care to inpatient rehabilitation.**[c]

ii. **Median time from hospital admission for stroke to initial assessment for rehabilitation during inpatient stay.**[c]

iii. Percentage of stroke patients discharged to the community who receive a referral for outpatient rehabilitation prior to discharge from acute and/or inpatient rehabilitation hospital (referrals may include either facility-based or community-based programs).

iv. Median length of time between referral for outpatient rehabilitation to admission to a community rehabilitation program.

v. Length of time between referral for outpatient rehabilitation to commencement of therapy.

vi. Percentage increase in Telehealth/telestroke coverage to remote communities to support organized stroke care across the continuum and provide rehabilitation assessments for stroke patients.

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Measurement Notes:

a. Referral information may be found through primary audit of inpatient charts (nurses notes, discharge summary notes, copies of referral forms) or though databases maintained by organizations that receive and process referrals. These community databases will vary in the amount of information included, and there may be challenges in accessing information contained in these databases.

b. Most home care service provider organizations monitor when the first service started but cannot determine easily the onset of rehabilitation therapy.

c. For measure #v, this should be stratified by stroke patients discharged directly to the community, and those who spend time in inpatient rehabilitation and then are discharged to the community.

SUMMARY OF THE EVIDENCE

One RCT published in 2001 addressed both acute and rehabilitative care. It sought to quantify the differences between staff interventions in a stroke unit versus staff interventions on a general ward supported by a stroke specialist team. Observations were made daily for the first week of acute care but only weekly during the post-acute phase. During the observation period, the stroke unit patients were monitored more frequently and received better supportive care, including early initiation of feeding. (Evans et al, 2001; Langhorne et al, 2001)

5.2 | PROVISION OF INPATIENT STROKE REHABILITATION

BEST PRACTICE RECOMMENDATION 5.2: PROVISION OF INPATIENT STROKE REHABILITATION

- All patients with stroke who are admitted to hospital and who require rehabilitation should be treated in a comprehensive or rehabilitation stroke unit by an interdisciplinary team. (Australian Rehabilitation; Evidence Level A/I)
- Post-acute stroke care should be delivered in a setting in which rehabilitation care is formally coordinated and organized. (AHA-ASA; Evidence Level 1)
- All patients should be referred to a specialist rehabilitation team on a geographically defined unit as soon as possible after admission. (RCP; Evidence Level A)
- Post-acute stroke care should be delivered by a variety of treatment disciplines, experienced in providing post stroke care, to ensure consistency and reduce the risk of complications. (RCP; Evidence Level C)
- The interdisciplinary team may consist of a physician, nurse, physical therapist, occupational therapist, speech and language pathologist, psychologist, recreation therapist, patient and family/caregivers. (ASA-AHA; Evidence Level 1). This "core" interdisciplinary team should consist of appropriate levels of these disciplines, as identified by the Stroke Unit Trialists' Collaboration. (SIGN 64; Evidence Level B)
- The interdisciplinary team should assess patients within 24–48 hours of admission, and develop a comprehensive rehabilitation plan to reflect the severity of the stroke and the needs and goals of the stroke survivor. (HSFO, NZ; Evidence Level C)
- Stroke unit teams should conduct at least one formal interdisciplinary meeting per week to discuss the progress and problems, rehabilitation goals, and discharge arrangements for patients on the unit. (SIGN 64; Evidence Level B)
- Standardized assessment tools should be used to assess the functional status of stroke patients. (AHA-ASA; Evidence Level II)
- Where admission to a stroke rehabilitation unit is not possible, longer-term inpatient rehabilitation should be provided on a mixed rehabilitation unit (i.e. where interdisciplinary care is provided to patients disabled by a range of disorders including stroke). (SIGN 64; Evidence Level B)

RATIONALE

Better clinical outcomes are achieved when post-acute stroke patients who are candidates for rehabilitation receive coordinated, interdisciplinary evaluation and intervention on a stroke rehabilitation unit. (Langhorne P and Duncan P, 2005). Stroke patients should be admitted early to stroke rehabilitation units as this results in improved functional outcomes (EBRSR 2006, Level 2).

Stroke is multi-faceted and requires a wide range of rehabilitation health professionals who can address the patients' impairments and disabilities post-stroke. Persons with moderate or severe stroke require rehabilitation to reduce the impairments and activity restriction caused by the stroke. The benefits of this approach are substantial and compared to a general hospital ward, coordinated and organized rehabilitation care in a stroke unit has been shown to reduce hospitalization length of stay, and to increase stroke survivor's walking mobility, functional status and quality of life. It is important that rehabilitation beds and resources are protected, in order to provide sufficient intensity of treatment during the inpatient rehabilitation phase. There is evidence that this interdisciplinary approach is one of the factors that result in reduced deaths and disability/ morbidity in specialized stroke units. For every 100 patients receiving organized inpatient interdisciplinary rehabilitation, an extra five returned home in an independent state.

Ambulatory (outpatient) and in-home rehabilitation services need to be coordinated between acute and rehabilitation services.

SYSTEM IMPLICATIONS

- Organized stroke care available including stroke units with critical mass of trained staff, interdisciplinary team during the rehabilitation period following stroke.
- Initial assessment performed by clinicians experienced in stroke and stroke rehabilitation.
- Timely access to specialized, interdisciplinary stroke rehabilitation services.
- Timely access to appropriate type and intensity of rehabilitation for stroke survivors.
- Optimization of strategies to prevent the recurrence of stroke.
- Definition, dissemination, and implementation of best practices for stroke rehabilitation across the continuum of care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Number of stroke patients treated on a combined or rehabilitation-focused stroke unit at any time during their inpatient rehabilitation phase following an acute stroke event.[c]

ii. Final discharge disposition for stroke survivors following inpatient rehabilitation: percentage discharged to their original place of residence; percentage discharged to a long term care facility or nursing home; percentage of patients requiring readmission to an acute care hospital for stroke related causes.[c]

iii. Number of stroke patients assessed by: physiotherapy; occupational therapy; speech language pathologist; and social workers during inpatient rehabilitation.

iv. Proportion of total time during inpatient rehabilitation following an acute stroke event that is spent on a rehabilitation stroke unit.

v. Frequency and duration/intensity of therapies received from rehabilitation professionals while in an inpatient rehabilitation setting following stroke.

vi. Percentage change in functional status using a standardized measurement tool, from time of admission to an inpatient rehabilitation unit for stroke patients, to the time of discharge.

Measurement Notes:

a. Some acute care hospitals provide combined acute and rehabilitation stroke units, where patients progress to 'rehabilitation status' and may not actually move or change locations. This information could be found in patient records through primary chart audit.

b. For (i), the denominator should be the total number of stroke patients admitted to inpatient rehabilitation.

c. For duration/intensity of services by rehabilitation professionals, this would require a chart review or consistent use of reliable workload measurement tools that are implemented locally/regionally.

d. Data for (ii) should be correlated with stroke severity scores during analysis.

SUMMARY OF THE EVIDENCE

Langhorne and Duncan (2001) conducted a systematic review of a subset of the studies identified by the Stroke Unit Trialists' Collaboration, those dealing with post–acute rehabilitation stroke services. They defined intervention as "organized inpatient multidisciplinary rehabilitation commencing at least one week after stroke" and sought randomized trials that compared this model of care with an alternative. In a heterogeneous group of 9 trials (6 involving stroke rehabilitation units and 3 involving general rehabilitation wards) that recruited 1437 patients, organized inpatient multidisciplinary rehabilitation was associated with a reduced odds of death

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(OR_0.66; 95% CI, 0.49 to 0.88; P_0.01), death or institutionalization (OR_0.70; 95% CI, 0.56 to 0.88; P_0.001), and death or dependency (OR_0.65; 95% CI, 0.50 to 0.85; P_0.001), which was consistent across a variety of trial subgroups. This review of post–acute stroke care concluded there can be substantial benefit from organized inpatient interdisciplinary rehabilitation in the post-acute period, which is both statistically significant and clinically important.

The Stroke Unit Trialists' Collaboration (Cochrane Systematic Review) determined that comprehensive units, rehabilitation stroke units and mixed assessment/rehabilitation units all tended to be more effective than care in a general medical ward. Apparent benefits were seen in units with acute admission policies as well as those with delayed admission policies and in units that could offer a period of rehabilitation lasting several weeks. (Langhorne and Duncan 2001) Both the Cochrane review and a subsequent meta-analysis (Langhorne et al 2005) showed that care provided on a dedicated ward is superior to care provided by a mobile stroke team.

A systematic review by the Ottawa Panel (2006) showed that stroke unit rehabilitation reduced length of stay and significantly improved functional status (including an increase in the proportion of patients able to walk long distances independently at the end of six weeks of treatment) and enhanced quality of life. This review also showed that stroke unit rehabilitation was superior to home care.

Based on the results from meta-analyses, there is strong (Level 1a) evidence that combined acute and rehabilitation stroke units are associated with a reduction in the odds of combined death/dependency (OR 0.56), length of stay in hospital and the need for long-term institutionalization (OR 0.55), but not with reductions in mortality alone (Teasell 2006).

Stroke rehabilitation units, which admit patients from a different ward or facility following acute stroke, help to improve functional outcomes compared to standard care. Based on the results from meta-analyses, there is strong (Level 1a) evidence that specialized, interdisciplinary rehabilitation provided in the sub-acute phase of stroke is associated with reductions in mortality (OR 0.60 with 95% CI) and the combined outcome of death or dependency (OR 0.63 with 95% CI) (Teasell 2006). Patients treated on a stroke rehabilitation unit are more likely to be discharged home and less likely to require institutionalization. Kalra and Eade (1995) reported that a larger percentage of patients who were treated in a stroke rehabilitation unit were discharged home (47% vs. 19% on a general medical ward, $p<0.01$). Kalra et al (1993) reported that patients with moderate stroke receiving stroke unit care were less likely to require long-term care (22% vs. 44%).

There is strong (Level 1a) evidence that sub-groups of patients will benefit from sub-acute rehabilitation in different ways. Patients with more severe strokes have reduced mortality and those with moderate strokes experience improved functional outcomes. (Teasell 2006)

Based on the results from meta-analyses, there is strong (Level 1a) evidence that mobile stroke teams do not reduce mortality (OR 1.13 (0.83,1.55) with 95% CI), the combined outcome of death or dependency (OR 0.97 (.72, 1.32) with 95% CI), the need for institutionalization (OR 1.23 (0.70, 2.17) with 95% CI), or the length of hospital stay (OR 7.0 (-1.73, 15.73) with 95% CI). (Teasell, 2006)

5.3 | COMPONENTS OF INPATIENT STROKE REHABILITATION

BEST PRACTICE RECOMMENDATION 5.3: COMPONENTS OF INPATIENT STROKE REHABILITATION

- All patients with stroke should begin rehabilitation therapy as early as possible once medical stability is reached. (AHS/ASA; Evidence Level I)
- Patients should undergo as much therapy appropriate to their needs as they are willing and able to tolerate. (RCP; Evidence Level A)
- The team should promote the practice of skills gained in therapy into the patient's daily routine in a consistent manner. (RCP; Evidence Level A)
- Therapy should include repetitive and intense use of novel tasks that challenge the patient to acquire necessary motor skills to use the involved limb during functional tasks and activities. (SCORE; Evidence Level A)
- Stroke unit teams should conduct at least one formal interdisciplinary meeting per week at which patient problems are identified, rehabilitation goals set, progress monitored, and support after discharge planned. (SIGN 64; Evidence Level B)

RATIONALE

To obtain the benefits of inpatient stroke rehabilitation units, a number of important components must be present. Both animal and human research suggests that the earlier rehabilitation starts the better the outcome. In fact, people who start rehabilitation later may never recover as much as those who start early. Early and enhanced intensive rehabilitation care for both acute or subacute stroke survivors improves arm and leg motor recovery, walking mobility, and functional status, including independence in self-care and participation in leisure activities. It is important that the rehabilitation be tailored to the tasks that need to be retrained; it is not adequate to focus on muscle strengthening alone.

Another vital component is that all the professionals involved work together as a coordinated specialized team, meeting regularly to discuss the rehabilitation goals and progress. This ensures the whole team takes advantage of the opportunity to work on goals throughout the day, and makes it easier to identify potential barriers to discharge.

SYSTEM IMPLICATIONS

- Organized stroke care available including stroke units with critical mass of trained staff, interdisciplinary team during the rehabilitation period following stroke.
- Initial assessment performed by clinicians experienced in stroke and stroke rehabilitation.
- Timely access to specialized, interdisciplinary stroke rehabilitation services.
- Timely access to appropriate type and intensity of rehabilitation for stroke survivors.
- Optimization of strategies to prevent the recurrence of stroke.
- Stroke rehabilitation support provided to caregivers.
- Long term rehabilitation services widely available in nursing and continuing care facilities, and in outpatient and community programs.
- Definition, dissemination, and implementation of best practices for stroke rehabilitation across the continuum of care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. **Length of time from stroke admission in an acute care hospital to assessment of rehabilitation potential by a rehabilitation healthcare professional.**

ii. **Length of time between stroke onset and admission to stroke inpatient rehabilitation.**

iii. **Number/percentage of patients admitted to a coordinated stroke unit–either a combined acute care and rehabilitation unit, or a rehabilitation stroke unit in an inpatient rehabilitation facility at any time during their hospital stay (acute and/or rehabilitation).[c]**

iv. **Final discharge disposition for stroke survivors following inpatient rehabilitation: percentage discharged to their original place of residence; percentage discharged to a long term care facility or nursing home; percentage of patients requiring readmission to an acute care hospital for stroke related causes.[c]**

v. Median length of time spent on a stroke unit during inpatient rehabilitation.

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vi. Median number of days in spent as 'alternate level of care' in an acute care setting prior to arrival in inpatient rehabilitation setting.

vii. Change (improvement) in functional status scores using a standardized assessment tool from admission to an inpatient rehabilitation program to discharge.

viii. Total length of time (days) spent in inpatient rehabilitation, by stroke type.

ix. Number of patients screened for cognitive impairment using valid screening tool during inpatient rehabilitation.

x. Time from stroke onset to mobilization: a) sitting; b) standing upright; c) walking with/without assistance.

Measurement Notes:

a. Some acute care hospitals provide combined acute and rehabilitation stroke units, where patients progress to 'rehabilitation status' and may not actually move or change locations. This information could be found in patient records through primary chart audit.

b. Many performance measures require primary chart audit of inpatient rehabilitation records. Documentation quality by rehabilitation staff may create data availability and data quality concerns.

c. The Canadian Institute for Health Information has a database known as the National Rehabilitation System (NRS). The NRS includes data on all inpatient rehabilitation encounters to designated rehabilitation beds. It is mandated in some provinces to submit data to the NRS; others are optional. Currently seven provinces contribute to the NRS and two more are expected to join by 2008. The NRS has information on approximately 75% of all inpatient rehabilitation encounters in Canada, and can distinguish stroke cases by diagnosis from other rehabilitation patients.

d. Duration/intensity of services by rehabilitation professionals requires a chart review or consistent use of reliable workload measurement tools that are implemented locally/regionally.

SUMMARY OF THE EVIDENCE

Early onset of Rehabilitation: In their review, Cifu and Stewart (1999) report that there were four studies of moderate quality that demonstrated a positive correlation between early onset of rehabilitation interventions following stroke and improved functional outcomes. They note that: "Overall, the available literature demonstrates that early onset of rehabilitation interventions—within 3 to 30 days post stroke—is strongly associated with improved functional outcome".

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Ottenbacher and Jannell (1993) conducted a meta-analysis including 36 studies with 3,717 stroke survivors, and demonstrated a positive correlation between early intervention of rehabilitation and improved functional outcome. (Reference SREBR).

According to the Ottawa Panel CPGs, which include a recent systematic review (2006):

- Early care for patients with acute stroke versus standard customary care in stroke unit, Level I (RCT), (one RCT, n=30) (Hayes 1986) a clinically important benefit with statistical significance (Grade A) was shown for length of stay (days).

- Six days/week of rehabilitation for patients with post-acute stroke versus seven days/week treatment, Level I (RCT), one RCT (n=113) (Ruff 1999) showed clinically important benefits without statistical significance for mobility (ambulation section of Functional Recovery Scale) at end of treatment, 3 weeks (19% RD).

- Enhanced upper-limb treatment for patients with sub-acute stroke versus interdisciplinary treatment, Level I (RCT), (one RCT, n=626) (Rodgers 2003) showed a clinically important benefit with statistical significance (Grade A) for motor function (Frenchay Arm test) and functional status (Barthel index) at follow-up, 18 weeks.

- Enhanced occupational therapy for patients with sub-acute stroke versus standard customary occupational therapy, Level I (RCT), (five RCTs, n=492) (Gibson 1997, Gilbertson 2000, Drummond 1996b, 1995, Logan 1997), clinically important benefits with statistical significance (Grade A) were demonstrated for functional status (# of patients improved in ADL) at end of treatment, 8 weeks and 6 months (23-18% RD), life habit/leisure (overall leisure score) at end of treatment, 3 and 6 months (15–24%), life habit/leisure (total leisure activity score) at end of treatment, 6 months (23%), mobility (Nottingham EADL score for mobility) at end of treatment, 3 and 6 months (56%–58%) and functional status (Nottingham EADL score) at end of treatment, 8 weeks, 3 months and 6 months (16%, 91% and 28% respectively). Clinically important benefits without statistical significance (Grade C+) were demonstrated for quality of life (# of patients living independently) at end of treatment, 3 weeks (28%), functional status (FIM for UE and LE dressing) (41 and 50% respectively) at end of treatment, 3 weeks (28%) and functional status (EADL total score) at follow-up 3 months (28%).

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- Enhanced occupational therapy for patients with sub-acute stroke versus no therapy, Level I (RCT), (five RCTs, n=481) (Jongbloed 1991, Drummond 1996b, 1995, Gilbertson 2000, Corr 1995) clinically important benefits with statistical significance (Grade A) were demonstrated for mobility (NHP for mobility and EADL for mobility) at end of treatment, 3 months and 6 months (49–62% and 39–40% RD respectively), life habit/leisure (Overall Leisure score and Total Leisure activity) at end of treatment, 3 and 6 months (24–30% and 20–30% respectively), functional status (number of patients improved in ADL) at follow-up, 6 months (19%). Clinically important benefits were demonstrated without statistical significance (Grade C+) for activity involvement (Katz adjustment index: # of patients satisfied with their walking) at follow-up, 13 weeks (20%), for activity involvement (# of patients satisfied with their work in the yard) at end of treatment, 5 weeks (15%) and functional status (EADL) at follow-up, 1 year (40%).

- Enhanced physiotherapy for patients with sub-acute stroke versus standard customary physiotherapy, Level I (RCT), (two RCTs, n=564) (Parry 1999, Lincoln 1999), clinically important benefits with statistical significance (Grade A) were demonstrated for motor function (Action Research Arm test) at follow-up, 21 weeks (18% RD). A clinically important benefit was demonstrated without statistical significance (Grade C+) for functional status (Barthel index) at follow-up, 3 and 16 weeks (15%).

5.4 | IDENTIFICATION AND MANAGEMENT OF POST-STROKE DEPRESSION

Note: Post stroke depression is considered an issue that should be assessed for and managed across the continuum of stroke care. It has been included in the rehabilitation section, as that is the area where most of the evidence emerges.

BEST PRACTICE RECOMMENDATION 5.4:
IDENTIFICATION AND MANAGEMENT OF POST-STROKE DEPRESSION

All patients with stroke should be considered to be at a high level of risk for depression. The clinical team should assess the patient's prior history of depression and previous risk factors of depression as part of the initial screening. All patients with stroke should be screened for depression initially and at three-month intervals or key stages of the rehabilitation process and after rehabilitation services has been discontinued. (BPS-WG; Evidence Level A)

- Patients diagnosed with a depressive disorder should be given a trial of antidepressant medication, if no contraindication exists. The Working Group makes no recommendation for the use of one class of antidepressants over another; however, side effect profiles suggest that Serotonin-Specific Reuptake Inhibitors (SSRIs) may be favored in this patient population. (AHA-ASA; Evidence Level I)

- In patients with severe, persistent, or troublesome tearfulness, SSRIs are recommended as the antidepressant of choice. (AHA-ASA; Evidence Level I)

- Routine use of prophylactic antidepressants is not recommended in post stroke patients. (AHA-ASA; Evidence Level 1)

- Patients should be given information, advice and the opportunity to talk about the impact of illness upon their lives. (RCP; Evidence Level B)

- Patients with marked anxiety should be offered psychological therapy, given by an appropriately trained and supervised practitioner. (RCP; Evidence Level B)

- Patients and their carers should have their individual psychosocial and support needs reviewed on a regular basis as part of the longer-term management of stroke. (RCP; Evidence Level A)

RATIONALE

Post-stroke depression may affect a patient's ability to participate in therapy, and is associated with slower progress in rehabilitation and increased length of stay. Clinicians need to be watchful and recognize depression before it interferes too much with therapy and the patient's well being. Due to its adverse effects on rehabilitation, it is important to address the symptoms early on in the rehabilitation process. (Duncan 2005) Standardized screening assessments for depression can indicate that depression exists, and can be used to monitor progress. However, there is no single universally accepted tool for the assessment of post-stroke depression. An alternative to verbal scales to assess mood should be sought when assessing someone who is aphasic. (Duncan 2005) The stroke survivor is at greatest risk for the few months after a stroke, especially in the first six months after the stroke. Anxiety should be assessed and treated, especially when found in conjunction with depressive symptoms. Aphasic patients (individuals who have communication problems) provide a unique challenge for assessment and treatment.

SYSTEM IMPLICATIONS

- Education for primary care and healthcare providers throughout the continuum of stroke on assessment and recognition of post-stroke depression.
- Timely access to appropriate specialized therapies to manage post-stroke depression (medication and counseling as required).
- Mechanisms in place to support caregivers of stroke survivors.
- Optimization of strategies to prevent the recurrence of stroke.
- Definition, dissemination, and implementation of best practices for stroke rehabilitation across the continuum of care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of stroke patients with documentation to indicate assessment/screening for depression was performed either informally or using a formal assessment tool in the acute care or rehabilitation setting following an acute stroke event.

ii. Proportion of stroke patients referred for additional assessment/intervention for a suspected diagnosis of depression following an acute stroke event.

Measurement Notes:

a. This recommendation and corresponding indicators apply across the continuum of care and should be considered in the acute, early rehabilitation and longer term recovery phases.

b. When monitoring this indicator it is important to communicate the measurement time frame and rel evant stage of the stroke continuum.

c. Data for measurement may be found through primary chart audit. Data quality will be dependent on the quality of documentation by healthcare professionals.

d. For patients referred to psychiatry, information may be available through provincial physician billing databases.

e. For persons over 65 years, information on medication prescriptions may be available through provincial senior drug benefit plan databases.

SUMMARY OF THE EVIDENCE

Risk factors associated with increased risk for post-stroke depression include gender (being female), past history of depression or psychiatric illness, social isolation, functional impairment and cognitive impairment. (Paolucci et al, 1999)

Post-stroke depression has a negative impact on functional recovery, and social activity. A reduction is social activity can also adversely affect mood. It is crucial to monitor the person's level of social activity and/or withdrawal from social events.

It is extremely common for post-stroke patients to experience periods of emotionalism. About 15% of patients experience uncontrollable laughing/crying, and if not treated this can develop into clinical depression. When this lability interferes with the patient's rehabilitation or complicates the patient's relationship with family members, pharmacotherapy has been found to be beneficial. (Duncan et al, 2005)

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There is no evidence that the provision of information alone helps resolve clinical depression in stroke patients. (Teasell et al, 2006) A systematic evidence-based review of counseling and psychological therapies has looked at the level of expertise that is required for working with patients with depression. This concluded that: generic counseling should only be offered to those with minor degrees of psychological distress, and that patients with complex psychological problems should be treated by staff with therapeutic expertise. (SIGN 64, 2005)

Literature suggests that post stroke depression is treatable with a variety of medications, with selective serotonin-reuptake inhibitors (SSRIs) and tricyclic antidepressants being the most frequently studied. (Teasell et al, 2006) When compared to placebo, heterocyclic antidepressant medications demonstrated a significant treatment effect. (Lipsey et al 1984, Robinson et al 2000) Robinson et al (2000) compared a heterocyclic antidepressant with a serotonin reuptake inhibitor and found nortriptyline (a heterocyclic drug) to be more effective than the serotonin reuptake inhibitor fluoxetine. Robinson et al (2000) observed nortriptyline improved the Hamilton Depression Scale scores significantly more so than fluoxetine and/or placebo. In addition, the response rate of nortriptyline was significantly greater than both fluoxetine and placebo. While the Lispey at al (1984) study results were promising, they noted confusion, drowsiness and agitation were significant side effects that may pose risks to elderly patients. Likewise, while the heterocyclic combination of imipramine and mianserin significantly improved melancholia scale scores, Lauritzen et al (1984) noted that a significant number of patients with myocardial infarctions were excluded. Furthermore, those with cardiac arrhythmias, heart block, urinary outlet obstructions and narrow-angle glaucoma are advised against the use of heterocyclic antidepressants. This relatively high incidence of side effects associated with heterocyclic antidepressants, especially in elderly patients, must be taken into account when deciding on their use.

Selective serotonin-reuptake inhibitors selectively block serotonin-reuptake rather than blocking both serotonin and norepinephrine reuptake. There is conflicting (three positive, two negative) evidence regarding the effectiveness of selective serotonin reuptake inhibitors in treatment for post-stroke depression. (Hackett et al, 2004) Fruehwald et al (2003) found benefit with fluoxetine at 12 and 18 weeks after treatment initiation. Drug effect was found to be quicker than for the heterocyclic drugs, taking effect 3 weeks into the treatment. Furthermore, side effects were found to be mild and transient and significantly less severe than those associated with the heterocyclic drugs. SSRIs work faster and have fewer and less severe side effects that heterocyclic drugs. Efficacy of heterocyclic drugs in the treatment of post-stroke depression, have strong (Level 1a) evidence. However, side effects mean that they should be used with caution in the elderly population. (Teasell et al, 2006)

There is not a strong body of literature for the effect of physical activity on post-stroke depression, but there is extensive evidence to support positive effects of physical activity on depression in able-bodied adults. Increased levels of physical activity are associated with a reduced risk for stroke and cardiovascular disease and enhanced physical and psychosocial performance. (AHA 2004)

5.5 | SHOULDER PAIN ASSESSMENT AND TREATMENT

Note: shoulder pain assessment should be conducted throughout the continuum of care from acute inpatient care, inpatient rehabilitation, community rehabilitation and ongoing follow-up in the community.

BEST PRACTICE RECOMMENDATION 5.5: SHOULDER PAIN ASSESSMENT AND TREATMENT

22a. Factors that contribute to, or exacerbate, shoulder pain should be identified and managed appropriately.

- Educate staff and carers about correct handling of the hemiplegic arm. (RCP, SCORE; Evidence Level B)
- Consider use of supports for the arm. (RCP; Evidence Level A)

22b. Joint protection strategies should be instituted to minimize joint trauma.

- The shoulder should not be passively moved beyond 90 degrees of flexion and abduction unless the scapula is upwardly rotated and the humerus is laterally rotated. (SCORE; Evidence Level A)
- Overhead pulleys should not be used. (Ottawa Panel; Evidence Level A)
- The upper limb must be handled carefully during functional activities. (SCORE; Evidence Level B)
- Staff should position patients, whether lying or sitting, to minimize the risk of complications such as shoulder pain. (RCP; Evidence Level B)

22c. Shoulder pain and limitations in range of motion should be treated through gentle stretching and mobilization techniques focusing especially on external rotation and abduction, (SCORE; Evidence Level B).

RATIONALE

The incidence of shoulder pain following a stroke is high, with as many as 72% of stroke patients experiencing at least one episode of shoulder pain within the first year post-stroke. Shoulder pain can delay rehabilitation and recovery of function; the pain may mask improvement of movement and function or may inhibit patient participation in the rehabilitation activities, such as therapy, ADL, etc. (Duncan 2005)

Hemiplegic shoulder pain (HSP) may contribute to poor functional recovery of the arm and hand, depression, and sleeplessness. (SIGN 2005) Preventing shoulder pain may impact quality of life. In a study of 86 patients in 1994, Brause et al found that early awareness of potential injuries to the shoulder joint reduced the frequency of shoulder-hand syndrome from 27% to 8%.

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A number of well-conducted RCTs and high quality systematic reviews have failed to provide unequivocal evidence of an effective intervention. Shoulder pain after stroke is strongly associated with prolonged hospital stay and poor recovery of arm function. Incorrect handling is a contributing factor in development and/or exacerbation of shoulder pain. Careful handling of the affected upper limb along with supportive positioning strategies should be practiced at all times. The stroke team, as appropriate, should provide education to staff, patients and carers; training should include strategies such as care for the shoulder during manual handling and transfers, and advice regarding position. (SIGN 64, 2005)

Avoiding the use of overhead pulleys, which encourage uncontrolled abduction is recommended. Kumar et al in an RCT found that overhead pulleys caused dramatically higher levels of shoulder pain than more restrained ROM exercises.

SYSTEM IMPLICATIONS

- Organized stroke care available including stroke units with critical mass of trained staff, interdisciplinary team during the rehabilitation period following stroke.
- Initial assessment performed by clinicians experienced in stroke and stroke rehabilitation.
- Timely access to specialized, interdisciplinary stroke rehabilitation services.
- Timely access to appropriate type and intensity of rehabilitation for stroke survivors.
- Optimization of strategies to prevent the recurrence of stroke.
- Stroke rehabilitation support provided to caregivers
- Long term rehabilitation services widely available in nursing and continuing care facilities, and in outpatient and community programs.
- Definition, dissemination, and implementation of best practices for stroke rehabilitation across the continuum of care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Proportion of stroke patients who experience shoulder pain in acute care hospital, inpatient rehabilitation and following discharge into the community.

ii. Length of stay during acute care hospitalization and inpatient rehabilitation for patients experiencing shoulder pain (as compared to patients not experiencing shoulder pain).

iii. Proportion of stroke patients who report shoulder pain at 3 months and 6 month follow-up.

iv. Pain intensity rating change from baseline to defined measurement periods.

v. Motor score change from baseline at defined measurement periods.

vi. Range of shoulder external rotation before and after treatment for shoulder pain.

vii. Proportion of patients with contractures related to shoulder pain.

Measurement Notes:

a. Standardized rating scales should be used for assessment of pain levels and motor scores.

b. Some data will require survey or chart audit. Documentation by healthcare professionals related to shoulder pain will impact the quality and ability to report some of these performance measures.

c. Audit tools at a local level may be helpful in collecting shoulder pain data on those patients who experience this.

SUMMARY OF THE EVIDENCE

Careful handling of the affected upper limb in conjunction with consistent supportive positioning strategies should be practiced at all times. Education of staff, patients and carers should be provided (SIGN 64, 2005). Brause et al (1994) reported the incidence of shoulder-hand syndrome was 27% in their sample of 132 stroke survivors. In the second part of that study, on another 86 patients, early awareness of potential injuries to the shoulder joint structures reduced the frequency of shoulder-hand syndrome from 27% to 8%. In sub-acute patients, one RCT (n=28) demonstrated that shoulder positioning compared to treatment also showed trend (clinically important benefit, without statistical significance (Grade C+) towards improvement in active ROM shoulder abduction. (Ottawa Panel 2006).

"Careful positioning of the shoulder serves to minimize subluxation and later contractures as well as possibly promote recovery, while poor positioning may adversely affect symmetry, balance and body image." (Teasell, 2006) Gilmore et al (2004) and Davies (2000) suggest that through careful and correct positioning, the development of shoulder pain can be prevented. Bender and McKenna (2001) noted that the "recommended position for the upper limb is towards abduction, external rotation and flexion of the shoulder," but also note that the "most popular theories failed to yield consensus for exact degrees of the positioning." (Teasell, 2006)

One RCT (Kumar et al 1990) compared the use of an overhead pulley versus using a skateboard, versus control. The control group received passive range of motion exercises, with 28 patients. No benefit for overhead pulleys was found, but results favoured the control for pain relief (# of patients without pain) at the end of 8–10 weeks of treatment. Pain was the only outcome measured. The Ottawa Panel does not recommend the use of overhead pulleys, especially if the shoulder is subluxed, as the pulleys do not give adequate stabilization of the shoulder girdle during the movement. Passive range of motion exercises by a qualified rehabilitation practitioner is the favoured treatment to maintain passive shoulder mobility. The quality of the shoulder movement can be controlled by an experienced therapist more so than with the overhead pulleys and skateboard.

There is moderate (Level 1b) evidence that gentle exercises to improve range of motion are the preferred approach to treatment of the hemiplegic shoulder. (Teasell, 2006) The Ottawa Panel (2006) recommends that passive range of motion exercises performed on the shoulder of the stroke patient by a qualified rehabilitation practitioner are favoured over overhead pulley and skateboard exercises. This will serve as a means of preventing frozen shoulder and shoulder-hand-pain syndrome. The quality of the shoulder motion can be better controlled by an experienced therapist and thus can be beneficial in avoiding undesired movements that could further potentiate pain and damage the hemiplegic shoulder.

5.6 | COMMUNITY-BASED REHABILITATION

BEST PRACTICE RECOMMENDATION 5.6: COMMUNITY-BASED REHABILITATION

Stroke survivors should continue to have access to specialized stroke care and rehabilitation after leaving hospital (acute and/or inpatient rehabilitation). (RCP; Evidence Level A)

- Early supported discharge services provided by a well resourced, coordinated specialist interdisciplinary team are an acceptable alternative to more prolonged hospital stroke unit care and can reduce the length of hospital stay for selected patients. (SIGN 64; Evidence Level A) In addition, early supported discharge services to generic (non-specific) community services should not be undertaken. (RCP; Evi dence Level A) See rationale below for explanation of early supported discharge.

- People who have difficulty in activities of daily living (ADL) should receive Occupational Therapy or multi-disciplinary interventions targeting ADL. (Australian; Evidence Level 1)

- Multifactorial interventions provided in the community including an individually prescribed exercise program, may be provided for people who are at risk of falling, in order to prevent or reduce the number and severity of falls. (Australian; Evidence Level 1)

RATIONALE

Community based rehabilitation may be defined as care received in the community once the patient has past the acute stage and has transitioned back to their home and community environment. Options for specialized stroke care and rehabilitation may include outpatient services, day hospital programs, home-based rehabilitation services or other alternative services. While there are several options for ongoing rehabilitation environments, location should be based on clients' "medical status, function, social support, and access to care (Duncan, 2005, e137)".

Community based stroke rehabilitation may be characterized by:

- A case coordination approach,

- An inter-disciplinary team of specialists in stroke care and rehabilitation,

- Services that are delivered in the most suited environment based on client issues and strengths,

- Emphasis on client and family centered practice,

- Focus on clients' re-engagement in and attainment of their desired life activities and roles,

- Enhancing clients' quality of life after stroke, and,

- Provision of intensive rehabilitation services where indicated to promote/ assist in the achievement of client goals.

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Early supported discharge (ESD) links inpatient care with community services. It enables stroke survivors to go home earlier than might otherwise be possible, with the support of rehabilitation (Occupational Therapy, Physiotherapy, Speech Language Pathology) and nursing services in the home, while reducing disability and need for long-term institutional care. ESD programs can reduce hospital lengths of stay for high-level (higher functioning) stroke patients by approximately one week. (Teasell et al, 2005) ESD services also reduce adverse events (e.g. readmission rates), and increase the likelihood of being independent and living at home. To work effectively, ESD services must have similar elements to those of organized stroke teams. ESD services should target stroke survivors with mild to moderate disability and should only be considered where there are adequate community services for rehabilitation and caregiver support. Stroke survivors have reported greater satisfaction following ESD than conventional care.

For patients with moderate to severe strokes, specialized stroke care and rehabilitation result in improved functional outcomes. Enhanced stroke rehabilitation for these patients reduces length of hospital stay and increases the likelihood of discharge home (Teasell et al, page 32, 2005). Community based stroke rehabilitation services can enhance mobility and fitness, reduce or prevent the number and severity of falls (Langhorne 2005), and enable clients to access relevant information about community programs and resources. In addition, occupational therapy can improve function in ADL and extended activities of daily living (Langhorne 2005). Such interventions may reduce the potential for hospital readmission as well as reducing health care and caregiver burden. Approximately 1 in 15 stroke patients are spared a poor outcome when receiving community based stroke rehabilitation services. (Outpatient Service Trialists, 2002)

SYSTEM IMPLICATIONS

- Organized and accessible stroke care available within communities.
- Initial assessment performed by clinicians experienced in stroke and stroke rehabilitation.
- Timely access to specialized, interdisciplinary stroke rehabilitation services in the community.
- Timely access to appropriate type and intensity of rehabilitation for stroke survivors in the community.
- Optimization of strategies to prevent the recurrence of stroke.
- Stroke rehabilitation support provided to caregivers.
- Long term rehabilitation services widely available in nursing and continuing care facilities, and in outpatient and community programs.
- Definition, dissemination, and implementation of best practices for stroke rehabilitation across the continuum of care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. Percentage of stroke patients discharged to the community who receive a referral for ongoing rehabilitation prior to discharge from hospital (acute and/or inpatient rehabilitation).

ii. Median length of time between referral for outpatient rehabilitation to admission to a community rehabilitation program.

iii. Frequency and duration of services by rehabilitation professionals in the community.

iv. Change in functional status scores, using a standardized measurement tool, for stroke survivors engaged in community rehabilitation programs.

v. Length of time between referral for ongoing rehabilitation to commencement of therapy.

vi. Percentage of persons with a diagnosis of stroke who receive outpatient therapy after an admission to hospital for a stroke event.

vii. Percentage increase in Telehealth/telestroke coverage to remote communities to support organized stroke care across the continuum and provide rehabilitation assessments and ongoing rehabilitation monitoring and management for stroke survivors in the community.

viii. Number of stroke patients assessed by: physiotherapy, occupational therapy, speech language pathologists, and social workers in the community.

Measurement Notes:

a. Many performance measures require targeted data collection through audits of rehabilitation records and community program records. Documentation quality by rehabilitation staff may create data availability and data quality concerns.

b. Information regarding frequency and duration of services by rehabilitation professionals would require a chart review or consistent use of reliable workload measurement tools that are implemented locally/regionally.

c. Data availability regarding community programs varies considerably across programs, regions and provinces. Efforts should be made to introduce standard audit tools for collection of this data.

SUMMARY OF THE EVIDENCE

"The efficacy of early supported discharge for acute stroke patients, evaluated by the Early Supported Discharge (ESD) Trialists, was first published in 2001 and was updated in 2004. The purpose of this review was to determine whether ESD, with appropriate community support, could be as effective as conventional inpatient rehabilitation. ESD interventions were designed to accelerate the transition from hospital to home. Six of the trials provided coordinated interdisciplinary team care that was provided in the patients' home. One trial (Ronning & Guldvog 1998) provided a wide range of services, which were not centrally coordinated. A variety of outcomes were assessed comparing early supported discharge with conventional care at the end of scheduled follow up, which ranged from 3–12 months. While ESD programs were associated with shorter periods of initial hospitalization, their impact on the well being of caregivers remains unknown. The authors concluded that the "relative risks and benefits of this type of intervention remain unclear" and await the results of ongoing trials. Costing data were available for only two of the trials, both of which reported cost savings associated with ESD programs. However, the authors suggested that further data is required before recommendations can be made regarding potential cost savings". (Teasell et al, page 7, 2005)

Langhorne et al (2005) reported additional patient-level analysis from their original Cochrane review, which examined the effects of patient characteristics and differing levels of service provision (more coordinated versus less organized) on the outcome of death and dependency. The results from an unpublished study were included in this analysis. The levels of service included: 1. ESD team with coordination and delivery: an interdisciplinary team, which coordinated discharge from hospital and post discharge, care and provided rehabilitation therapies in the home 2. ESD team coordination: discharge and immediate post discharge plans were coordinated by a interdisciplinary care team, but rehabilitation therapies were provided by community-based agencies, and 3. No ESD team coordination-therapies were provided by uncoordinated community services or by health-care volunteers. As hypothesized by the authors, the increasing coordination of services was associated with an improved outcome. (Teasell et al, 2005)

"In a review of factors affecting functional outcomes following stroke, Cifu and Stewart (1999) reported the results of three "moderate quality" RCT's examining the differences in functional outcomes between groups of patients who had received either home based therapy or day hospital treatment (Gladman and Lincoln 1994, Tangemen et al. 1990, Young and Foster 1992)." (Teasell et al, pages 16–17, 2005). Teasell et al, 2005 concluded "Overall, the available literature demonstrates that participation in outpatient, home health, and day rehabilitation programs is strongly associated with improved functional outcomes after stroke".

In a systematic review of randomized controlled trials of stroke patients, the effects of therapy-based rehabilitation services targeted towards patients residing in the community was analyzed. Researchers identified and analyzed 14 randomized controlled trials of stroke patients (including 1617 patients) residing in the community and receiving a therapy intervention and compared this to conventional or no care. Electronic databases were searched for the years 1967–November 2001 to ensure identification of all potentially relevant trials were included in the review. Therapy services were defined as those provided by physiotherapy, occupational therapy, or by interdisciplinary staff working with patients primarily to improve task-oriented behaviour and hence increase activity and participation. The results indicated that therapy-based rehabilitation services reduced the odds of a poor outcome (Peto odds ratio 0.72 (95% CI 0.57 to 0.92; P = 0.009) and increased personal activity of daily living scores (standardized mean difference 0.14 (95% CI 0.02 to 0.25; P = 0.02). For every 100 stroke patients resident in the community receiving therapy-based rehabilitation services, 7 (95% CI 2 to 11) patients would be spared a poor outcome, assuming 37.5% would have had a poor outcome with no treatment. The authors concluded that therapy-based rehabilitation services targeted towards stroke patients living at home appear to improve independence in personal activities of daily living. (Outpatient Service Trialists, 2002)

6

Follow-up and Community Reintegration After Stroke

6.1 | FOLLOW-UP AND COMMUNITY REINTEGRATION

BEST PRACTICE RECOMMENDATION 6.1: FOLLOW-UP AND EVALUATION IN THE COMMUNITY

6.1a. Stroke survivors and their caregivers should have their individual psychosocial and support needs reviewed on a regular basis. (RCP; Evidence Level A)

6.1b. Any stroke survivor with reduced activity at six months or later after stroke should be assessed for appropriate targeted rehabilitation. (RCP; Evidence Level A)

6.1c. People living in the community who have difficulty with ADL should have access, as appropriate, to therapy services to improve, or prevent deterioration in ADL. (Australian; Evidence Level I)

6.1d. Recommendation # 21 (Identification and Management of Post-Stroke Depression) should also be observed as part of follow-up and evaluation of stroke survivors in the community. (BPS-WG)

RATIONALE

The post-discharge period is consistently reported by stroke survivors and their families to be a difficult time. (Anderson, 1992; Australian Clinical Practice Guidelines; Stanton, 2000) Patients and their families often lose the social, emotional and practical support offered by an inpatient stroke service (RCP). In one study, only 10% of families were actively in contact with professional rehabilitation services after hospital discharge. (Anderson, 1992) In general, caregivers cope with physical limitations better than cognitive or emotional ones. When the psychosocial needs of patients and their caregivers are regularly addressed through social support, improved outcomes are observed, including reduced caregiver burden, reduced incidence of anxiety, reduced emotionalism and depression, reduced hospital readmissions and failed discharges, and facilitated reintegration of the patient in family and social roles. (Anderson, 1992; Duncan et al) The evidence shows that when support services are provided, patient and carer satisfaction improves. (Pound et al, 1995; RCP guidelines).

Ongoing rehabilitation (beyond six months post stroke) can further improve ADL and fitness. Stroke rehabilitation involves programs to reduce impairments, enhance recovery and adapt to persisting disabilities. There is now evidence to show that after stroke, patients continue to decline. The risk of deterioration in ability can be reduced or reversed by further rehabilitation input (RCP). Therapy-based rehabilitation services can: reduce poor outcomes (i.e., prevent hospital readmission); promote participation in desired activities; increase ADLs; and reduce external home care supports. For every 100 stroke patients living in the community and receiving therapy-based rehabilitation services, 7 patients are spared a poor outcome (Outpatient Service Trialists, 2002; Australian guidelines, RCP). "Rehabilitation after stroke must also address 'participation'. This may require planned withdrawal of medical and rehabilitation services and substituting them with leisure and social activity to encourage independence and reintegration to normal life" (RCP). The interdisciplinary team should encourage use of community resources such as peer and/or family support groups, social and recreational activities, transportation resources etc. "Community support can help buffer the effects of disability on the patient family, and caregivers. Living with disabilities after a stroke is a lifelong challenge. For many stroke patients and their families, the real work of recovery begins after formal rehabilitation." (Duncan et al, 2005)

SYSTEM IMPLICATIONS

- Provinces, territories and regions have planning in place to support community reintegration of stroke survivors.
- Assistance received by stroke survivors and their families with an evolving care plan and regular follow-up assessments.
- Health care professionals and caregivers in community and long term care settings have stroke care expertise and access to ongoing education.
- Ongoing support in the form of community programs, respite care and educational opportunities available to support caregivers in balancing personal needs with care giving responsibilities.
- Strategies to assist stroke survivors to maintain, enhance, and develop appropriate social support, and reengage in desired vocational, social and recreational activities.
- Definition, dissemination, and implementation of best practices for stroke rehabilitation across the continuum of care.
- Mechanisms for ongoing monitoring and evaluation, with a feedback loop for interpretation of findings and opportunities for quality improvement.

PERFORMANCE MEASURES

i. **Percentage of stroke patients with documentation that information was given to patient/family on: formal/informal educational programs, care after stroke, available services, process to access available services, and what services are covered by health insurance.**

ii. Proportion of patients who are discharged from acute care who receive a referral for home care/ community supportive services.[c]

iii. Number of patients referred to a secondary prevention team by the rehabilitation team.

iv. Percentage of readmissions to acute care for stroke related causes following discharge to the community (by stroke type).

v. Number of visits to primary care within specified time frames for stroke related issues.

vi. Number of visits to an emergency department within specified time frames.

vii. Percentage of patients who return home following stroke rehab who require community support services (e.g., homecare or respite).

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viii. **Length of time from hospital discharge (following acute care or inpatient rehabilitation) to initiation of community support services.**

ix. Frequency and duration of community support services, stratified by the type of service provided.

x. Number of readmissions from stroke rehabilitation to acute care for stroke related causes.

xi. Percentage of patients who return to the community from acute hospital stay or following an inpatient rehabilitation who require admission to long term care/nursing home within 6 months/one year.[c]

xii. Median wait time from referral to admission to nursing home or long term care facility.

xiii. Documentation to indicate assessment for fitness to drive and related patient counseling was performed.

xiv. Number of patients referred for driving assessment by occupational therapist in the community.

xv. Measure of burden of care for family and care givers of stroke survivors living in the community.

Measurement Notes:

a. Data for (i) may be attainable from inpatient chart documentation, or community support services documentation. For informal education, or education received by primary care this may be difficult to track unless specific audit tools are developed and implemented in local areas. Also, refer to some performance measures in Recommendation 3 on patient and family education.

b. Emergency department visits can be tracked through the CIHI database for participating institutions, or hospital records (if the patient returns to the ED of the hospital where in patient stay occurred).

c. CIHI holds an administrative dataset for complex continuing care and long term care which uses a minimal dataset which is mandated in several regions across Canada. This dataset uses the RAI tool for assessing functional status. At this time there are no validated comparison models between the Functional Impact Measure (FIM) and the Resident Assessment Instrument (RAI).

d. Hospital readmissions from inpatient rehabilitation to acute care can be obtained from hospital administrative data nationally and provincially.

e. Visits to primary care, and indicators related to information and education are difficult to measure. They could be obtained through surveys and standardized audit tools at the local/regional level.

SUMMARY OF THE EVIDENCE

Anderson (1992) examined the effect of stroke on 173 patients and their family carers. More than a third of people who support stroke patients at home regarded their own health as only fair or poor. Access to help from professional rehabilitation services was patchy and inconsistently available. "Care became a burden rather than a pleasure, social function and personal relationships deteriorated, and contact with the outside world slipped away." Low mood was a major influence of outcome and a main component of quality of life. To carers it contributed substantially to the burden of care. In order to alleviate the suffering of illness, Anderson states that the social, psychological, family and economic aspects of stroke must be directly addressed.

Pound and colleagues (1995), in exploring the components of care most valued by patients, undertook a qualitative study using in-depth interviews of stroke patients and their carers 10 months after the stroke. These researchers found that as the acute phase of stroke passes, patients and carers may increasingly desire support relating to rehabilitation, discharge, prognosis, etc. The researchers stated, "More information is needed about the stages of the stroke carer so that care may be tailored to respond sensitively and flexibly to the different stages."

Stanton (2000) examined the process of adaptation for both the person who had the stroke and for their partner. Using in-depth interviews and observations of stroke survivors and their partners 4–7 months post stroke, Stanton found that the majority of "adaptation" to stroke occurred upon returning home (post-discharge). Role strain, physical exhaustion, and the quality of the relationship between the stroke survivor and their partner had an ongoing influence on post-stroke adaptation. Stanton indicated, "An emphasis on physical recovery and the management of self-care tasks in rehabilitation appears to be insufficient to facilitate the achievement of clients' goals." She also noted that access to rehabilitation services in the clients' home and community ronment may help clients and partners remove barriers that limit resumption of past activities, break the "downward cycle that can lead to partner exhaustion and depression," and improve quality of life.

In a systematic review of randomized controlled trials of stroke patients, the effects of therapy-based rehabilitation services targeted towards patients residing in the community was analyzed. Reviewers sought to identify the proportion of patients who had deteriorated or were dependent in personal activities of daily living and performance in personal activities of daily living at the end of follow-up. The main results identified a heterogeneous group of 14 trials including 1617 patients. Therapy-based rehabilitation services reduced the odds of a poor outcome (Peto odds ratio 0.72 (95% CI 0.57 to 0.92; P = 0.009) and increased personal activity of daily living scores (standardized mean difference 0.14 (95% CI 0.02 to 0.25; P = 0.02). For every 100 stroke patients resident in the community receiving therapy-based rehabilitation services, 7 (95% CI 2 to 11) patients would be spared a poor outcome, assuming 37.5% would have had a poor outcome with no treatment. (Outpatient Service Trialists, 2002)

"Comprehensive understanding and involvement of the person, family/caregiver, and environmental system are required for stroke rehabilitation. Without adequate resources and support it is difficult for patients to sustain the gains made during inpatient care or to make further progress in the community. It is essential that the treatment team know the patient (including history, expectations, coping style, resources and emotional support system in order to fully engage him/her in the treatment process. Motivation and hope for improvement is a critical factor for functional improvement". (VA/DoD Clinical Practice Guidelines 2002, Duncan 2005)

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Guidelines for the Early Management of Patients With Ischemic Stroke
A Scientific Statement from the Stroke Council of the American Stroke Association
Adams et al, © 2003 American Heart Association, Inc.
http://stroke.ahajournals.org/cgi/content/full/34/4/1056

Guidelines for the Early Management of Patients With Ischemic Stroke: 2005 Guidelines Update
A Scientific Statement From the Stroke Council of the American Heart Association/American Stroke Association
Adams et al, © 2005 American Heart Association, Inc.
- http://stroke.ahajournals.org/cgi/content/full/36/4/916

Guidelines for Prevention of Stroke in Patients With Ischemic Stroke or Transient Ischemic Attack
A Statement for Healthcare Professionals From the American Heart Association/
American Stroke Association Council on Stroke:
Co-Sponsored by the Council on Cardiovascular Radiology and Intervention
Sacco et al, © 2006 American Heart Association.
- http://stroke.ahajournals.org/cgi/content/full/37/2/577

*Management of Adult Stroke Rehabilitation Care: A Clinical Practice Guideline**
Duncan et al, © 2005 American Heart Association.
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Australian Clinical Guidelines for Stroke Management

i. *Clinical Guidelines for Acute Stroke Management*: acute care (considered to be the first seven days), assessment of impairment and early management decisions.
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- www.diabetes.ca

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Ruth McPherson MD, PhD, Jiri Frohlich MD, George Fodor MD, & Jacques Genest MD. Revised Recommendations 2006. In Press (used with permission, Dr. G. Fodor; May 2006)

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Canadian Hypertension Education Program Recommendations 2006

- www.hypertension.ca

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Canadian Stroke Quality of Care Study:

Principal Investigators: Dr. Patrice Lindsay, Dr. Moira Kapral
Co-Investigators: Dr. Jeremy Grimshaw, Dr. Frank Silver, Dr. David Gladstone, Dr. Cheryl Jaigobin, Dr. Andreas Laupacis, Dr. Jack Tu

i. Quality Indicators and Literature Review for Acute Ischemic Stroke, 2004

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Canadian Stroke Network, Ontario Ministry of Health and Long Term Care,
And the Institute of Clinical Evaluative Sciences , Ontario

- www.rcsn.org (Found under Evaluation)

7. European Stroke Initiative

European Stroke Initiative Recommendations for Stroke Management: Update 2003

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Best Practice guidelines for stroke care
A resource for implementing optimal stroke care
2003/Heart and Stroke Foundation of Ontario
▸ http://209.5.25.171/Page.asp?PageID=399&SubcategoryID=110&CategoryID=7

9. New Zealand

Life after stroke: New Zealand guideline for management of stroke
Best practice evidence-based guideline
Stroke Foundation
November 2003/New Zealand
▸ www.nzgg.org.nz/guidelines/0037/ACF291F.pdf

10. Ottawa Panel

Ottawa Panel Evidence-Based Clinical Practice Guidelines for Post-Stroke Rehabilitation
© 2006 Thomas Land Publishers, Inc. Top Stroke Rehabil 2006;13(1):1–116
▸ www.thomasland.com

11. Royal College of Physicians, United Kingdom

National Clinical Guidelines for Stroke, Second edition
Prepared by the Intercollegiate Stroke Working Party
Clinical Effectiveness & Evaluation Unit
ROYAL COLLEGE OF PHYSICIANS of LONDON
June 2004/London, England
▸ www.rcplondon.ac.uk/pubs/books/stroke/stroke_guidelines_2ed.pdf

12. Scottish Intercollegiate Guidelines Network

SIGN Guidelines
National Clinical Guidelines
Scottish Intercollegiate Guidelines Network
Nov 02/Edinburgh, Scotland

Four SIGN stroke guidelines have been published:

- Management of patients with stroke part I: Assessment, investigation, immediate management and secondary prevention (SIGN 13, 1997/UNDER REVIEW)
  ▸ www.sign.ac.uk/pdf/sign13.pdf

- Management of patients with stroke part II: Management of carotid stenosis and carotid endarterectomy (SIGN 14, 1997/UNDER REVIEW)
  ▸ www.sign.ac.uk/pdf/sign14.pdf

- Management of patients with stroke part III: Identification and management of dysphagia (SIGN 20, 1997/ replaced by SIGN 78, 2004)
  - www.sign.ac.uk/pdf/sign78.pdf

- Management of patients with stroke part IV: Rehabilitation, prevention and management of complications, and discharge planning (SIGN 20, 1997/replaced by SIGN 64, 2002, updated 2005)
  - www.sign.ac.uk/pdf/sign64.pdf

Note: SIGN 13 and 14 are being reviewed jointly and a single publication is expected in 2006

13. Stroke Canada Optimization of Rehabilitation through Evidence (SCORE)

Stroke Canada Optimization of Rehabilitation through Evidence
Recommendations for the Upper and Lower Extremities and Risk Assessment Post-Stroke
2005/Canadian Stroke Network
Principal Investigator: Dr. Mark Bayley
- www.canadianstrokenetwork.ca/research/projects/downloads/SCORE_recommendations.pdf

14. Veterans Affairs/Department of Defense

Veterans Affairs/Department of Defense
Clinical Practice Guideline for the Management of Adult Stroke Guideline Summary
Oct 2002
- www.oqp.med.va.gov/cpg/STR/G/StrokeSum508.pdf

Several additional clinical practice guidelines are available for various aspects of stroke care. A detailed listing of these guidelines can be found on the Canadian Stroke Strategy website.

▸▸▸ http://canadianstrokestrategy.webexone.com

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Appendix One:

CANADIAN STROKE STRATEGY BEST PRACTICES AND STANDARDS

Working Group Members:

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Ms. Alison McDonald (Co-Chair)	Physiotherapist	Nova Scotia
Ms. Lisa Ashley	Senior Advisor	Public Health Agency of Canada
Dr. Nigel Ashworth	Director of Physical Medicine and Rehabilitation	Alberta
Dr. Mark Bayley	Physiatrist, Associate Professor of Rehabilitation Medicine	Ontario
Dr. Alan Bell	College of Family Physicians	Ontario
Dr. Lucie Brosseau	Associate Professor, Rehabilitation Sciences	Ontario
Ms. Nancy Cooper	Ontario Long Term Care Association	Ontario
Ms. Bev Culham	Project Manager, Alberta Provincial Stroke Strategy	Alberta
Dr. Ian Graham	Vice President, Knowledge Translation	Canadian Institutes for Health Research
Dr. Gordon Gubitz	Stroke Neurologist	Nova Scotia
Ms. Valerie MacGillivary	Speech Language Pathologist	British Columbia
Ms. Janel Nadeau	Stroke Survivor	Alberta
Ms. Louise Nichol	Community Team Manager, Community Stroke Care Service	Manitoba
Ms. Christina O'Callaghan	Regional Stroke Program Manager	Ontario
Ms. Elizabeth Swain	Physiotherapist	British Columbia
Dr. John Witt	Emergency Physician	Canadian Association of Emergency Physicians
Ms. Rika VanderLaan	Consultant	Heart and Stroke Foundation of Ontario
Ms. Mary Elizabeth Harriman	Associate Executive Director	Heart and Stroke Foundation of Canada
Ms. Katie Lafferty	Executive Director	Canadian Stroke Network
Ms. Debra Lynkowski	Director	Canadian Stroke Strategy
Dr. Patrice Lindsay	Co-Chair CSS Information & Evaluation Working Group	Canadian Stroke Strategy
Ms. Laurie Cameron	Program Coordinator and Executive Assistant	Canadian Stroke Strategy
Ms. Gail Williams	Consultant	Canadian Stroke Strategy

Expert Panel and External Consultation Members:

Ms Barb Ansley	Coordinator, Rehabilitation Research & Program Evaluation	Ontario
Mr. Leo Barrett	Stroke Recovery Association	Saskatchewan
Dr. Norm Campbell	Canadian Chair in Hypertension Prevention and Control	Canadian Hypertension Education Program
Ms. Charlotte Comrie	Executive Director	Heart and Stroke Foundation of Prince Edward Island
Ms. Corinne Corning	Stroke Policy Planner	Nova Scotia Dept. of Health
Ms. Peggy Daly	Assistant Professor, School of Nursing	Memorial University, Newfoundland
Dr. Naeem Dean	Internist, Clinical Associate Professor Dept. of Medicine	University of Alberta
Ms. Lisa Durnford	Stroke Navigator	Heart and Stroke Foundation of Newfoundland/Labrador
Dr. George Fodor	Head of Research, Prevention and Rehabilitation	University of Ottawa Heart Institute
Ms. Neala Gil	Manager, Cardiovascular Health	Nova Scotia Dept. of Health
Ms. Teri Green	Calgary Stroke Program Coordinator Foothills Medical Centre	Alberta
Ms. Ann Grantmyre	Chair, Board of Directors	Heart and Stroke Foundation of Nova Scotia
Dr. Antoine Hakim	CEO & Scientific Director	Canadian Stroke Network
Dr. Devin Harris	Emergency Department Physician	British Columbia
Dr. Kenneth Harris	Vascular Surgeon, NASCET Investigator	University of Western Ontario
Dr. Ed Harrison	Physiatrist, Queen Elizabeth Hospital	Prince Edward Island
Dr. Andy Hurtubise	Family Physician	College of Family Physicians of Canada
Dr. Brendan Kenny	Neurosurgery	Quebec
Ms. Donna Lillie	Vice-President Research and Professional Education	Canadian Diabetes Association
Ms. Diane MacKenzie	School of Occupational Therapy Dalhousie University	Nova Scotia
Ms. Rosemary Martino	School of Speech and Language Pathology	University of Toronto
Ms. Jessica Peters	Senior Specialist, Research & Product Development	Canadian Council on Health Services Accreditation
Mr. Pierre Poirier	Executive Director	Paramedics Association of Canada
Dr. Demetrios Sahlas	Director, Stroke Prevention Clinic	Ontario
Mr. John Serkiz	Health Care Consultant Hospital Services	New Brunswick Dept. of Health
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Appendix Two:

CANADIAN STROKE STRATEGY

Information & Evaluation Working Group Members

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Ms. Nancy Porteous	Centre for Chronic Disease Prevention & Control	Public Health Agency of Canada
Mr. Peter Walsh	Centre for Chronic Disease Prevention & Control	Public Health Agency of Canada
Dr. Grace Warner	Epidemiologist, Dalhousie University	Nova Scotia
Ms. Katie Lafferty	Executive Director	Canadian Stroke Network
Ms. Mary Elizabeth Harriman	Associate Executive Director	Heart and Stroke Foundation of Canada
Ms. Debra Lynkowski	Director	Canadian Stroke Strategy
Ms. Laurie Cameron	Program Coordinator & Executive Assistant	Canadian Stroke Strategy

Appendix Three:

STROKE GUIDELINES: GRADING SYSTEM SUMMARY TABLE (ALPHABETICAL)

	RCP (2004)	SIGN* (2002, 2004) *(see Numeric list for def'ns)*	NZ (2003) *(Uses SIGN Numeric LOE system)*	CSQCS/ Guyatt (1998)
A	**I**a. Meta-analysis of randomized controlled trials (RCTs) **I**b. At lease one RCT	At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results	The recommendation is supported by good evidence	Methods strong, results consistent—RCTs, no heterogeneity: 1: Effect clear—Clear that benefits do (or do not) outweigh risks 2: Effect equivocal—Uncertainty whether benefits outweigh risks
B	**II**a. At least one well designed, controlled study but without randomization **II**b. At least one well designed, quasi-experimental study **III**. At least one well designed, non-experimental descriptive study (e.g. comparative studies, correlation studies, case studies)	A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+	The recommendation is supported by fair evidence	Methods strong, results inconsistent—RCTs, heterogeneity present: 1: Effect clear—Clear that benefits do (or do not) outweigh risks 2: Effect equivocal—Uncertainty whether benefits outweigh risks
C	**IV**. Expert committee reports, opinions and/or experience of respected authorities. This grading indicates that directly applicable clinical studies of good quality are absent	A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++	The recommendation is supported by expert opinion only and/or limited evidence	Methods weak—Observational studies: 1: Effect clear—Clear that benefits do (or do not) outweigh risks 2: Effect equivocal—Uncertainty whether benefits outweigh risks
D	Consensus of Working party Recommended good practice based on the clinical experience of the Guideline Development Group	Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+	N/A	N/A
Other Alphabetical Categories	**R**—Recommended as good practice based on the clinical experience of the guideline development group	None	**I**—No recommendation can be made because the evidence is insufficient. Evidence is lacking, of poor quality or conflicting and the balance of benefits and harms cannot be determined	None

STROKE GUIDELINES: GRADING SYSTEM SUMMARY TABLE (NUMERIC)

RCP (2004)	SIGN (1997, 2002, 2004)	Australia (2005)	VA/DOD (2005)	
Ia. Meta-analysis of randomized controlled trials (RCTs) Ib. At lease one RCT	1++ High-quality meta-analyses, systematic reviews of randomized controlled trials (RCTs) or RCTs with a very low risk of bias 1+ Well conducted meta-analyses, systematic reviews or RCTs with a low risk of bias 1– Meta-analyses, systematic reviews or RCTs with a high risk of bias	Evidence obtained from a systematic review of all relevant randomized controlled trials	I: At least one properly done RCT	I
IIa. At least one well designed, controlled study but without randomization IIb. At least one well designed, quasi-experimental study	2++ High-quality systematic reviews of case-control or cohort studies. High-quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal 2+ Well conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal 2– Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal	Evidence obtained from at least one properly designed randomized controlled	II-1: Well designed controlled trial without randomization II-2: Well designed cohort or case-control analytic study II-3: Multiple time series, dramatic results of uncontrolled experiment	II
III At least one well designed, non-experimental descriptive study (e.g. comparative studies, correlation studies, case studies)	3: Non-analytic studies, e.g. case reports, case series	III-1 Evidence obtained from well-designed pseudo-randomized controlled trials (alternate allocation or some other method) III-2 Evidence obtained from comparative studies with concurrent controls and allocation randomized (cohort studies), case-control studies, or interrupted time-series III-3 Evidence obtained from comparative studies with historical control, two or more interrupted time series without a parallel control group	III: Opinion of respected authorities, case reports, and expert committees	III
IV Expert committee reports, opinions and/or experience of respected authorities. This grading indicates that directly applicable clinical studies of good quality are absent	4 : Expert opinion	IV Evidence obtained from case series, either post-test or pre-test and post-test	NA	IV
Recommended good practice based on the clinical experience of the Guideline Development Group	NA	R—Recommended best practice based on clinical experience and expert opinion	NA	R

NOTES