Complete Summary

GUIDELINE TITLE

Acute stroke management. Blood glucose. In: Canadian best practice recommendations for stroke care: 2006.

BIBLIOGRAPHIC SOURCE(S)

Acute stroke management. Blood glucose. In: Canadian best practice recommendations for stroke care: 2006. Ottawa (ON): Canadian Stroke Network, Heart & Stroke Foundation of Canada; 2006. p. 49-50.

GUIDELINE STATUS

This is the current release of the guideline.

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

COMPLETE SUMMARY CONTENT

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SCOPE

DISEASE/CONDITION(S)

- Acute stroke, including ischemic and hemorrhagic stroke
- Diabetes mellitus
- Hypoglycemia
- Hyperglycemia

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Treatment

CLINICAL SPECIALTY

Critical Care
Emergency Medicine
Family Practice
Internal Medicine
Neurology

INTENDED USERS

Advanced Practice Nurses
Emergency Medical Technicians/Paramedics
Health Care Providers
Nurses
Patients
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

To synthesize available literature and recommend best practices in stroke care appropriate to the Canadian context

TARGET POPULATION

All patients with suspected acute stroke

INTERVENTIONS AND PRACTICES CONSIDERED

1. Blood glucose measurement
2. Correction of blood glucose levels

MAJOR OUTCOMES CONSIDERED

- Hypoglycemia
- Hyperglycemia
- Focal neurological deficits

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

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, 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 Best Practices and Standards Working Group (BPS-WG) and provided direction for the identification of Phase I Primary Guidelines and topics.

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 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.

Identification of Primary Guidelines

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.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

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 the original guideline document provides the levels of evidence for the recommendation as well as the reference for the Primary Guideline(s) that were adapted or contributed most to the wording of the recommendation.

Level of Evidence*		Definition
A	I	At least one randomized controlled trial (RCT); or, meta-analysis of 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 in the original guideline document for a detailed table defining the evidence rating system used by each primary guideline referenced in this document.

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

A Stroke Best Practices Recommendations Matrix was developed that mapped other existing stroke-related recommendations and their levels of evidence onto

topic areas identified as relevant to optimal stroke care in Canada (i.e., blood pressure management, organization of care).

The list of topics was generated by identifying recommendations with the highest levels of evidence in each of the reference 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 Canadian Stroke Quality of Care Study (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.

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 the original guideline document provides the levels of evidence for the recommendation (see "Rating Scheme for the Strength of the Evidence" field), as well as the reference for the Primary Guideline(s) that were adapted or contributed most to the wording of the recommendation.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Consensus Development Conference)
Expert Consensus (Delphi)
Other

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The Best Practices and Standards Working Group (BPS-WG) chose a conceptual framework to follow for the identification and selection of stroke recommendations. The Practice Guideline Evaluation and Adaptation Cycle 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.

Drafting of the 2006 Stroke Recommendations

Once agreement on a core set of reference 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

There were some recommendations from the core reference 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 full 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.

Break-out sessions were held 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 Best Practices and Standards Working Group (BPS-WG).

See Section C.4 in the original guideline document for a description of the methods used to develop performance measures.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

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. A final round of external reviews was completed prior to publication.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Definitions of the levels of evidence (A-D; I-IV; R) are provided at the end of the "Major Recommendations" field.

Note from the Canadian Stroke Network/Heart & Stroke Foundation of Canada and the National Guideline Clearinghouse (NGC): The *Canadian Best Practice Recommendations for Stroke Care: 2006* guideline has been divided into individual summaries. In addition to the current summary, the following are available:

- Public awareness and responsiveness.
- Patient and caregiver education.
- Stroke prevention. Life style and risk factor management.
- Stroke prevention. Blood pressure management.
- Stroke prevention. Lipid-management.
- Stroke prevention. Diabetes management.
- Stroke prevention. Antiplatelet therapy.
- Stroke prevention. Antithrombotic therapy in atrial fibrillation.
- Stroke prevention. Carotid intervention.
- Acute stroke management. Stroke unit care.
- Acute stroke management. Brain imaging.
- Acute stroke management. Acute thrombolytic treatment.
- Acute stroke management. Carotid artery imaging.

- Acute stroke management. Dysphagia assessment.
- Acute stroke management. Acute aspirin therapy.
- Acute stroke management. Management of subarachnoid and intracerebral hemorrhage.
- Stroke rehabilitation and community reintegration. Initial stroke rehabilitation assessment.
- Stroke rehabilitation and community reintegration. Provision of inpatient stroke rehabilitation.
- Stroke rehabilitation and community reintegration. Components of inpatient stroke rehabilitation.
- Stroke rehabilitation and community reintegration. Identification and management of post-stroke depression.
- Stroke rehabilitation and community reintegration. Shoulder pain assessment and treatment.
- Stroke rehabilitation and community reintegration. Community-based rehabilitation.
- Follow-up and community reintegration after stroke.

Best Practice Recommendation

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. (**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.

Definitions:

Levels of Evidence

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 the original guideline document provides the levels of evidence for the recommendation as well as the reference for the Primary Guideline(s) that were adapted or contributed most to the wording of the recommendation.

Level of Evidence*	Definition

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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
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R	R	Recommended good practice based on the clinical experience of the Guideline Development Group

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

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence is specifically stated for each recommendation.

This document is the result of an extensive review of national and international evidence-based stroke best practice recommendations and guidelines.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate measurement of blood glucose in patients with suspected acute stroke results in timely treatment, prevention of focal neurological deficits, and better outcomes

POTENTIAL HARMS

Not stated

CONTRAINDICATIONS

CONTRAINDICATIONS

Severe hyperglycemia is a relative contraindication to the administration of intravenous alteplase.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

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.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

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 Canadian Stroke Strategy (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.

Core Elements of an Integrated Stroke Strategy*

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" in the original guideline document. 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.

* 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.

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 emergency department (ED) or on the inpatient ward.
ii. Proportion of patients with known diabetes who have blood glucose levels in therapeutic range for that patient.

IMPLEMENTATION TOOLS

Audit Criteria/Indicators
Patient Resources
Pocket Guide/Reference Cards

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Acute stroke management. Blood glucose. In: Canadian best practice recommendations for stroke care: 2006. Ottawa (ON): Canadian Stroke Network, Heart & Stroke Foundation of Canada; 2006. p. 49-50.

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2006

GUIDELINE DEVELOPER(S)

Canadian Stroke Network - Disease Specific Society
Heart and Stroke Foundation of Canada - Disease Specific Society

SOURCE(S) OF FUNDING

Government Funding – National Centres of Excellence Program

GUIDELINE COMMITTEE

Canadian Stroke Strategy Best Practices and Standards Working Group

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Working Group Members: Dr. Stephen Phillips (Co-Chair), Director Acute Stroke Service, Queen Elizabeth II Health Sciences Centre, Nova Scotia; Ms. Alison McDonald (Co-Chair), Physiotherapist, Nova Scotia Rehabilitation Centre, Capital Health, Nova Scotia; Ms. Lisa Ashley, Senior Advisor, Public Health Agency of Canada; Dr. Nigel Ashworth, Director of Physical Medicine and Rehabilitation, Glenrose Rehabilitation Hospital, Alberta; Dr. Mark Bayley, Physiatrist, Associate, Medicine Toronto Rehabilitation Institute, Ontario; Dr. Alan Bell, Family Practitioner, College of Family Physicians of Canada; Dr. Lucie Brosseau, Associate Professor, Rehabilitation Sciences, University of Ottawa, Ontario; Ms. Nancy Cooper, Director of Policy and Professional Development, Ontario Long Term Care Association; Ms. Bev Culham, Project Manager, Alberta Provincial Stroke Strategy, Alberta; Dr. Ian Graham, Vice President, Knowledge Translation Canadian Institutes for Health Research (CIHR); Dr. Gordon Gubitz, Neurologist Acute Stroke Unit & Outpatient Neurovascular Clinic, Queen Elizabeth II Health Sciences Centre, Nova Scotia; Ms. Valerie MacGillivary, Speech Language Pathologist,

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

ENDORSER(S)

World Stroke Organization - International Agency

GUIDELINE STATUS

This is the current release of the guideline.

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

GUIDELINE AVAILABILITY

Electronic copies: Available from the Canadian Stroke Strategy Web site.

Print copies: Available from The Canadian Stroke Strategy, 451 Smyth Road, Room 3105, Ottawa, Ontario K1H 8M5.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Canadian Stroke Strategy performance measurement manual: a supplement to the Canadian best practice recommendations for stroke care. 2007 May. 35 p. Electronic copies: Available in Portable Document Format (PDF) from the Canadian Stroke Strategy Web site.
- Stroke prevention cards: risk stratification for early stroke recurrence following TIA. 2 p. Electronic copies: Available in Portable Document Format (PDF) from the Canadian Stroke Strategy Web site.
- Integrated stroke care in Ontario: stroke evaluation report 2006. 2007 Jul. 72 p. Available in Portable Document Format (PDF) from the Canadian Stroke Strategy Web site.

- Stroke services and resources inventory: a national survey initiative. 2007 Jun. 36 p. Available in Portable Document Format (PDF) from the Canadian Stroke Strategy Web site.

Print copies: Available from The Canadian Stroke Strategy, 451 Smyth Road, Room 3105, Ottawa, Ontario; K1H 8M5.

Additionally, suggested performance measures are available in the original guideline document.

PATIENT RESOURCES

A variety of patient information resources, including a list of stroke warning signs, is available from the Heart & Stroke Foundation of Canada Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC STATUS

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